PRAKRITI SANRAKSHAN

Newsletter

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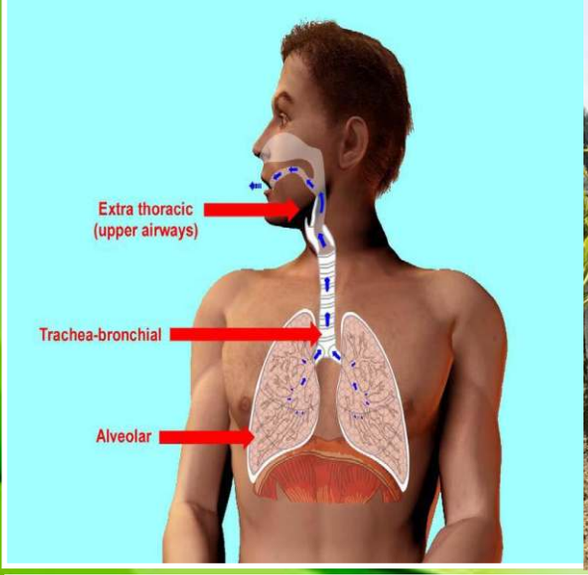
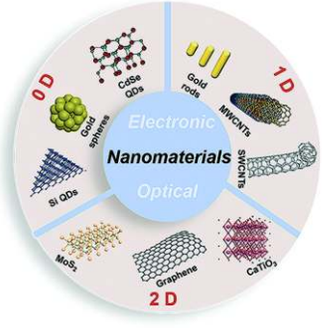
Inside Glimpses











If you believe in our ideology and wish to step up for the environment, we welcome you to join our organisation and together we can save the environment.

Visit- https://stenvironment.org/

Follow the link, choose the kind of membership that suits you and fill-up the form.

ABOUT US

Save the Environment (STE)

SAVE THE ENVIRONMENT (STE) is the organization that aims to spread awareness to the society about environment, health and water. It was founded and registered on 19th November 1990. STE has collaborated with various organizations in the past 29 years such as All India Institute of Hygiene & Public Health (AIIHPH) and India Canada Environment Facility, DRDO Ministry of Defence, Department of Science and Technology (DST), Indian Institute of Management (IIM), Ahmedabad to mitigate the effects of arsenic and provide arsenic-free drinking water.

The vision of the society is to protect present and future generations from various Environmental Hazards. The NGO has been actively organizing various interactive sessions such as conferences (National and International), workshops, seminars and awareness programs including poster competitions, quiz competitions, science exhibitions and webinars.

STE Annual Awards 2022

(NOMINATION AND APPLICATIONS ARE INVITED)

LAST DATE 31 August, 2022

Annual Awards of STE are the tangible symbol to signify eminence of contributions made by a person or institution. This boosts the enthusiasm of the contributors who have contributed in different fields of science and social service with their excellence, expertise and approach towards achieving certain goals for the society. Recognition of such extraordinary activities is eventually very important to boost their confidence and to honour them for what they have done for the science and society. STE confers following categories of awards and honours to such eminent personalities.:

STE Dr. APJ Abdul Kalam Award
STE Fellowship Awards
STE Water Awards
STE Dr. Praloy O Basu Life Time Achievement Award
STE Green Excellence Award
STE Humanitarian Award for NGO
STE Best Teacher Award
STE Young Researcher Awards
STE Best Ideas/Innovations/Technology for Environment Awards
STE Women Awards
STE Meritorious Award for Excellence in academics and research
STE International Achiever Awards

For more information, please log on to our website
www.stenvironment.org/ste-awards/

ARTICLES ARE INVITED FOR THE
INTERNATIONAL JOURNAL OF ENVIRONMENT AND HEALTH SCIENCES

This journal is being published by Save the Environment. Send your manuscripts for peer-review by e-mail. The authors must mention address, Contact Nos. and E-MAIL ID in their forwarding letter. Proof will be sent for correction before publishing. A pledge for originality will be signed by the authors.

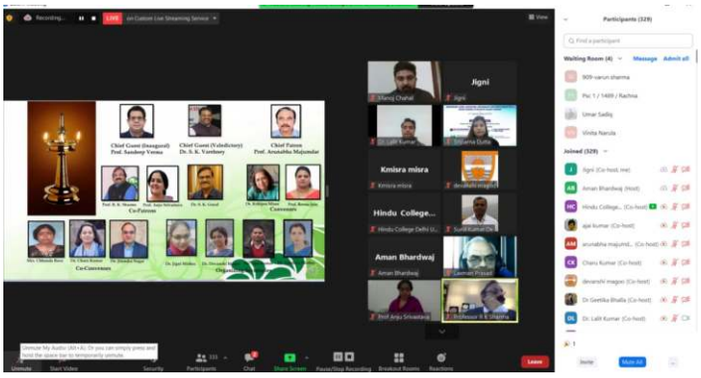
We are pleased to announce that the DOI prefix for International Journal of Environment and Health Sciences is now available from Crossref, the official Digital Object Identifier (DOI). The journal is now indexed in International Scientific Indexing (ISI).

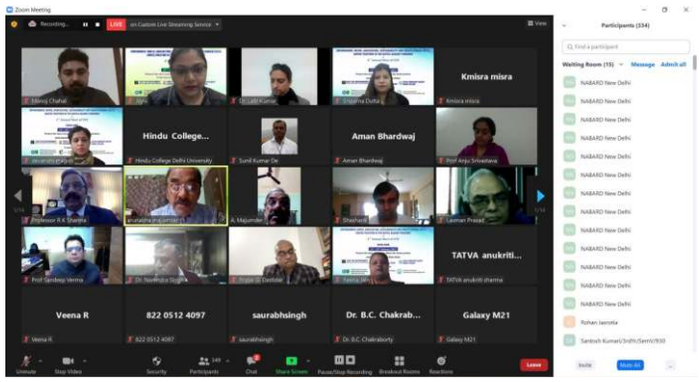
For further details, please contact, Chief Editor at: **ijehseditor@gmail.com** or visit our website: **www.stenvironment.org**

REPORT OF
INTERNATIONAL CONFERENCE
ON
ENVIRONMENT, WATER, AGRICULTURE, SUSTAINABILITY AND HEALTH (EWASH-2021): UNITED TOGETHER IN THE BATTLE AGAINST PANDEMIC
&
3rd Annual Meet of STE
21 to 22 January, 2022 (ONLINE)

Save The Environment (STE), a registered NGO based in Kolkata, West Bengal (dedicated largely towards eradication of groundwater arsenic poisoning, environment protection, water management and health improvement) successfully organized the two-day online *International Conference on* ***'Environment, Water, Agriculture, Sustainability & Health (EWASH-2021): United Together in the Battle against Pandemic***, on **21st – 22nd January, 2022**, in joint collaboration with **Department of Chemistry, Hindu College, Delhi University** and in association with **CSIR- National Environmental Engineering Research Institute, Royal Society of Chemistry London- North India Section** and **Environment and Social Development Association (ESDA), Delhi.**

Around 350 delegates including the life members of STE society participated in the EWASH- 2021 conference, which was very ***kindly supported by NABARD***. The conference was an intellectual amalgamation of expert academicians, eminent scientists, policy makers, environmentalists, industry personnel and contemporary researchers who engaged on various pertinent topics about deep rooted environmental issues and sustainable approaches to solve existing environmental problems on the local, national, and global scale, especially as the world strives to recover from the pandemic phase. Enlightening keynote and invited talks were delivered by distinguished scientists of national and international repute. Noteworthy oral and poster presentation sessions were conducted. Numerous student activities were organized that enunciated innovative solutions from young minds to solve environmental crises.



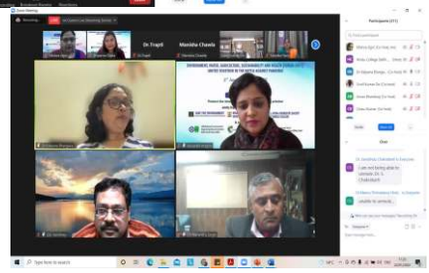


This was also the 3rd Annual Meet of Save The Environment where eminent researchers and pioneers who have inspirationally contributed towards water conservation, environmental protection and social upliftment in recent times were felicitated. **Prof. Sandeep Verma, Secretary, SERB, Dept. of Science & Technology, Govt. of India & Professor, IIT Kanpur** and **Shri. S.K. Varshney, Head, International Cooperation, Dept. of Science & Technology, Govt. of India** graced the event as Honorable Chief Guests in the inaugural session and valedictory session, respectively.

Videos can be viewed on YouTube also using the following links:

Day 1, 21st Jan, 2022 https://youtu.be/G5SMP4qiZ4s

Day 2, 22nd Jan, 2022 https://youtu.be/UClYtYZBUsg

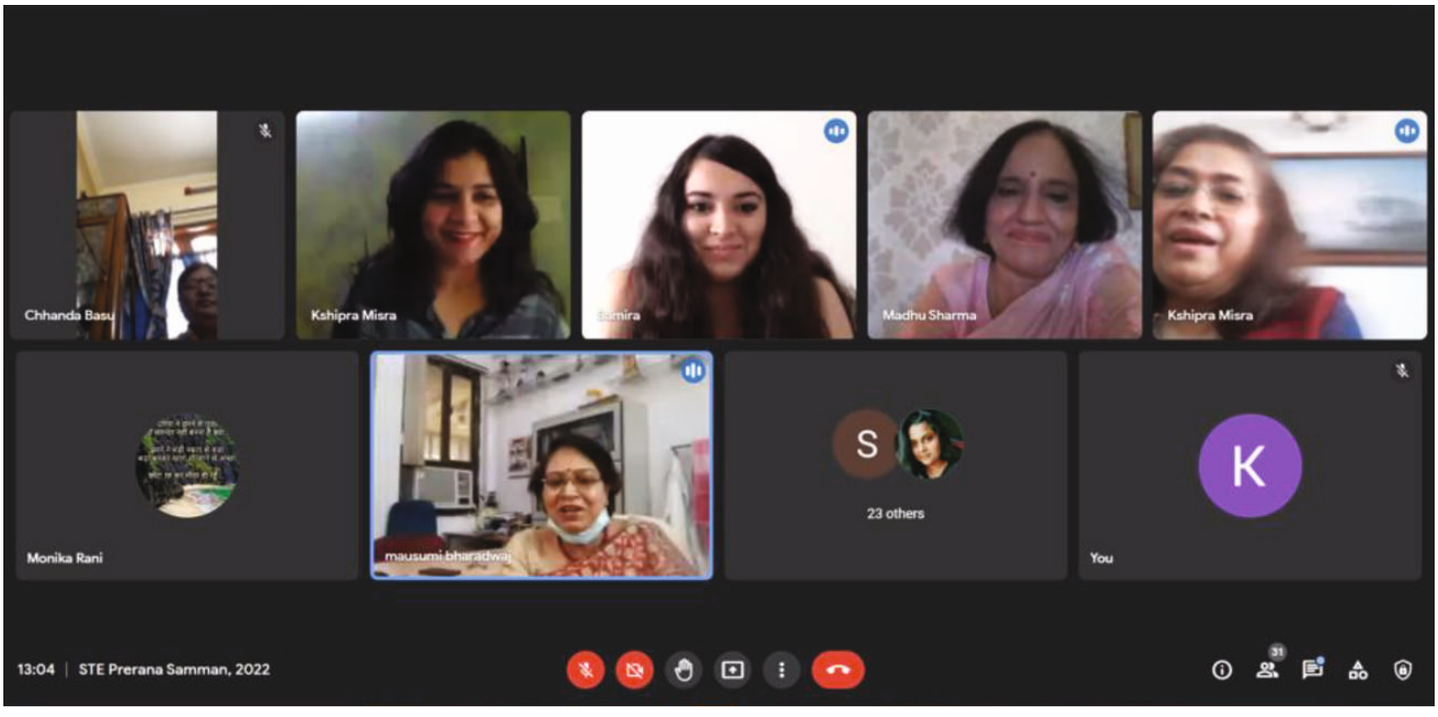


STE Prerana Samman, 2022

The ***STE Prerana Samman, 2022*** was organized on 8th March, 2022, to mark the occasion of International Women's Day. The theme was aligned with that of UN's this year- '*Gender Equality Today for a Sustainable Tomorrow*'. To celebrate the event, STE felicitated three very inspirational women achievers to honor their cognizance and motivating efforts towards the betterment of our society. The STE Prerana Samman recipients for this year were:

- ***Dr. Mausumi Bharadwaj***, Scientist G & Head, Molecular Biology Group, ICMR-NICPR, NOIDA;
- ***Ms. Samira Kelkar***, Stanford Certified Creative Entrepreneur and Founder of The Foundation Room- an initiative for encouragement of creative and musical talents
- ***Ms. Madhu Sharma***, Education Consultant and Founder-Gyan Global Consultancy

Dr. Kshipra Misra, President, STE & Former Additional Director, DIPAS (DRDO), Delhi presided over the event as Convener. Organizing secretaries **Dr. Kavita Khatana**, IIMT College of Engineering, G. NOIDA and **Dr. Jigni Mishra**, Project Associate, IARI & E.C. member, STE conducted the event successfully. Around 100 participants from various fields graced the program as audience.



SAFETY ISSUES in LARGE-SCALE APPLICATIONS of NANO-MATERIALS

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Former Director, CFEES/DRDO Delhi, and DIXS/DRDO, Nagpur;
Former Advisor (Strategic Projects), DRDO HQ, Delhi;
Professor & Director, Amity Institute of Environment Sciences, Amity University, Noida;
Former Vice President, Asia Fire-protection Inspection Council(AFIC), Seoul;
Member, Int. Forum of Directors of Fire Research Laboratories, NIST, Gaithersburg, US;
Former President, Institute of Defence Sc. Tech., Bangalore-Delhi-Hyderabad-Pune.

INTRODUCTION

Over the last two decades, the R&D and production of nano-materials(NM) has seen an exponential growth for exploiting their immense potential for defence and commercial purposes. Almost everything in market seems to have grabbed nano as the tagline to promote their products; be it in pharmaceuticals, cosmetics, paints, textiles, adhesives, etc. This article tries to figure out why and how such a large scale use of tiniest of the tiny substance should pose any worthwhile threat to human beings, environment and the bio-life on this Earth in general. And the increasing usage of NM in coming years is throwing-up new challenges of under-standing, predicting, and managing health & safety risks. Assessment of exposure to NM involves many complex factors: particle size & shape, functional groups, surface area, concentration, composition, exposure duration, retention & assimilation in body. Importance of studying the behavior of nano-particles emanates from the role these NM play in modifying our understanding of the health (respiration), visibility, radiative balance, cloud formation, heterogeneous physic- chemical reactions, delivery of nutrients & drugs. Most of these processes are poorly understood and are required to be investigated. The picture becomes more frightening when we learn that at size 10 nm, the particle size matches with the pore size of the exchange membranes in most of the body tissues, meaning these are able to penetration into the most vital of the biological barrier and also directly into the body-cells. This single factor should raise concerns of the researchers in the field of bio-safety.

The world, in fact, is immersed in the atmospheric ocean of Nano-particles, which are known to the mankind for ages. Atmosphere has been, since Earth's origin, has been an ocean of nano-sizedcondensation nuclei(Aitken Nuclei) of metallic and non-metallic particles formed from nucleation of different materials at different times, during and after evolution of the Atmosphere. Since then, spatial distribution over the surface of Earth, concentration, material&chemical composition, surface distribution and mass fraction of these nano-particles wrt overall aerosol properties has been changing continuously.

Currently the average concentration by number varies between10^9/m3 over the ocean to 10^{14}/m3 in a typical urban area. For comparison sake just consider that the concentration of all particles of size upto 3000 nm in controlled conditions of low grade (Class 10000)Clean room facility is below 3.5 x10^5/m3 and in typical high fidelity Clean rooms used for chip fabrication(Class 1) is just 350 particles/m3. Condensation nuclei in air are useful to the Mankind, as the essential component of rain droplet formation, of scattering of sun-light and of occurrence of lightening, and hence these have been studied extensively since last century.

NANO-PARTICLESin the EARTH'S ATMOSPHERE are NATURAL to HUMANS

Nano-particles are injected into or in-situ formed in the Atmosphere from the following broad sources:-

I) ***Natural Sources:*** volcanic eruptions, wind-blown dust, maritime sea salt particles, wild fires, gas-to-particle conversion, photo-chemical& bio-generated aerosols; and

ii) ***Anthropogenic Sources:*** Energy generation, transport, chemical industry, ore beneficiation, engineerednano-materials.

Each of these above sources may require another article and hence in this article, it will not be discussed further. It is more pertinent to devote some part to give the reader idea of the size range where nano-particles are placed in comparison of natural and other manmade nano-materials. Table 1 below provides some details of these materials on the scale of size range.

Table: 1

a. <u>Relative Dimensions of Nano-materials</u>

1.	Water molecules	0.2 nm
2.	Fullerenes	~2 nm

3.	Nano-particles	1 – 100 nm
4.	Hemoglobin	7 nm
5.	Virus	10 - 100 nm
6.	Microbial cells	1000 nm
7.	$PM_{2.5}$ Aerosols	2500 nm

b. Manmade Nano-materials of Different Types

1.	Quantum dots, Nano-crystals	1-10 nm
2.	Ceramic oxides, Buckey-balls	1-100 nm
3.	Nano-tubes, Nano-wires	1-100 nm
4.	Feature size of current microchip	50-70 nm

Table-2 provides the contribution of various natural sources to the annual release of all particles in the atmosphere and out of the total best estimated world-wide emissions of 3100 trillion gram ($3.1x10^{15}$gm). Assuming that 0.01 percent of the total mass released is in the size range of nano-particles,quantum of nano-particle would be a staggering 3.1 trillion gram, that is $3.1x10^{11}$ gram.

Table 2: Estimates of Global Emissions of Natural Atmospheric Aerosols

Source	Amount-range (Tg yr^{-1})	Amount-best estimate (Tg yr^{-1})
Soil Dust	1000-3000	1500
Sea Salt	1000-10000	1300
Botanical Debris	26-80	50
Volcanoes	4-10000	30
Forest Fires	3-150	20
Gas conversion	100-260	180
Photochem	40-200	60
Total	2200-24000	3100

In addition to the natural sources, the anthropogenic sources also add to the total aerosols inventory of the nano-particle concentration in the atmosphere. Table-3 gives details of their share to the total atmospheric aerosol inventory.

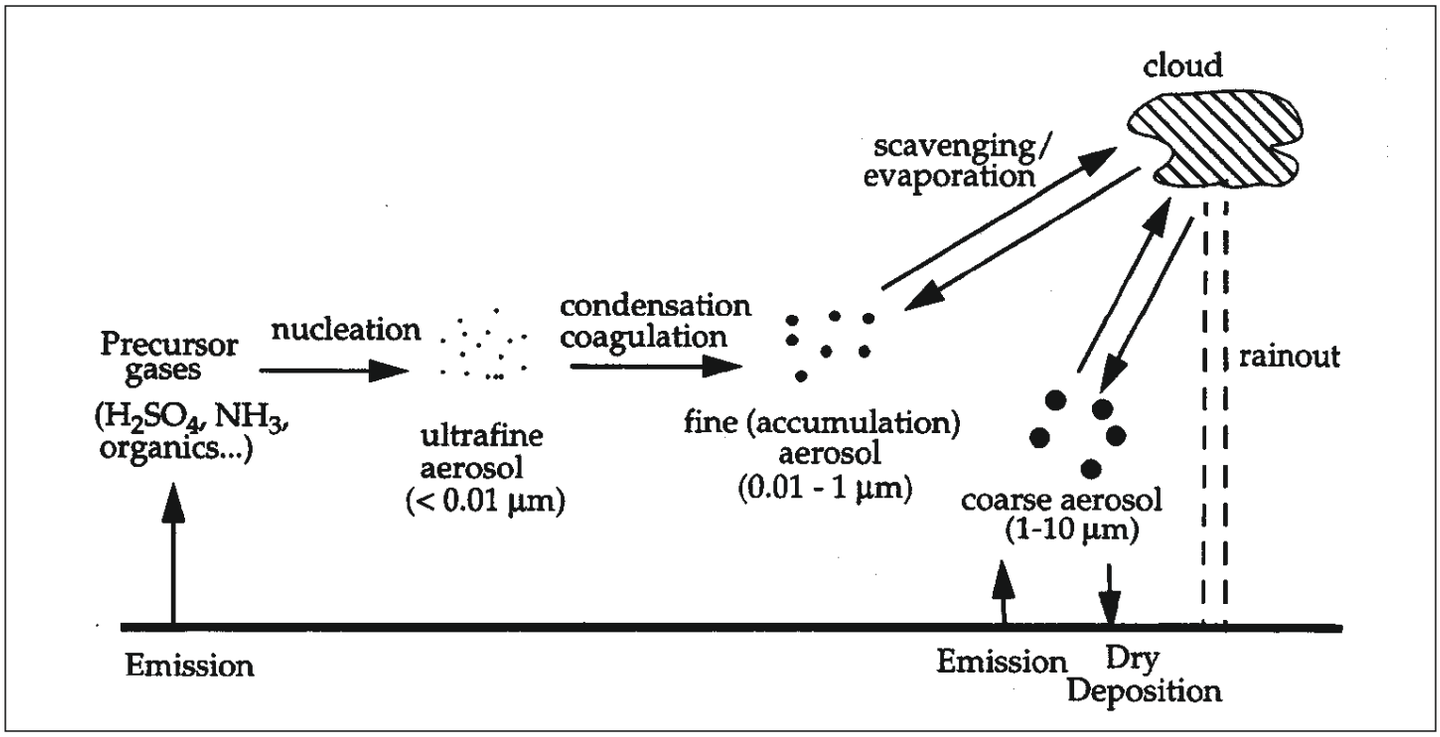
Table 3: Emissions of Anthropogenic Atmospheric Aerosols.

1.	Direct emissions	5-160 Tg/y
2.	Gas to particle conversion	260-460 Tg/y
3.	Photochemistry	5-25 Tg/y
4.	TOTAL (Range)	320-540 Tg/y
5.	**(Best estimate)**	**460 Tg/Y**

In Figure-1, different sources and the dynamics of the various size fractions of the atmospheric aerosols are shown. It depicts the formation of the smallest of these particles, i.e. nano-particles thru the condensation and nucleation of gases and vapour released into the atmosphere from natural and anthropogenic sources. These particles formed by coalescence of gas molecules under super saturation conditions, different for various different gases released in the atmosphere, are also known as the primary aerosols. These primary aerosols grow in time due to two processes, one- by condensation of vapour molecules, second- by agglomeration. As the particle size grows, number concentration falls drastically, both due to depletion by agglomeration and due to removal processes (scavenging by rain drops and deposition). All these processes are in dynamic balance, in time and in space and also influenced by sun-light, pressure and humidity and wind conditions.

Figure 1: Source and Dynamics of Atmospheric Aerosols.

(Size range from 1nm(molecular clusters) to 100 microns(small rain drops)



SYNTHETIC NANO-MATERIALSand APPLICATIONS

Applications of the nano-materials in public domain are expanding in the military, aerospace, industry and civil sector and that is where the hazards are foreseen to come from, to the human beings. An exhaustive account of various applications in military and civil sectors is given in this section. Some of these may lead to enhanced exposure of humans to toxic nano-materials and have profound potential of increasing risk from nano-materials. Important of these are medical, pharmaceutical and cosmetics industries listed under civil applications Table 4. These three applications involve direct contact/ingestion of the products made from nano-materials, and hence the possibility of assimilation of the nano-materials from these products is the maximum. The assimilated fraction, finally reach the blood stream and other vital fluids of the physiological systems, directly impacting the humans in terms of exposure to adverse effects.

a. Military Applications

1. Radiation &microwave absorbers in space, as shield against UV
2. Signature suppression(military platforms) - composites for tailored EM radiation shielding, conformal coatings, IR shielding, electrostatic discharge films, electrostatic dissipative, polymers
3. Aerospace Applications - non-mettalic conductive materials for airframe

4. Ballistic Protection - body armours, flexible & light, shear thickening with sensing of shockwave.
5. Electrostatic charge dissipation
6. Porous nano-composites- detection &analysis of gases, super-adsorbers for environmental protection, shock absorbers & acoustic absorbents.
7. Corrosion protection &solid lubricants
8. Chemical/ pressure sensors & actuators

10 Nano-composites-multi-functional materials with extreme properties, microwave shielding, energy storage, super high-strength materials.

11 Fibre and Textile Applications - flash-welded non-woven mats of highly aligned electro-spun fibres in selective pattern to yield desired properties.

Table 4: Civil Application Areas of Nano-materials.

Automotive industry • lightweight construction • painting (fillers, base coat, clear coat) • catalysts • tires (fillers) • sensors • Coatings for wind-screen and car bodies	**Chemical industry** • fillers for paint systems • coating systems based on nanocomposites • impregnation of papers • switchable adhesives • magnetic fluids	**Engineering** • wear protection for tools and machines (anti blocking coatings, scratch resistant coatings on plastic parts, etc.) • lubricant-free bearings
Electronic industry • data memory (MRAM, GMR-HD) • displays (OLED, FED) • laser diodes • glass fibres • optical switches • filters (IR-blocking) • conductive, antistatic coatings	**Construction** • construction materials • thermal insulation • flame retardants • surface-functionalised building materials for wood, floors, stone, facades, tiles, roof tiles, etc. • facade coatings • groove mortar	**Medicine** • drug delivery systems • active agents • contrast medium • medical rapid tests • prostheses and implants • antimicrobial agents and coatings • agents in cancer therapy
Textile/fabrics/non-wovens • surface-processed textiles • smart clothes	**Energy** • fuel cells • solar cells • batteries • capacitors	**Cosmetics** • sun protection • lipsticks • skin creams • tooth paste
Food and drinks • package materials • storage life sensors • additives • clarification of fruit juices	**Household** • ceramic coatings for irons • odors catalyst • cleaner for glass, ceramic, floor, windows	**Sports /outdoor** • ski wax • antifogging of glasses/goggles • antifouling coatings for ships/boats • reinforced tennis rackets and balls

EUROPEAN AGENCY PRINCIPLE for SAFETY & HEALTH at WORK

The Precautionary Principle enunciated by 1992 Rio Conference on Environment & Development, later adopted by European Union in 2002, calls for the following measures to be adopted until R&D results of the authenticated results of the comprehensive safety studies on new materials are available and are adopted. Since, the nano-materials are basically the manipulation of matter on atomic scale to produce new structures, materials, devices. Increasing usage as discussed in previous section, of the nano-materials in future is throwing-up new challenge of under-standing, predicting, and managing health & safety risks.

Data on hazards from the known materials is available as MSDS and is in public domain. These are not directly applicable to nano-materials and it will be far-fetched to assume that any modifications in current MSDS can account for the enhanced surface and reactivity of the nano-materials. Therefore, all these MSDS, with more robust provisions by increasing the safety levels, and decreasing the MELs will be at best serve as interim measure until the time proper MSDS are made available specific to nano-materials.

Therefore, public & private institutions and industries must adopt enhanced preventive and protective measures to minimize, mitigate and eliminate risk to the personnel, facility and the environment. Preliminary effort requires risk mitigation methodology at technology level, organizational level and at personnel level.

What need to be done to assess, measure and offset these adverse effects of the use of nano-materials? Foremost of all these, is to start a program on understanding the reactive behaviour of toxic materials of nano-materials in-vitro and in-vivo conditions. This must go simultaneously work on possible adverse effects related to health, safety & environment to be understood and quantified. Meanwhile, we must also respond by updating the existing and creating newmaterials and control measures to minimize the releases and also tighten administrative infrastructure, control and implementation mechanism. Necessary exposure control measures to be re-designed and engineering controls, personal protection equipment also need to be upgraded. Alongside this, work on strengthening the regulatory framework need to be started.

1. Assessment of exposure to NM involves many complex factors such as particle size & shape, functional groups, surface area, concentration, composition, exposure duration, retention & assimilation in body. Most of these are poorly understood, at best !

2. A series of expert forecasts provide an overview of the potential emerging risks in the work-place (physical, biological, psychosocial & chemical). Three major health and safety risks emerging in this decade are diesel fumes, manmade mineral fibres and nano-particles. All these three have in common, their physico-chemical state as insoluble particles/fibres. The experts agreed that nanoparticles and ultrafine particles pose the strongest emerging risk and our understanding of their properties need to improve for assessing risk from working with them.

NANO-PARTICLES at the WORKPLACE

Mainly, we can classify nano-particle generation processes in the following three categories by the ways these particles are evolved and released:-

i) All processes involving combustion including flame pyrolysis, plasma synthesis, vapour phase chemical reactions, boiling / evaporation - all result in formation of nano-particles by a common phenomenon called nucleation.

ii) All mechanical dis-integration processes like crushing, cutting, grinding, milling, abrasion, polishing etc generate a small fraction as nano-particles.

iii) Adsorption of vapour and gases on CN formed by processes above.

Hence, in the current expanding nano-regime, exposure to nano-particles is inevitable.

IS the EXPOSURE to NANO-MATERIALS DIFFERENT from EXPOSURE to BULK

A growing body of evidence indicates that exposure to material in nano-form may cause, more severe health effects than in bulk form. Based on the preliminary toxicological data, controlling occupational exposure to nano materials is mandatory. Wide scale application in medicine, consumer products, energy, materials, and manufacturing is throwing-up consumer products at a rate of three to four per week.

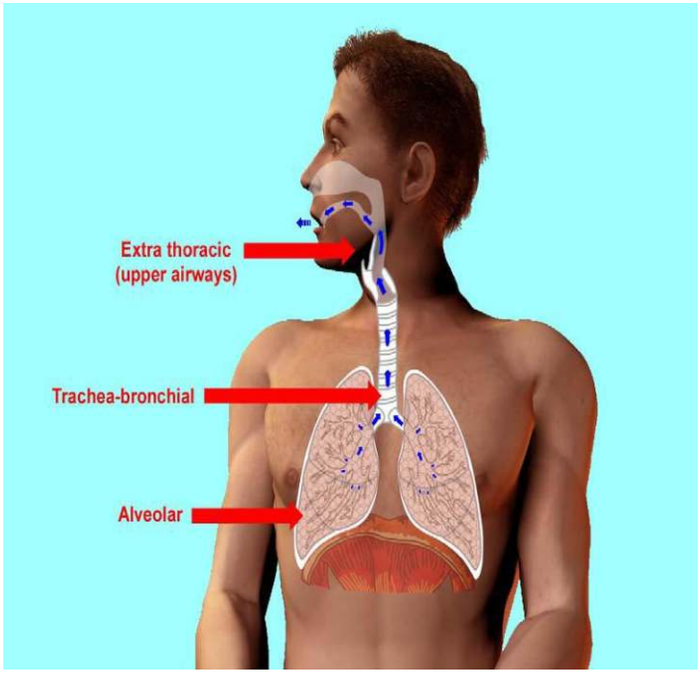
With nanotechnology predicted to have $1 trillion global economy, and employ two million people by 2020, the Question to be asked is the following,

“Is Regulatory Framework adequate to deal with the exposure tonano-materials?”

This leads us to understand how the nano-particles are

deposited/ingested in human body? Most important route for this is the respiratory system as shown in the Figure - 5.Respiratory system is efficient at removing aerosols, deposited in different regions depending on size. Aerosols below 100 nm reach bronchial & alveolar regions. Other less important routes of ingestion are skin, eyes and mouth. Some fraction of these is excreted through body fluids.

Figure 5: Respitory System of Human-Beings.



A fraction of this ingested material is retained and absorbed in the body and defines the exposure to that material and is the cause of adverse effects. Generally irritation occurs at low concentrations, though more toxic effects may manifest at high concentrations. Dermal route is important contributor to overall dose for nano-particles, as soluble particles may dissolve and pass through the skin.

POTENTIAL HEALTH CONCERNS

Animal studies indicate that nano-particles ingested in the body by different routes have thrown up some disturbing facts, which must concern all HS&E professionals. Some of these are listed here :_

i) Nano-particles deposited in the respiratory system can enter blood stream, and trans-locate to other organs.

ii) Experimental studies in rats have shown that equivalent mass doses of insoluble nanoparticles are more potent than similar large particles in causing pulmonary inflammation and lung tumors.

iii) Results from in vitro cell culture studies with similar materials are supportive of the biological responses observed in animals.

iv) Experimental studies in animals, cell cultures, & cell-free systems show that changes in the chemical composition, crystality & particle size influence oxidant generation properties and cyto-toxicity.

v) Studies in workers exposed to fine aerosols / nano-particles indicate adverse lung effects including lung function decrements and obstructive and fibrotic lung diseases.

vi) Implications of these studies, which may have different particle properties, are yet uncertain and research is needed to determine the key physical and chemical characteristics of nano-particles that determine their hazard potential.

Therefore, these studies and their results bring in some uncertainties regarding toxicity and related aspects of the exposure. These are as follows :-

a) Uncertainties regarding the unique properties of engineered nano-materials & their possible effect on occupational health risks.

b) These uncertainties due to gaps in knowledge about the factors that are essential for predicting health risks— as routes of exposure, translocation of materials in the body, and interaction of the materials with the body's biological systems.

c) The potential health risk following exposure to a substance is generally associated with the magnitude and duration of the exposure, the persistence of the material in the body, and its inherent toxicity.

d) Existing toxicity information about material in larger particle size can provide a baseline for predicting the possible adverse health effects from exposure to this material in nano-scale.

e) However, predicting toxicity of an engineered nanomaterial based on its physicochemical properties may not be accurate.

f) It is reasonable to believe that activities involving nano-materials are likely to have higher level of adverse effect on human health; the precautionary principle must be applied.

WHY is it IMPORTANT to UNDERSTAND DEPOSITION PATTERN?

- Assessing toxic effects of airborne pollutant depositing in specific region of the lung.

- Evaluating efficiency of dose deliverance i.e. how much and how long particles will remain in the lung.
- Pulmonary drug delivery.

1. Human Lungs : Some Important Facts :

- Lung is the Most Important organ of Respiratory System. Average lung contains 2414 km of airway, with total surface area of 80 m2.
- A person breaths in 10 - 25m 3 of air per day, depending on physical activity.
- Functions of the lung are:
  - -- Exchange of O2 and CO 2 in the alveolar sacs, Most NM deposit here.
  - -- Filter out gas micro bubbles and removes clots in blood stream

Deposition of the nano-particles is likely to lead to reduction of all above three vital function

2. Respiratory Tracts Compartment Dosimetry Model -- (ICRP - 66)

- Lung is made up of many generations of airways. Trachea is generation 0 (G0), this is a straight duct with ring structure
- Upper bronchial consist of G1 to G16. This is a series of branching "smooth" tubes with high flow velocities.
- Alveoli start at generation G17. Airways are narrow with un-smooth walls. Average no of terminal bronchioles --34856
- Low flow velocities & high residence time for high exchange of gases.

MECHANISMS INVOLVED in PARTICLE DEPOSITION in LUNGS

Major processes that result in deposition of inhaled particles in the respiratory system are - Diffusion, Sedimentation, Impaction, Interception and Electrostatic deposition and these contribute differently in various regions of the system as follow :-

- Naso-pharyngeal : impaction, sedimentation, electrostatic – (> 1 μm)
- Tracheo-bronchial : impaction, sedimentation, diffusion – (< 1 μm)
- Alveoli /Pulmonary : sedimentation, diffusion – (< 0.1 μm)

Diffusion is the deposition mechanism for small particles and increases with decreasing particle size and flow velocity. For nano-particles, most of the deposition occurs in the alveoli region because of relatively still air, longer residence time and smaller diameter of the airway.

IMPORTANT AEROSOL PROPERTIES for ASSESSMENT of EXPOSURE

- Size & density of aerosol determine deposition of aerosol particles.
- Deposition mechanisms are dependent on particle size and mass.
- Gas-particle and particle-particle interactions are also important because these lead to changes in size &concentration of the inhaled aerosols via condensation, nucleation and coagulation.
- Retention rate of aerosol is dependent on the type of aerosol - morphology, hygro-scopicity, and chemical composition, particle surface charge.
- Fraction of the deposited mass that is assimilated in the body fluids accounts for the dose of the inhaled substance.

FATE of DEPOSITED NANO-MATERIAL and CLEARANCE from LUNGS

Getting rid of deposited particles from the lung is called clearance and major particle clearance mechanisms in various parts of the respiratory system :

Naso-pharyngeal Compartment:

- mucociliary clearance (transport back to nasopharynx)
- mechanical clearance (sneezing, coughing, swallowing)
- absorption into circulation (soluble particles).

Tracheo-bronchial Compartment:

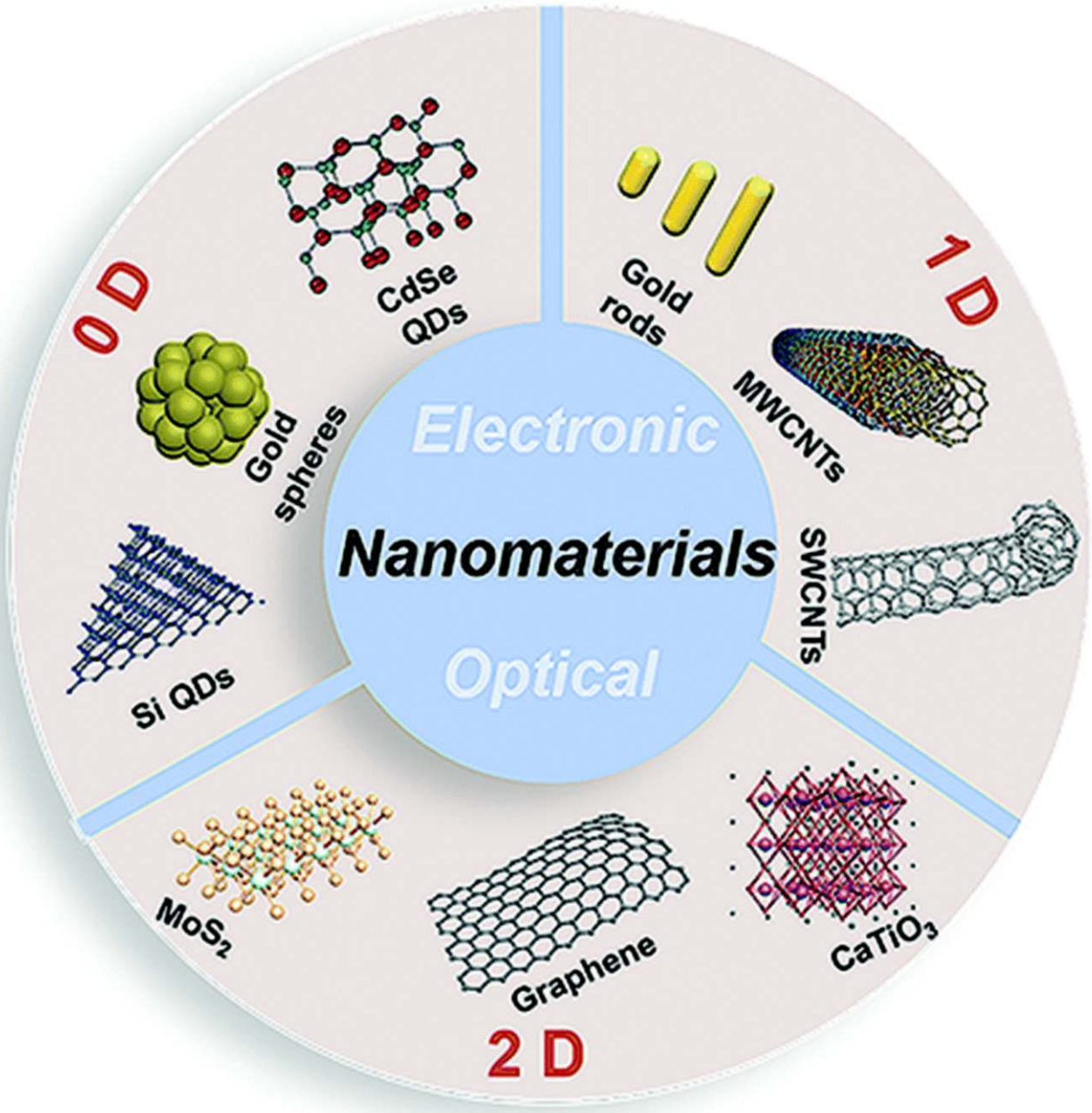
- mucociliary clearance (transport to oropharynx)
- endocytosis into peribronchial region (insoluble particles)
- absorption into circulation (soluble particles).

Pulmonary Compartment:

- alveolar macrophage mediated clearance
- endocytosis by lung epithelial cells into interstitum
- absorption into circulation (soluble particles)

TRANSITION PATHWAYS to SAFE NANO-TECHNOLOGY

In the conclusions, it is summarized that the detailed studies are needed for realistic assessment of the exposure to the



nano-particles and dose apportionment to the human-beings because of this exposure. The list below may not be taken as exhaustive, and many more issues, especially the concerning in-viva behavior may have been left out.

1. How the large surface area of the nano-particles changes their surface reactivity and the surface groups?
2. Relative contribution of various routes of body intake : respiratory, dermal, oral ingestion.
3. Whether and how the deposition pattern of nano-particles in the respiratory system is different ?
4. Partitioning between retention & rejection of the deposition.
5. Adsorption, dissolution and assimilation of the retained material in different components of biological system.
6. Difference in the physiological effects of the assimilated material vis-à-vis the same material in non-nano form.
7. Studies on the potential of nano-materials to directly penetrate into the cell boundary.

PROF MRADU GUPTA: AN AYURDEVIC PROFESSOR THAT DESIGNED AND ESTABLISHED AN UNIQUE MEDICINAL PLANT GARDEN IN KOLKATA, WEST BENGAL

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Medicinal plants are not only important for our pharmaceutical industries only; but they now also cater to the global functional food and nutraceutical industries too. Furthermore, traditional medicinal system such as Ayurveda, Chinese, Tibetan, African, Latin American and North American aboriginal holistic medicinal treatments are exclusively dependent on various medicinal herbs, shrubs and trees. Unfortunately, till date only a very few medicinal plants are available commercially as agronomic and/or chemurgic crops. As a consequence, vast number of medicinal plant species are harvested from different forests, mountains and other highly sensitive ecological habitats pushing many species towards extinction due to over harvest and over exploitation.

The communities involved in harvesting medicinal plants are mostly poor marginal farmers, harvesters, forest resident aboriginals (tribal communities) or fringe forest dwellers in remote inaccessible localities. A network of greedy middle men employ these extremely poor and under privileged communities in harvesting medicinal plants. Once collected these plants are sold to rich businessmen or corporate pharmaceutical and allied industries both nationally and internationally making profits in terms of billions of dollars per year. Only an infinitesimal amount is paid to the collectors of medicinal plants leaving them in the vicious cycle of abject poverty and uterus hopelessness as they struggle survive a date heavily dependent on major and minor forest resources for their sustainability. Hence they are reckless in collecting medicinal plants for their very survival.

Neither governments nor other agencies have done much for these communities to help or support them with alternative livelihood to provide long term protection to the vulnerable, endangered, critically endangered and near extinction medicinal plants. As a consequence our valuable medicinal plant resources are rapidly declining across developing and under developed countries of Asia, Africa and Latin America that are politically unstable, economically backward, have accelerating human population putting pressure on the available natural resources; but are extremely rich in biodiversity in both Northern and Southern Hemispheres.

Therefore, it is extremely important that globally we concentrate our efforts in protecting and conserving medicinal plants. At this end an exemplary work of establishing a medicinal/herbal plant garden at EcoPark New Town, Kolkata has been successfully by a single woman effort. Prof Mradu Gupta, the Principal of the famous Institute of Post Graduate Ayurvedic Education and Research and Education located at Raja Bazar and the Head of the Department of Dravyagun Vijanana has played a monumental role in establishing this state of the art herbal garden at the heart of Kolkata. The garden scientifically manages the cultivation of over 300 plus Indian medicinal herbs, shrubs and trees. In addition the garden has a modern classroom for students with audio-visual presentation system, small medicinal plant library and a herbarium to assist students and researchers working in medicinal plants. This unique garden is unparalleled in India and is currently the best of its kind in the entire country. Dr. Gupta had a dream of establishing a research herbal garden for both under graduate, post graduate and PhD scholars working in areas of Ayurveda, Agriculture, Agronomy,

Horticulture, Botany and Forestry, Ecology and Environmental Sciences as well as Medicinal Plant and Natural Products Chemistry. Her initiative has added a jewel to the crown of Kolkata as it is also recognized as an important tourist center; thereby helping in the education and awareness of common people about the importance of medicinal plants to our lives. We salute her efforts and dedicated hard work to make this a reality. This herbal garden designed, developed and managed by HUDCO under Eco Park was planned and executed by Prof. Mradu Gupta almost single handedly. We salute her efforts and hard work in making this a reality and establishing this unique herbal garden for research and education as well as recreation.

Photo credit: **Saikat Kumar Basu**

MILLET - "THE DIABETIC FRIENDLY GRAIN"

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Introduction:

According to the International Diabetes Federation (IDF), 463 million people worldwide had diabetes by 2020, with 88 million in Southeast Asia. India accounts for 77 million of the 88 million people. The prevalence of diabetes in the population is 8.9%. Type-2 diabetes is the most common chronic metabolic disease in the world, and it's linked to long-term consequences like stroke, heart disease, kidney failure, retinopathy and neuropathy. Diabetic retinopathy damages the tiny blood vessels, resulting in blindness which accounts for 1 percent of blindness worldwide. It's also not uncommon for renal failure owing to prolonged reduced blood supply to occur. Elevated blood glucose can potentially lead to nerve damage, which may require amputation. Debilitating illnesses decrease the patient's ability to function normally. Other diabetes-related factors can contribute to fracture risk. Due to their higher BMI and lack of physical activity, Type 2 Diabetes patients are at a higher risk of fractures when they fall. The fracture risk is also increased by complications such as retinopathy and social habits such as excessive alcohol consumption that interferes with balance, increasing the likelihood of falling. This is because a rise in blood sugar interferes with collagen cross-linking, resulting in brittle bones. Dietary interventions are an easy and cost-effective way to provide health benefits to people at risk and those who have been diagnosed with Type-2 Diabetes, in addition to improving their quality of life. Current guidelines for those with Type-2 Diabetes are to follow a healthy, balanced diet-notably including starchy carbohydrates with a low GI (Glycemic index) and higher dietary fiber, both of which can help regulate post-prandial hyperglycemia and reduce body weight. It has been shown that a low glycemic carbohydrate or high-fiber diet safely reduces plasma cholesterol levels and improves blood glucose control in people with Type-2 diabetes.

Types of Millet:

Millets are small-grained cereals that belong to the Poaceae plant family. Millet, an ancient cereal grain, has gained popularity for its high nutritional content and its potential to prevent diseases. Millet has become such an "it" food that it's earned the nickname, "the new quinoa." Millet is actually a group of grasses with small seeds grown mainly in Asia and Africa and can survive in dry climates. Millets, especially sorghum, were widely used as staple grains until about half a century ago in various parts of the world. Investing in a few crops like rice, wheat, and maize has pushed nutritious and climate-smart millets off the table. Millets have a low average glycemic index (GI) of 52.7, about 36% lower than milled rice and refined wheat, and about 14-37 GI points lower compared to maize. All 11 types of millets studied could be defined as either low (55) or medium (55-69) GI, with the GI as an indicator of how much and how quickly a food increases blood sugar level.

Millets are indigestible when raw, so they must be prepared and cooked before consumption. One cup of cooked millet contains 6.11 g of protein, 1.74 g of fat, 41.2 g of carbohydrate, 2.26 g of fibre and other nutrients like copper, manganese, phosphorus and calcium. Millets showed a lower GI than rice, wheat and maize after boiling, baking, and steaming (the most popular methods of preparing grains).

The following are some of the most commercially available types of millet:

Reference: **https://pristineorganics.com/millet-ancient-grains-for-a-healthier-future.**

English (type of millet)	Hindi (type of millet)	Health benefits
Pearl Millet	Bajra	Increases energy levels, high fibre content
Foxtail Millet	Kangni, Kakum, Rala	Lowers blood sugar, cholesterol and triglyceride levels
Kodo Millet	Koden, Kodra	Strengthens nervous system, increases insulin sensitivity
Little Millet	Kutki, Shavan	Rich in iron, low glcyemic index
Barnyard Millet	Jhangora, Sanwa	Rich in fibre and B complex vitamins, reduce fasting plasma glucose levels
Sorghum	Jowar	Rich in potassium, phosphorus, calcium, iron and zinc
Finger Millet	Nachani, Mandika,Marwah	Anti- diabetic grain. Also useful for constipation, cholesterol and intestinal cancer

How and Why Millet is a Vital Intervention

Blood glucose levels fluctuate in diabetic patients, leading to a variety of health problems. This fluctuation can be controlled with dietary regulation, exercise, or prescription medications. Because diabetes is on the rise worldwide, it is essential to develop preventative measures involving dietary and lifestyle interventions, which would greatly reduce the risk of developing diabetes. Among the anti-diabetic characteristics of millets, a study in India found that patients with Type 2 Diabetes who were fed foxtail millet for 90 days had better glycemic control and other benefits. With a high level of compliance, the patients were given a diet consisting of foxtail millet, split black gram, and spice mix. The HbA1c, fasting glucose, insulin, total cholesterol, triglyceride, and LDL concentrations were all lower as a result of the treatment. All of evidence suggested that the diet had a beneficial effect on Type 2 Diabetes patients. Reduced cholesterol, triglyceride, and LDL Cholesterol levels were associated with improved cardiac health.

A new study has found that eating millets can help people with diabetes manage their blood glucose levels and reduce their risk of developing type 2 diabetes, indicating the potential to design appropriate millets-based meals for diabetic and pre-diabetic people as well as non-diabetic people as a preventive approach. Diabetics who ate millet as part of their daily diet noticed a 12-15 percent decline in blood glucose levels (fasting and post-meal), and their blood glucose levels moved from diabetic to pre-diabetic.

Pre-diabetic people's HbA1c (blood glucose linked to haemoglobin) levels dropped by an average of 17%, moving them from a pre-diabetic to a normal state. This data supports the idea that consuming millets helps improve glycemic control. Millets have a low glycemic index because to their high fibre content, which helps to minimize blood sugar increases after meals. Millets are also high in protein, which boosts insulin sensitivity, or the body's capacity to convert glucose from food into energy using the hormone insulin. Millets may lower fasting and post-meal blood sugar levels in healthy people and people with type 2 diabetes, according to the findings. As part of a healthy diet for blood sugar management, the American Diabetes Association (ADA) recommends millets as well as other grains.

Conclusion:

Preventing acute complications and reducing risk of the disease can be accomplished with medical support and education in patient self-management, as well as promoting

beneficial lifestyle modifications, a healthy diet, physical activity and weight loss. While numerous advice are available, nutritional options are limited owing to geopolitical, political, or economic constraints. This is especially true in nations like India, where 77 million people are diabetic and the number is rising at an alarming rate. According to the International Diabetes Association, diabetes is increasing in all regions of the world. India, China and the USA have the highest numbers of people with diabetes. Africa has the largest forecasted increase of 143% from 2019 to 2045, the Middle East and North Africa 96%, and South East Asia 74%. Millets are a globally important food crop with considerable economic implications for underdeveloped countries. They are drought and pest-resistant grains, which gives them an edge and are high-energy, nutrient-dense meals that aid in the treatment of malnutrition. Foods made from millet are thought to be possible prebiotics and probiotics, with potential health advantages. The millets utilized had a GI of 52.7, which was much lower than white rice (GI 71.7) and refined wheat (GI 74.2). Instead of using rice, wheat flour and corn flour traditional Indian foods like rotis, dosa, pulav, khichdi, ladoos can be made from millet which have a lower glycemic index. Other than millets, grains recommended by the American Diabetic Association are sorghum, brown rice, oatmeal, whole grain barley and rye, triticale and quinoa.

References

1. **Kam J, Puranik S, Yadav R, Manwaring HR, Pierre S, Srivastava RK, Yadav RS**. Dietary Interventions for Type 2 Diabetes: How Millet Comes to Help. Front Plant Sci. 2016 Sep 27;7:1454. doi: 10.3389/fpls.2016.01454. PMID: 27729921; PMCID: PMC5037128.
2. **Lakshmi Kumari P, Sumathi S**. Effect of consumption of finger millet on hyperglycemia in non-insulin dependent diabetes mellitus (NIDDM) subjects. Plant Foods Hum Nutr. 2002 Fall;57(3-4):205-13. doi: 10.1023/a:1021805028738. PMID: 12602929.
3. **Nithiyanantham S, Kalaiselvi P, Mahomoodally MF, Zengin G, Abirami A, Srinivasan G.** Nutritional and functional roles of millets-A review. J Food Biochem. 2019 Jul;43(7):e12859. doi: 10.1111/jfbc.12859. Epub 2019 Apr 14. PMID: 31353706.
4. https://www.icrisat.org/millet-based-diet-can-lower-risk-of-type-2-diabetes-and-help-manage-blood-glucose-levels/
5. https://www.webmd.com/diabetes/millet-diabetes-blood-sugar

प्लास्टिक को ना!

विराज भारद्वाज
कक्षा – सातवींए माउंट कार्मल स्कूल
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प्लास्टिक हमारी धरती के लिए बहुत हानिकारक और संकटपूर्ण होते हैं। प्लास्टिक हमारी प्रकृति और वन्य जीवन के लिए बहुत बड़ा खतरा हैं। कई जानवर कचरे में पड़ी प्लास्टिक की थैलियाँ खा जाते हें और उनकी मृत्यु हो जाती है। हमें प्लास्टिक का प्रयोग कम कसे कम करना चाहिए। बाजार में जाते वक्त हम कपड़े का थैला साथ ले जाना चाहिए। हमें अपने आस–पास हो रहे प्लास्टिक के इस्तेमाल का भी रोकना चाहिए और लोगों को भी समझाना चाहिए कि प्लास्टिक का उपयोग कम से कम करें।

प्लास्टिक को ना कहें

हमें, जहां तक हो सकेंश 'बेस्ट आउट ऑफ वेस्ट' करना चाहिए। जैसे खाली बोतलों से पेन–स्टेंड बनाना, बड़ी बोतलों को काटकर उसमें पौधे लगाना, पुरानी शीशियों को साफ करकके उन्हें अतिरिक्त कार्यो में इस्तेमाल करना। प्लास्टिक को जलाने पर जो धुआँ निकलता है वह वातावरण को प्रदूषित करता है। इसलिए प्लास्टिक को भी जलाना नहीं चाहिए। प्लास्टिक के सामान को इकट्ठा करके रद्दी वालों को दे देना चाहिए, जिससे कि वह समान रिसाइकल हो सके। घर में भी खाना रखने, बनाने व खाने के लिए प्लास्टिक के बर्तन इस्तेमाल नहीं करने चाहिए। प्लास्टिक का सामान जबकि सस्ता मिलता है, परंतु उससे होने वाली प्रत्यक्ष और अप्रत्यक्ष हानि बहुत बड़ी है।

जो धरती से करे प्यार, वो प्लास्टिक से करे इंकार।

प्रकृति का आंचल

सत्यनारायण वशिष्ठ शास्त्री
सेवा निवृत–संस्कृत शिक्षक
राजकीय वरिष्ठ माध्यमिक विद्यालय
पाक्षीत (हरिद्वार)

प्रकृति का आंचल माँ के आँचल के समान है,
प्रकृति की गोद में नर सदा रहता जवान है।
भौतिकता के युग में दिन रात हो रहा विकास,
वृक्ष रहित बना धरा को नर कर रहा विनाश।
नरियाँ झरने आज जगत में सब निष्फल हो गए,
अपमानित कर प्रकृति को सब प्राणी आकुल हो गए।
सड़क, रेल–मार्ग, कभी उद्योगों के कारण वृक्ष काटे जाते हैं,
इन्हीं कारण नर आज शुद्व ऑक्सीजन नहीं ले पाते हैं।
धर्नोपॉर्जन की लालसा में नर मारा मारा फिरता है।,
प्रकृति से अन्याय कर आयुस्तर हमारा गिरता है।
नदी झरने पहाड़ वृक्ष प्रकृति का श्रृंगार है,
विकास नाम पर इन सब से हो रहा खिलवाड़ है।
वृक्ष सब प्राणी का सदा देते नव जीवन दान हैं,
सब वृक्ष किसी ना किसी गुण की खान हैं।
बहु विद्या औषधि की वनस्पति दाता है,
कर प्रयोग इनका नर निरोगता ही पाता है।
वन उपवनों से सजा धरा को नवजीवन संचार करो,
उद्योग, ट्रैफिक, जन वृद्वि का तुम बहिष्कार करो।
इन सब की बाहुल्यता सब रोगों की जन्मदाता है,
इनके कारण ही मानव अकाल मृत्यु पाता है।
यदि सुखी जीवन चाहो तो पर्यावरण में सुधार करो।
बहू विद्या के वृक्ष लगा पुनः वसुधा श्रृंगार करो।

हिमाचल प्रदेश के कुल्लू घाटी में पारम्परिक मधुमक्खी पालनः लघुउद्योग का एक विकल्प

विनोद कुमार एवं सरला शाश्नी
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कुल्लू घाटी में मधुमक्खी पालन

हिमाचल प्रदेश के कुल्लू घाटी में पारम्परिक मधुमक्खी पालन सदियों से चली आ रही एक परम्परा है। शहद की प्राप्ति के लिए मधुमक्खीयों को पालनें की विधि को मधुमक्खी पालन कहा जाता है। पुरे भारत वर्श में मधुमक्खीयों की मुख्यता चार प्रजातियां पाई जाती है जिनका नाम ऐपिससैरेना, ऐपिसमैलिफेरा, ऐपिसडोरसेटा और ऐपिसफलौरे इत्यादि है। इन प्रजातियों में ऐपिससैरेना प्रजाति को मधुमक्खी पालन के लिए हिमाचल प्रदेश के ग्रामीण एवं उपरी इलाकों में पूर्णतया पारम्परिक तरीकों से रखा अथवा पाला जाता है। पारम्परिक मधुमक्खी पालन में मधुमक्खीयों को पेडों के खाली खोल में जिसे स्थानीय भाशा में डिंडोर अथवा मडामया फिर पारम्परिक तरीकों से बने पुरानें घरों की दिवारों पर पहले से ही बने डिब्बे जिन्हे तीरें कहतें हैं में पाला जाता है। पारम्परिक मधुमक्खी पालन के लिए उपयोग में लाई जानें वाली लकडी ज्यादातर का इल *(Pinus wallichiana)* राइ (*Piceasmithiana)*, तोश (*Abies pindrow),*रिखल या अरखल *(Taxus wallichiana),* दराल *(Toona ciliata)* इत्यादि पेडों की होती है। इसका एक कारण यह है कि इन पेडों की लकडी को यहां के स्थानीय निवासी बहुत शुद्व मानतें हैं तथा यह पेड गंध रहित होते हैं। कुल्लू घाटी को देवी देवताओं का स्थान भी माना जाता है और यहां के लोग अपनें देवी–देवताओं में गहरी आस्था रखतें हैं। इसी कारण स्थानीय लोगों द्वारा जब भी शहद निकाला जाता है उसका पहला हिस्सा देवी–देवताओं को अर्पित किया जाता है।

कुल्लू घाटी में मधुमक्खी पालन की वर्तमान स्थिति

पिछले कुछ वर्शों में यह देखा गया कि कुल्लू घाटी में पारम्परिक मधुमक्खी पालन में खासी गिरावट आ गई है जिसका मुख्य कारण लोगों द्वारा आधुनिकृत घरों का निर्माण तथा मधुमक्खी पालन में कम दिलचस्पी तथा ज्ञान का आभाव रहा। पारम्परिक घरों में मधुमक्खी पालन के लिए शुरू से स्थान बनाए और छोडे जाते थे जबकि आधुनिक घरों में मधुमक्खी पालन हेतू किसी भी तरह का विकल्प नही रहता। पिछले दो दशकों में मधुमक्खी की प्रजाति ऐपिससैरेनाकी संख्या में भारी कमी देखी गई है जिसका एक प्रमुख कारण यहां के लोगों का झुकाव व्यवसयिक कृशि की तरफ ज्यादा होना, कीटनाशकों एवं खरपतवारों का अत्यधिक एवं अनियमित मात्रा में प्रयोग में लाना है । फसलों एवं अन्य फलदार पेडों में जरूरत से ज्यादा कीटनाशकों का प्रयोग किया जाता है जिससे भारी मात्रा में मधुमक्खीयां एवं अन्य किट मर जाती है। जिसके कारण प्राकृतिक परागणकर्ता के रूप में उपयोग में कार्य करनें वाले इन किटों की संख्या में गिरावट आर ही है। अन्य कारण यह भी है कि जो लोग मधुमक्खीयों को अपनें घरों में पाल रहें हैं उनको मधुमक्खीपालन से जुडी तकनीकों का सम्पूर्ण रूप से ज्ञान नही है जैसे कि

क. रानी मक्खी, नर मक्खी तथा काम करनें वाली मक्खीयों की पहचान
ख. मधुमक्खी के कालोनी का रखरखाव
ग. कालोनीं में भोजन की उपलब्धता का ध्यान
घ. विमारियों एवं शत्रु किटों से रखरखाव
कृ शहद निकालनें की विधि

च. मोम के बारे में जानकारी के आभाव में मोम को फैंक देना
दृ विदेशी मधुमक्खीयों की तरफ रूझान
ज. मधुमक्खीयों के परागण में योगदान

उपरोक्त कारणों की वजह से कुल्लू घाटी में पारम्परिक मधुमक्खी पालन विलुप्ति के कगार पर है। अतः इस प्रजाति के संरक्षण और जैव विविधता को बनाए रखने के लिए ठोस प्रयास बहुत ही अनिवार्य है ।

पारम्परिक एवं आधुनिकृत मधुमक्खी पालन मे अंतर

पारम्परिक मधुमक्खी पालन में लकडी के डिब्बों को मधुमक्खी के साथ या थोडा सा शहद लगाकर बाहर से गोबर या मिटटी का लेप लगाकर पुरी तरह से बन्द करके घरों के उपरी हिस्से में रखा जाता है। इसके पश्चात इसे तभी देखा जाता है जब शहद निकालनें का समय हो। इस तरह पारम्परिक तकनीक में समय समय पर मधुमक्खी के डिब्बें कि जांच करना मुशकिल होता है। इसी तरह शहद निकालनें के लिए भी पारम्परिक तरीके से रखें डिब्बों में शहद के काशो को चयनित कर निकलना भी काफी मुशकिल होता हैं । इस विधि से जब शहद निकाला जाता है तो बडी मात्रा में मधुमक्खी के बच्चे मर जातें है और साथ ही साथ शहद की गुणवत्ता में भी कमी आ जाती है। इस प्रकिया से उस कालोनी में शहद की कमी के साथ ही कालोनी कमजोर भी हो जाती है क्योंकि मधुमक्खीयों का अधिकतर समय फिर से शहद से पहले मोम के काशे बनानें मे निकल जाती है।

इसके विपरित अगर हम मधुमक्खीयों को नए फ्रेमवाले बक्सों में डालें तो समय समय पर डिब्बों का निरिक्षण कर कालोनी की गतिविधियों को देखना आसान हो जाता है। इसके साथ ही साथ का लोनी विभाजन का समय, शहद निकालना, बिमारियों और शत्रु किटों से देख–रेख भी काफी आसान हो जाती हैं। आधुनिकृत बक्सों में मधुमक्खीयों को पालनें और शहद निकालनें के विधि से शहद की पैदावार भी पारम्परिक तरीकें से कई गुना अधिक होती है। क्योंकि इसमे शहद को हनी एकस्ट्रेक्टर की मदद से निकाला जाता है जिससे काशों को कोई हानि नही होती। आधुनिक तरीके से मधुमक्खी पालन में सुनिश्चित परागकण की सहायता से फसलों के उत्पादन में भी वृद्धि होती है। आधुनिक बक्सों को एक स्थान से दूसरे स्थान में स्थानत्रित करना भी आसान होता है।

देशी मधुमक्खी से मधुमक्खी पालन में लाभ

कुल्लू घाटी में देशी मधुमक्खी पालन (एपिस सेराना) पारंपरिक तरीकों से किया जाता रहा है क्योंकि इस प्रजाति की मधुमक्खियां यहां के तापमान के उतार–चढ़ाव को भी आसानी से झेल लेती हैं। जबकि इसके विपरित यूरोपीयन मधुमक्खीं को सर्दियों मे गर्म इलाकों तथा गर्मियों में कम गर्मी वाले इलाकों में निरन्तर ले जाना पडता है। इसके अतिरिक्त देशी मधुमक्खीं कम पौधों की उपलब्धता में भी अपनें आपको आसानी से समायोजित कर लेती है। पारम्परिक तरीकों से पाली जानें वाली मधुमक्खींयों द्वारा प्राप्त शहद की गुणवता दूसरें यूरोपीयन मधुमक्खी के शहद की तुलना में काफी अच्छा होता है।

गोविन्द बल्लभ पन्त राष्ट्रीय हिमालयी पर्यावरण संस्थान की पहल

पारम्परिक मधुमक्खी पालन को बढावा देने के लिए गोविंद बल्लभ पंत राष्ट्रीय हिमालयी पर्यावरण संस्थान, हिमाचल क्षेत्रीय केन्द्र,मोहल, कुल्लू द्वाराकुल्लू घाटी के तुंग पंचायत में नाबार्ड के माध्यम से एक परियोजना चलाई जा रही है। तुंग पंचायत विश्व धरोहर ग्रेट हिमालय नेशनल पार्क के इको जोन में होने के कारण भी विशेश महत्व रखताहै। इस पुरे पंचायत की कुल जनसंख्या 2200 के करीब है। यहां के लोगों के आय का मुख्य साधन कृशि एवं बागवानी है। इसके अतिरिक्त पिछले कुछ वर्शो में पर्यावरणीय पर्यटन की दृश्टि से भी यह घाटी स्थानीय एवं राश्ट्रीय स्तर पर काफी प्रसिद्व हो रहा है।

इस परियोजना का मुख्य उदेश्य देशी मधुमक्खी (एपिस सेराना) के संरक्षण के साथ पारम्परिक मधुमक्खी पालन को स्थानीय लोगों के आय का अतिरिक्त साधन बनाना है। इसके अलावा पारम्परिक मधुमक्खीओं को परागगण कर्ता के तौर पर प्रचलित करना, अच्छी गुणवता का शहद उत्पादन, मोम से मूल्य सवंर्धित उत्पादों का निर्माण कर आय में बृद्वि करना मुख्य उदेश्य है। परियोजना का एक अन्य उदेश्य मधुमक्खीं पालकों का समूह बनाकर उनको मधुमक्खी पालन के हर एक पहलू पर जागरूक कर पारम्परिक तरीकों को आधुनिकी कृत करना भी है। जिससे कि यहां के लोगों को शुद्ध शहद की प्राप्ति हो और लोगों की आय में अतिरिक्त बढ़ोतरी हो सके। इस परियोजना के तहत तुंग पंचायत के 150 मौन पालकों को मास्टर मौन पालकों के तर्ज पर तैयार किया जा रहा है और साथ ही मधुमक्खी के डब्बे (सक्रिय) व मधुमक्खी पालन में प्रयोग होने वाले उपकरण भी दिए जा रहे हैं। इस परियोजना में महिलाएं भी बढ़–चढ़कर भाग ले रही हैं। बहुत से मधुमक्खी पालक इस व्यवसाय में काफी रूचि ले रहे हैं कम समय में ही उन्होंने मधुमक्खी के डिब्बों की संख्या को भी बढ़ाया है।

मधुमक्खी पालन एक ऐसा व्यवसाय है जो समस्त मानवजाति और पर्यावरण को लाभ पहुंचाता है और यह तुंग पंचायत में चल रहे परियोजना के तहत भी सिद्व हो रहा है। यह एक बहुत ही कम लागत में शुरू किया जा सकने वाला व्यवसाय है जो

पारम्परिक मधुमक्खीपालन के बक्सें आधुनिकृत तरीके से देशी मधुमक्खी पालन, फ्रेम एवं खुमानी का पेड

रोजगार को बढ़ाने और पर्यावरण को शुद्ध रखने की क्षमता रखता है। आधुनिक समाज द्वारा अपनाये जा रहे विभिन्न व्यवसायों और उद्योगों ने प्राकृतिक संसाधनों के असंतुलित दोहन के साथ–साथ पर्यावरण के संतुलन को भी बिगाड़ा है। ऐसे में मधुमक्खी पालन पर्यावरण हितेषी के रूपमें सामने आया है। यह व्यवसाय ना केवल ग्रामीण क्षेत्रों में कुटीर उद्योगों को बढ़ावा देने के लिए महत्वपूर्ण भूमिका निभाता है बल्कि देश विदेश में भारतीय शहद खासकर हिमालयी क्षेत्रों से आई शहदकी मांग मे दिन प्रतिदिन बढोतरी में योगदान दे रहा है ।

मधूमक्खी पालन का एक लघु उधोग रूप में संम्भावनाएं

कुल्लू में लगभग 80 प्रतिशत लोग छोटे एवं मझोले किसान है जिन्हें स्वरोजगार तथा अतिरिक्त आय के साधन की आवश्यकता पड़ती है। मधुमक्खी पालन एक ऐसा व्यवसाय है जिसे बहुत कम लागत में शुरू किया जा सकता है। कोई भी यह व्यापार 4 से 5 बक्सों के साथ शुरू कर सकता हैं जिसमें प्रति बॉक्स लगभग 4000 से 5000 रूपयें का खर्चा आता है। अच्छी देख–रेख के साथ कम समय में ही बक्सों को विभाजित किया जा सकता हैं। कुल्लू घाटी में विभिन्न प्रकार के औशधीय एवं फल–फूलों के पेड़ पौधे पाए जाते हैं जिससे कि शहद के उत्पादन के साथ शहद की गुणवता भी काफी बढ़ जाती है। फलों में परपरागण की क्रिया मधुमक्खी द्वारा होने पर लगभग 15 से 20 प्रतिशत उत्पादन में वृद्धि होती है। मधुमक्खी पालकों द्वारा फलों के बगीचों मे परागगण के लिए मधुमक्खी के बक्सें 1000 से 1500 रूप्ये प्रति बक्से की दर से 15 दिन के लिए किराए पर भी दिए जाते हैं। देशी मधुमक्खीयों से प्राप्त शहद बाजार में 800 से 1000 रूपये तथा मोम 400 से 500 रूपये प्रति किलो के हिसाब से बेचा जाता है। इससे यह अन्दाजा लगाया जा सकता है कि देशी मधुमक्खी पालन आय के स्त्रोत के साथ जैवविविधता के संरक्षण के लिए भी कितना महत्वपूर्ण है।

ACTIVITIES AND SPECIAL DAYS AT A GLANCE IN THE MONTH OF JANUARY, FEBRUARY & MARCH 2022

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JANUARY2022

1-January: Happy New Year 2022: In many countries, New Year's Eve celebrations begin on December 31 and run into the early hours of January 1. New Year's greetings in the year 2022: According to the Gregorian calendar, New Year's Day (January 1) is one of the most celebrated holidays.

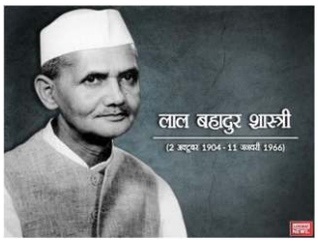
4-January: World Braille Day

Louis Braille is the creator of braille, the braille script that blind people use to read. He became blind as a result of an injury when he was a child, which inspired him to create the Braille script.

6-January: World War Orphan Day

Wars cause unfathomable loss to soldiers' families and the people of the conflict countries on both sides, hence world war orphan day is commemorated to address the issue of war orphans, which has become a rising global humanitarian and social catastrophe.

11 January – Death anniversary of Lal Bahadur Shastri



He was India's second Prime Minister after independence. He popularised the term "Jai Jawan, Jai Kisan" (Jai Jawan, Jai Kisan). He was an ardent participant in India's independence struggle. He died on January 11, 1966, from heart arrest.

12 January – National Youth Day

Swami Vivekananda, was a Hindu monk who introduced Indian darshans of Vedanta and yoga to the Western world. His birthday day is celebrated as national youth day.

14 January - Makar Sankranti

It will be commemorated on the 14th of January this year, marking the end of the Winter season and the start of a new harvest season.

15 January – Indian Army Day

Every year on January 15, Indian Army Day is commemorated because it was on this day in 1949 that Field Marshal Kodandera M Cariappa succeeded General Sir Francis Butcher as the first Commander-in-Chief of the Indian Army.

19-January: National Immunization Day (Polio Day)

Poliovirus, which is now endemic in India to prevent children from contracting with poliovirus vaccine drive is conducted every year on this day.

23 January - Netaji Subhas Chandra Bose Jayanti

Netaji Subhash Chandra Bose was born in Cuttack, Orissa, on January 23, 1897. He was one of India's most well-known liberation fighters. Indian National Army (INA) or Azad Hind Fauj was the name of his army. During World War II, he also led an Indian national force from afar against the Western forces.

24 January- National Girl Child Day

On 24 January every year, National Girl Child Day is celebrated to highlight the inequalities faced by a majority of the girls in India, the importance of education, nutrition, legal rights, medical care and safety of girl children, etc.

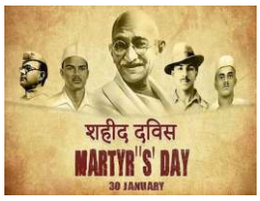
26 January- Republic Day

The Indian Constituent Assembly enacted the Constitution on November 26, 1949, replacing the Government

of India Act 1935 as the highest law of the land. With a democratic government system, it went into force on January 26, 1950. Every year on this day, the largest parade in Delhi takes place on Rajpath.

30 January – Martyrs Day or Shaheed Diwas

Every year on January 30th, Martyr's Day or Shaheed Diwas is commemorated in honour of Mahatma Gandhi and the sacrifice of three Indian revolutionaries. The 'Father of the Nation' was killed on January 30, 1948.



30 January – World Leprosy Eradication Day

The final Sunday in January is designated as World Leprosy Day, with the goal of achieving zero incidences of leprosy-related disability in children. Disabilities, as we all know, do not appear immediately, but rather after a lengthy period of undiagnosed illness.

FEBRUARY - 2022

2 February – World Wetlands Day

Every year on February 2nd, the world commemorates World Wetlands Day. This day commemorates the passage of the Convention on Wetlands in Ramsar, Iran, on February 2, 1971. In 1997, it was the first time it was commemorated. The topic for World Wetlands Day 2020 is "Wetlands and Biodiversity."

4 February - World Cancer Day

Every year on February 4th, World Cancer Day is commemorated around the world by the World Health Organization (WHO) to raise awareness about cancer and how to treat it.

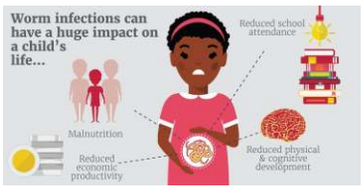
6 February: International Day of Zero Tolerance for Female Genital Mutilation

On February 6th, the International Day of Zero Tolerance for Female Genital Mutilation is commemorated to raise awareness and educate people about the ramifications and issues that girls experience as a result of genital mutilation.

10 February - National De-Worming Day

It is observed on 10 February. It is an initiative of the Ministry of Health and Family Welfare, Government of India to make every child worm-free in the country.

11 February - International Day of Women and Girls in Science



It is marked on February 11th to recognize the importance of women and girls in science as both beneficiaries and change agents. As a result, the focus of the day is on ensuring that women and girls have full and equal access to and participation in science. Also, to establish gender equality and women's and girls' empowerment.

13 February – Sarojini Naidu Birth Anniversary

13th February is celebrated as the birth anniversary of the Nightingale of India i.e. Sarojini Naidu. She was the first Indian woman to be elected President of the Indian National Congress, as well as the first woman to be elected Governor of an Indian state, the United Province, now known as Uttar Pradesh.

27 February - World NGO Day

The day is dedicated to recognizing, celebrating, and honoring all non-profit and non-governmental organizations that contribute to society, as well as the people who work for them.

28 February – National Science Day

Every year on February 28th, India celebrates National Science Day to commemorate the discovery of the Raman Effect by Indian physicist Sir Chandrasekhara Venkata Raman. On February 28, 1928, he discovered the Raman Effect, for which he was awarded the Nobel Prize in Physics topic in 1930.

MARCH - 2022

3rd March - World Wildlife Day

On March 3rd, the world commemorates World Oceans Day, which is directly linked to Sustainable Development Goal 12: Life without Water, which focuses on marine species and highlights the concerns and important issues that marine biodiversity poses to our daily lives. "Recovering essential species for ecosystem restoration" is the topic of World Wildlife Day 2022.

3rd March - World Hearing Day

Every year on March 3rd, World Hearing Day is commemorated to raise awareness about methods to prevent deafness and promote hearing around the world.

4th March - National Safety Day

The National Safety Council of India commemorates National Safety Day on March 4th. This day is observed to protect people from a variety of troubles such as financial loss, health problems, and other problems that they may encounter in their daily lives.

8 March - International Women's Day

Every year on March 8th, the world celebrates the social, economic, cultural, and political achievements of women. It's also a step toward achieving gender parity. Purple is a colour that is associated with women all across the world.

14 March - International Day of Action for Rivers

The International Day of Action for Rivers is observed every year on March 14th to raise awareness about river protection and demand better river policies. It's a day to raise awareness about the threats to our rivers and come up with solutions together.

16 March-National Vaccination Day

Every year on March 16, India celebrates National Vaccination Day, also known as National Immunization Day (IMD). When the first dose of Oral Polio Vaccine was delivered on March 16, 1995, it was the first time it was noticed. It is an attempt to raise awareness about the need to eradicate polio from the Earth.

20 March - International Day of Happiness

Every year on March 20th, the International Day of Happiness is commemorated. This day has been observed by the United Nations since 2013 to commemorate the importance of happiness in people's lives all across the world.

20 March – World Sparrow Day

On March 20th, the world commemorates World Sparrow Day to raise awareness about sparrow conservation. This day also honours the human-sparrow bond, encouraging people to love sparrows and recognise their value in our lives.

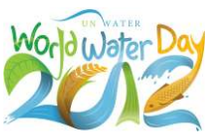
20 March: World Oral Health Day

World Oral Health Day is marked on March 20th to raise awareness about oral health. The topic of World Oral Health Day 2022 is "Be Proud Of Your Mouth." To put it another way, you should cherish it and take care of it.

21 March - World Forestry Day

Every year on March 21st, World Forestry Day or International Day of Forests is commemorated to raise public awareness about the importance, value, and contributions of forests in balancing the earth's life cycle. World Forestry Day was created in 1971 during the European Confederation of Agriculture's 23rd General Assembly.

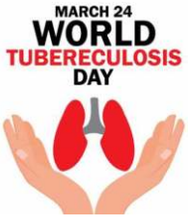
22 March – World Water Day



Every year on March 22nd, World Water Day is commemorated to raise awareness about the importance of freshwater and to advocate for its sustainable management. It was suggested that the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro celebrate it in 1992. The inaugural World Water Day is commemorated in 1993.

23rd March - World Meteorological Day

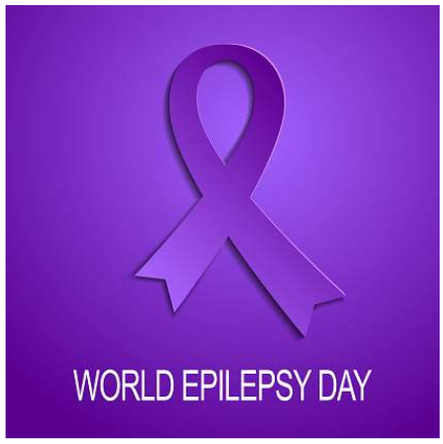
Every year on March 23rd, World Meteorological Day is commemorated to draw attention to the importance of weather and climate to society's safety and well-being.



24 March - World Tuberculosis (TB) Day

World TB Day is celebrated every year on 24 March annually to commemorate the date when Dr. Robert Koch announced his discovery of Mycobacterium tuberculosis, the bacillus that causes TB in 1882. This Day is observed to educate people about TB, its impact around the world.

26 March - Purple Day of Epilepsy



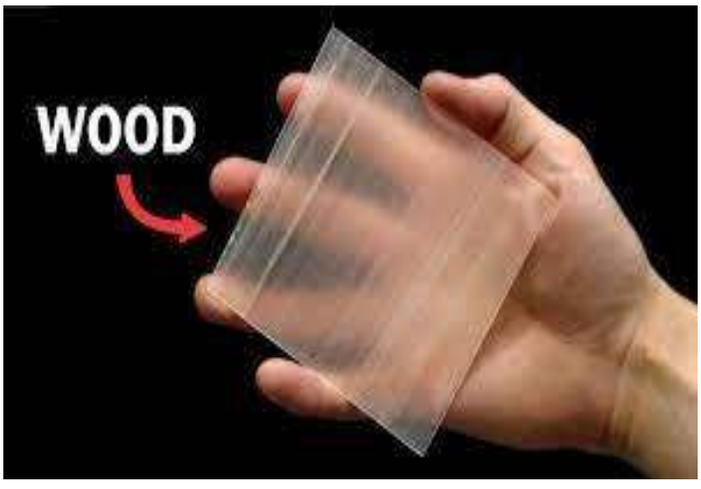
It's celebrated on March 26th to raise awareness about epilepsy and its effects on people's lives. The day also serves as a reminder to epilepsy sufferers that they are not alone.

FACTS

Discovery in Chemistry in the Year 2021

1. **Transparent wood - Window of the Future**

In January 2021 researchers at the University of Maryland discovered a new technique to make wood transparent which transmits 90% of light and is 50 times stronger and provides better insulation than any other transparent material. It was made by initially removing the wood's molecules that give colour. Then a special hydrogen peroxide agent is applied followed by exposure to UV light followed by soaking in ethanol.Finally, the pores are filled with colourless epoxy to make the material smooth and almost perfectly transparent. This discovery could become a real revolution for the construction industry and completely change the image of buildings in the future.



2. **ECO INK-An innovative, sustainable ink for digital Printing on Porcelain**

Italian company Metco, in March 2021 has created a special, sustainable ink called ECO-INK for digital ceramics. This pattern will be applied with a high-resolution printing method which makes it possible to get different colours and textures like those of fabrics and wood. The processed ink is aqueous and contains no organic solvent, thus reducing toxicity n carbon footprint. Since the paint can penetrate the surface of ceramic tile, therefore additional protective layer isn't required.

3. **Magnetic polymers**

An important milestone for the development of science and technology in March 2021 scientists have undertaken the MAGNETO project, which involves creating magnetic materials with mouldable properties made using shredded

magnetic materials that were mixed with various polymers. The presented composite materials with exceptional magneto-mechanical properties will allow for the introduction of innovative solutions in many areas, such as medicines, diagnostic tools, touch screens, etc.

4. **'Vision Repairing Ointment' -Newly discovered effects of a natural medicine with one thousand years of history**

In April 2021 research has been carried out at the University of Warwick into an 'antibiotic' vegetable paste whose recipe is 1,000 years old. An antibiotic named 'vision repairing ointment' is made up of onions, garlic, cow bile, and wineand has extremely potent antiseptic properties. It is used against a very dangerous bacteria called biofilms and also against foot infections in diabetes.

5. **Vanilla Flavouring based on plastic**

Plastic is a big problem for the world as it is not easy to dispose of them. But in order to make it used in another way in the month of June 2021, the University of Edinburgh transformed the plastic bottles into vanilla flavouring. 85% of vanillin is currently synthesized from chemicals derived from fossil fuels. However, the demand for vanillin continues to rise. Therefore, this is an important discovery both because of the increase in demand, more importantly for the sake of a solution with environmental benefits. This is done by a decomposing reaction by enzymes which forms terephthalic acid (TA), which was then converted into vanillin.

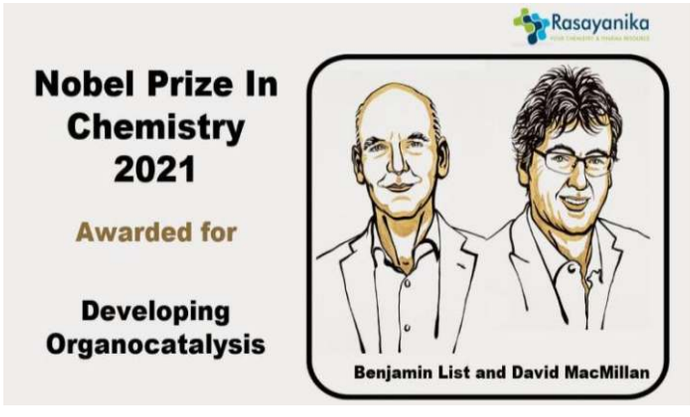
6. **Plastic eating yeast to save the planet**

Microparticles of plastics, which have a diameter of fewer than 5 millimeters, pose a particular threat. They can be found in water bodies, but also accumulate in living organisms such as fish, plankton, and the human body.

In order to reduce and decompose plastic, the research team of Dr. Piotr Biniarz from the Wrocław University of Environmental and Life Sciences in October 2021thinks of decomposing plastic using microorganisms that produce enzymes. But since it is inefficient, it is planned to clone their enzymes into fast-growing yeasts (Yarrowia lipolytica).This also has the capability of cleaning the water areas by directly killing the microorganisms.

7. **Nobel prize 2021**

This year's Nobel Prize in Chemistry was awarded to David MacMillan and Benjamin List 'for the development of asymmetric organic catalysis'. They have developed Organocatalysis which is a unique tool for building molecules and can be used to support the manufacture of almost anything from



modern pharmaceuticals to the molecules responsible for capturing light in photovoltaic cells.

This discovery has definitely revolutionized the world of science and technology.

8. The material that feels

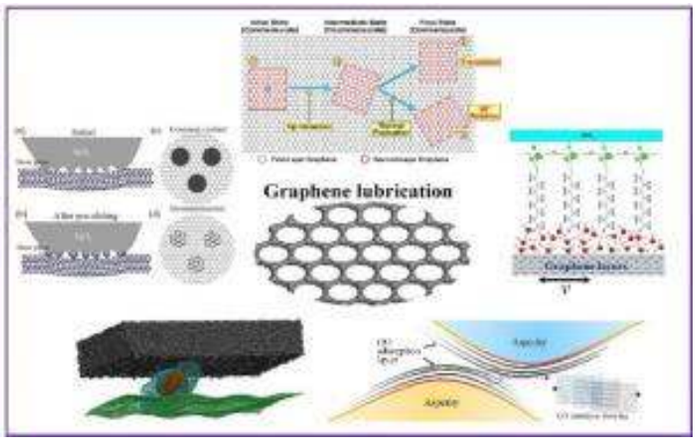
A research groupof scientists from Chicago and Missouriin December 2021 designed a metamaterial that is sensitive to sensing surrounding stimuli and adapting to them. It is made from piezoelectric elements that are controlled by electrical circuits. This material is able to make decisions without human interference which can be useful in aviation, the space industry, medicine, and many more areas.

9. Eco-friendly plastic from salmon seed

Plastic has only the problem of not being able to get decomposed, otherwise, it is an essential part of life so Chinese scientists have made plastic from the DNA of a salmon seed with a chemical derived from vegetable oil. The result is a spongy, gel-like substance – a hydrogel. Furthermore, it will be recyclable using DNA digesting enzymes also. The production of this bioplastic can emit up to 97% less CO_2 than the production of traditional polystyrene plastics. Additionally, it will be recyclable using DNA digesting enzymes. Ultimately, it can also be immersed in water so that it becomes a hydrogel again. These types of bioplastics a greener alternative represent an opportunity for the future of the plastics industry and to reduce the pollution on our planet.

10. Graphene-based lubricant

Italian scientists have devoted a lubricant based on graphene that can be used for cars and motorbikes. It does the same work as oil but is less toxic to the environment. Basically, it is the best alternative for oil and in the tests that the scientists conducted, Graphene has shown its best results.



(SOURCE – PCC GP https://www.products.pcc.eu/ en/blog/10-most-important-events-in-the-field-of-chemistry-in-2019/)

Dr. Vaishali Mishra

From the Editor's Desk

Dear Readers

I would like to welcome you to **Volume 5, Issue 1**, of the **PRAKRITI SANRAKSHAN** quarterly newsletter of STE.

Jan -March 2022 issue highlights the International Conference on 'Environment, Water, Agriculture, Sustainability & Health (EWASH-2021): United Together in the Battle against Pandemic& 3rd Annual Meet of STE, on 21st – 22nd January 2022 and STE Prerana Samman, 2022 was organized by STE on Theme-" Gender Equality Today for a Sustainable Tomorrow " on 8th March 2022, to mark the occasion of International Women's Day.

This issue highlights articles and poems based on environmental issues. The special days observed from the month of January to March 2022 have been also included in this issue.

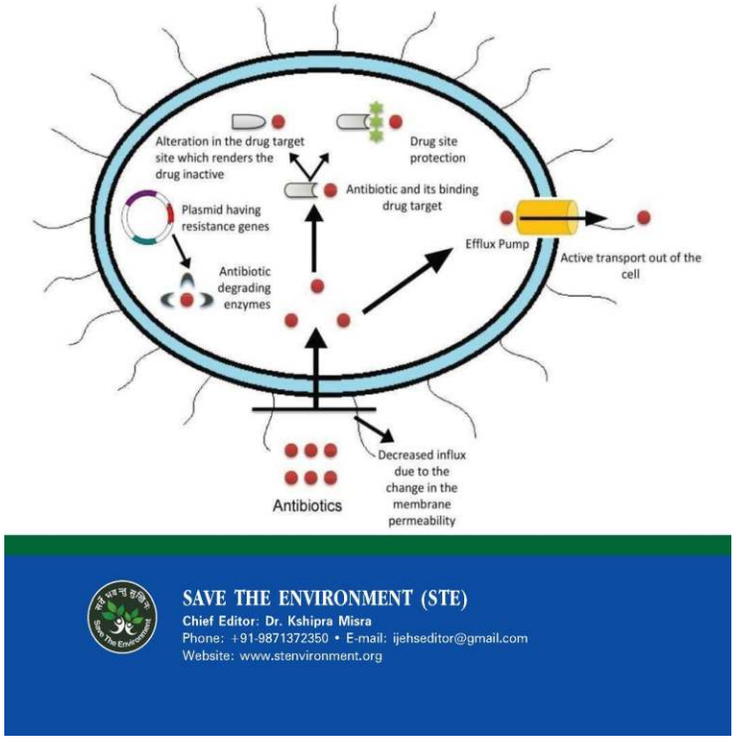
I express my sincere thanks to all the people who have contributed informative and inspirational articles to make this newsletter successful. I would like to express my profound gratitude to the President of STE Dr.KshipraMisra, the editorial team, and Mr. Gian Kashyapfor designing this issue of **PRAKRITI SANRAKSHAN** and giving it the desired shape.

Dr. Vaishali Mishra
Editor STE

ARTICLES ARE INVITED FOR THE
INTERNATIONAL JOURNAL OF ENVIRONMENT AND HEALTH SCIENCES

This journal is being published by Save the Environment. Send your manuscripts for peer-review by e-mail. The authors must mention address, Contact Nos. and E-MAIL ID in their forwarding letter. Proof will be sent for correction before publishing. A pledge for originality will be signed by the authors.

We are pleased to announce that the DOI prefix for International Journal of Environment and Health Sciences is now available from **Crossref, the official Digital Object Identifier (DOI)**. **The journal is now indexed in International Scientific Indexing (ISI).**



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STE Annual Awards 2022

(NOMINATION AND APPLICATIONS ARE INVITED)

LAST DATE 31st August, 2022

Annual Awards of STE are the tangible symbol to signify eminence of contributions made by a person or institution. This boosts the enthusiasm of the contributors who have contributed in different fields of science and social service with their excellence, expertise and approach towards achieving certain goals for the society. Recognition of such extraordinary activities is eventually very important to boost their confidence and to honour them for what they have done for the science and society. STE confers following categories of awards and honours to such eminent personalities.:

STE Dr. APJ Abdul Kalam Award

STE Green Excellence Award

STE Fellowship Awards

STE Meritorious Award

STE Water Awards

STE Best Teacher Award

STE Dr. Praloy O Basu Life Time Achievement Award

STE Young Researcher Awards

STE Best Ideas/Innovations/Technology for Environment Awards

STE Women Awards

STE International Achiever Awards

STE Humanitarian Award for NGO

For more information, please log on to our website
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If you believe in our ideology and wish to step up for the environment, we welcome you to join our organisation and together we can save the environment.

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