EVERYMAN'S SCIENCE

Vol. LIII No. 1 (April-May '18)

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Printed and published by Dr. Ashok Kumar Saxena on behalf of Indian Science Congress Association and printed at East India Photo Composing Centre, 69, Sisir Bhaduri Sarani, Kolkata, 700006 and published at Indian Science Congress Association, 14, Dr. Biresh Guha Street, Kolkata-700017, with Dr. Ashok Kumar Saxena as Editor.

Annual Subscription : (6 issues)

Institutional ₹ 500/-; Individual ₹ 300/-

Price : ₹ 20/- per issue

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EDITORIAL

PLASTIC EATING BACTERIA-A GREAT HOPE IN BIODEGRADATION

Polyethylene terephthalate (PET) is a chemically stable polyester. The use of PET has increased by several times in the past few years specially in making food and drink container,electronic components etc., One of the most common uses of PET is in the manufacture of drinking water bottles. Used water bottles are regularly found littering the aquatic environment. Plastic also puts a big chemical burden on the environment. The major form of pollution associated with plastic is wasted plastic sent to landfills. Plastics are very stable and stay in the environment for a long time after they are discarded.

Several groups of scientists are working throughout the world to find out ways of biodegradation of plastics. Few species of fungus having properties of growing on plastics were isolated. But it is known that fungus can not be easily grown like bacteria. Until now no microbes were isolated which can eat PET. A group of Japanese Scientists has identified a species of bacteria which eats PET found in most disposable water bottles. This study has raised a great hope in managing more than 50 million tons of this particular type of plastic produced globally each year.

Scientists from Kyoto Institute of Technology and Keio University collected 250 PET contaminated samples such as sediment, soil and waste water from plastic bottles recycling site. In the laboratory they screened the samples for microbes and wanted to find out whether plastic eating bacteria is present in the sample or not. Ultimately they discovered that just one of the bacterial species was responsible for the PET biodegradation.The bacteria was named as Ideonellasakainesis. They also found that these bacteria used two enzymes to breakdown the PET. After adhering to the PET surface the bacteria secrets one enzyme on to the PET to generate an intermediate chemical.This chemical is then taken up by the cell where another enzyme breaks it down further and thus provides the bacteria with carbon and energy to grow.

The research team showed that the bacteria could break down a thin film of PET over the course of 6 weeks at a temperature of 30°C. It is an interesting study but there are several things to be done to come up with an yield to work outside the laboratory. It is not clear whether it could help in keeping plastic out of waste area or not. However, this study has shown a great hope for biodegradation of PET.

Dr. Ashok Kumar Saxena

Anyone who thinks science is trying to make human life easier or more pleasant is utterly mistaken.
— Albert Einstein

BIOREFINERIES, BIOMASSES, AND BIOFUELS : A HOPE FOR ALTERNATIVE FUELS

Manoj Kumar Mahapatra

The quest for alternative transportation fuels has ended with the biofuels. They are economical, and efficient at par the conventional fossil fuels. Usage of waste biomasses for the biofuels generation is the real deal. Biofuels production processes are still in rudimentary state and need extensive R&D to increase the yield per unit of biomass used.

INTRODUCTION

Biofuel is essentially an alternative fuel source derived from biomasses. Rapid depletion of fossil fuel reserves and increasing pollution issues have rung an alarm to look for sustainable alternatives such as biofuels namely biogas, biodiesel, bioethanol, and biobutanol. Biofuels are believed to be cleaner fuels since they do not add up the carbon content in the atmosphere as the carbon emission from their usage equalizes the amount assimilated during growth of the biomass.

In the current scenario, the biomass energy amounts approximately 50 EJ (exajoules), which is about 10% of global energy demand. On the top, that amount covers up 75% of the total renewable energy in use today.

The produced biofuels are available in all the three principal forms of matter, i.e., solid, liquid and gas. However, the latter two forms are predominant owing to the ease of usability and environmental concerns. Liquid ones are the alcoholic biofuels as mentioned earlier and the gaseous ones are predominantly methane (CH_4) and hydrogen (H_2). Oil refineries produce the petrochemicals and fuels from petroleum crude. Similarly, biorefineries yield biofuels from the biomasses[1].

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THE CONCEPT OF BIOREFINERIES

The biorefinery is essentially a collection of facilities in terms of technology and equipment to process the biomasses and subsequently yield biofuels for transportation and chemicals from them. In a broad sense, biorefineries involve three different steps for their functioning namely; pretreatment of biomasses for making them fit for conversion. Conversion step is the one that acts on the pretreated biomass to yield biofuels and assorted chemicals. The final step is nothing but separation and purification which eventually makes the products market worthy. In the current global scenario, the major challenge for biorefinery development process is the efficient production of transportation biofuels[2].

The biorefineries have the need of renewable raw materials, and the following sectors qualify to provide the desired raw materials. Agriculture

sector provides dedicated crops and post harvest biomass residues. Forestry sectror provides lignocellulosic bimasses abundantly, provided one is following the sustainable route of harvesting forest biomasses. Industrial and domestic sources provide solid wastes and wastewaters; these are the potential candidates for biogas production via a biorefinery. Aquaculture sector provides seaweeds and algae as the raw materials. Although the biorefinery for aquaculture sector is rudimentary, however, from ongoing research and development, they have proven their mentle to become the raw material of future biorefineries dedicated to producing transportation biofuels in bulk[2].

GENERATIONS OF BIOFUELS BASED ON THE BIOMASSES USED

The biomasses for biofuel production are categorized in to various generations namely, first generation, second generation and the third generation of biomasses. Table-1 provides a summary of different generations of biomasses. Based on the generation of biomass used, the biofuels are also named accordingly. Although first generation biofuel production is not in practice today and third generation biofuel production still needs lots of research and development for efficiency enhancement[3].

Table 1. Generations of biomasses[3].

Generation of biomass	Type of crop	Examples
First generation	Food crop	Sweet potato, sugarcane, and ground nut
Second generation	Non-food crop	Lignocellulosic biomasses from agriculture and waste plants
Third generation	Non-food crop	Microalgae, photosynthetic bacteria

First generation biomasses are harvested with a high carbohydrate or oil content. The biofuels obtained from these biomasses are biodiesel, alcohols, and biogas (a mixture of CH_4 and CO_2). Although the first generation biomasses are produced abundantly because of their primary need, that is as food crops, and their usage for biofuel production is discouraged since that might lead to the increment of food crop prices[3]. Although the usage of first generation biomasses is the easiest one, however, their direct competition with food demands makes the process a no sustainable practice.

The second generation biomasses are the preferred biomasses for biofuel production nowadays. The non-edible raw materials comprised of lignocellulosic biomass and crop wastes constitute second generation biomasses. Dedicated energy crops do fall under this category and are namely; switch grass, Miscanthus, willows, and eucalyptus, etc[3].

The Third generation of biomasses have significantly higher content of carbohydrates, proteins and lipids/oils. However, they are not the plants rather microbes. The fermentative and photosynthetic bacteria and algae constitute this category. The microalgae have a lipid content of 20-40% of their dry weight and hence are potential candidates for biodiesel production. The microalgae based oil production platform is in a rudimentary state and needs lots of research and development inputs. It is estimated that in future once microalgae based biofuel production processes are in action, it can yield approximately 10-300 times more biodiesel than the amount produced using conventional biomasses[3,4].

CONVERSION PROCESSES

Conversion is the most important process in biofuel production sector since it transforms the throwaway biomasses in to the most valuable fuel alternatives. Broadly, the conversion

processes are categorized in to three major types namely; (1) thermochemical conversions, (2) biochemical conversions and (3) physicochemical conversions. The basic objectives of conversion processes are the conversion of complex forms of biomasses in to simpler forms and subsequently yield of final products from those intermediate simpler forms. The divisions of different conversion processes are summarized in table-2.

Table 2. Conversion processes for biomass to energy[3].

Biomass to energy conversion process			
Broad classification	***Sub classification***		
Thermochemical	Gasification	Pyrolysis	Liquefaction
Biochemical	Microbial fermentation	Anaerobic digestion	—
Physicochemical	Mechanical pressing and separation	—	—

Thermochemical conversion processes involve treating the biomass at high temperatures either in the presence or in the absence of oxygen. Again, the thermochemical conversion processes are of four sub-types : combustion, gasification, pyrolysis, and liquefaction. Each of these processes differs from each other in terms of heating rate, temperature, and oxygen presence[3, 4]. Combustion involves burning the biomass in the presence of an abundant amount of oxygen and is one of the oldest methods for the generation of heat and/or thermal electricity via a steam cycle. Essential criteria for biomasses in order to be the candidates for combustion are ultra-low cost, abundance in availability and considerably lesser moisture content[5]. Some of the industrial scale combustion devices those are in practice today are grate boilers and underfeed strokers, which are capable of producing heat energy in the range of (100-3000 MW).

Gasification is another thermochemical conversion process that converts the biomass into combustible gaseous mixtures like syngas at high temperature ranges such as 800-900 ^{o}C in partial presence of either of oxygen, air or steam[5]. The outcomes of this process are combustible gaseous components such as CO, H_2, CH_4, and other gaseous hydrocarbons. This process has an advantage in terms of minimal char and tar formation. Commercially four types of gasifiers are in usage, i.e., fixed bed co-current and fixed bed counter-current, fluidized bed, and entrained flow. The performance of gasification processes is affected by different operation conditions, such as physicochemical properties of biomass, the feed rate of biomass, the flow rate of the gasifying agent, and temperature[6].

Pyrolysis is another thermochemical process for biomass conversion but without the presence of oxygen within the temperature ranges of 350^{o}C to greater than 800^{o}C. Residence time, heating rate, and temperature are the parameters those define efficiency of pyrolysis products. Depending on the residence time pyrolysis is subdivided in to slow pyrolysis, fast pyrolysis, and flash pyrolysis. Slow pyrolysis or conventional pyrolysis of biomass yields charcoal, whereas both fast and flash pyrolysis produces bio-oils also called pyrolytic oil[7].

Liquefaction is a comparatively new thermochemical process. It is analogous to pyrolysis process but at considerably lower temperatures (200-350^{o}C) and very high pressures (10-20 Mpa) in the presence of a catalyst. The biomass is depleted in to the lighter oil molecules under the influence of catalysis and is subsequently re-polymerized to yield heavier oil molecules. Alkaline hydroxides and carbonates are used as the catalysts, which play a crucial role to reduce the yield of solid residues and simultaneously improve bio oil yield. The liquefaction process is generally discouraged owing to the high cost and complex technology and machinery involved[8].

Biochemical conversion processes use the metabolism of microorganisms to convert the simplest fermentable feedstock substrates like monomeric sugars into fuels or other high-value commodities. In the course, they do involve the concept of Biocatalysis, where enzymes involved with the metabolism of microbe play a major role in the conversion process. These conversion processes are eco-friendly in nature since they do not leave gaseous and solid waste residues behind. Apart from being eco-friendly biochemical conversions processes are the time consuming ones and take several days to be completed in comparison to the rapid thermo-chemical processes which are usually over in minutes to hour-long duration. Broadly biochemical conversion processes are divided in to two sub categories namely, microbial processes and anaerobic digestion process[9].

Microbial processes are essentially fermentation process to yield liquid biofuels of alcoholic nature like ethanol, and butanol. The agents of the same are microorganisms (hence the name) such as fungus and bacteria. Microbes use the simpler forms of sugars obtained from biomasses as the raw materials for the fermentation process to yield biofuels. However, pretreatment of biomasses is a necessary procedure in this microbial mode of biofuel production. Pretreatment degrades the complex structure of biomass, removes unwanted components like lignin and renders simpler sugars for the microbes to act. Microbial processes are preceded with pretreatment of lignocellulosic biomasses, which accounts for about 40-70% cost of microbial biofuels. Enzymes are also a part of pretreatment process but at a later stage to breakdown, the oligomers, branched chains of carbohydrates in to monomers and straight chains respectively. Cellulase, hemicellulose, and cellobiase are some of the enzymes employed for the purpose. Enzymatic pretreatment and microbial fermentation can take place in either of the two processes namely sequential hydrolysis and fermentation (SHF) and simultaneous saccharification and fermentation (SSF)[10].

The anaerobic digestion process is precisely a degradation process by anaerobic microbes such as the methanogenic bacteria for the generation of biogas composed of methane and carbon dioxide. This event of methanogenesis takes place in the absence of oxygen. Although the domestic biogas or so called gobar gas plants are in use today are based on this principle. It is also seen naturally in landfills, animal intestines, and unattended waterbodies full of debris. Biogas exiting from landfills particularly adds up the greenhouse gases in the troposphere. Hence, they need to be harvested and channelized post processing for its usage as fuel. The by-product of anaerobic digestion process is a slurry synonymous as digestate rich in all the essential nutrients needed for plants and is ideal organic manure. The potential raw materials for anaerobic digestion process are very diverse and are wastes from agriculture and industry, animal excreta, sewage sludge, food leftovers, and even microalgae residues post oil extraction process[10]. The wood residues are generally discouraged due to the difficulty in lignin degradation.

The physicochemical conversion process is also synonymous with mechanical extraction or agrochemical conversion. This process uses the oilseeds to yield oils by a physical operation like pressing and filtration. Although various types of feedstocks such as cottonseed, rapeseed, ground nut, etc. are used as raw materials for the production of either direct fuel or biodiesel via transesterification. However, rapeseed is the preferred one owing to its ease of cultivation and high oil content. The physicochemical process is non-polluting one since glycerine and oil cakes

come out at the end as byproducts. Glycerine is an important industrial chemical and is used in lubrication and cosmetic industries. Oil cakes have dual end uses as fodder and as maunre in a crop field. This process is still not a popular process because of the high cost of raw materials and is a time consuming process when focussed for maximum yield[3].

CONCLUSIONS

Biofuels production via birefineries is definitely a sustainable approach to produce alternative transporation fuels, biogas, and thermal energy. Thermochemical processes are being used widely for the biofuel production in the current scenario because of the well developed technologies. Biochemical conversion techniques although are ecofriendly but are having limitations in terms of quantity of yield. Physicochemical processes have proved themselves as the most sustainable pathways for biofuel production, but need significant downstream processing before releasing the biofuels to the market. However, a lot of research and development inputs need to be provided in each of the methods for making the processes more efficient.

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MOBILE PHONES AND MOBILE TOWER RADIATION AND ITS ASSOCIATED HEALTH HAZARDS

M. Roy

With the advent of mobile communication and cell phone technology, there is a tremendous increase in the world wide usage of mobile phones and hence mobile towers have also been rising globally, raising a health concern regarding the harmful effect of this technology. In this article it is tried to answer some of the rising concerns regarding the health hazards of the mobile towers and base stations, necessary for the basic knowledge to create awareness among local people.

INTRODUCTION

Cellular technology has grown tremendously in the last few decades. As on 2014 there were more than 900 million mobile connections in the country. The popularity of the cell phone and wireless communication devices has resulted in a huge proliferation of mobile towers and Base Transreciever Stations across the country. A large number of BTSs (Base Transreciever Stations) and Mobile towers have been emerged to keep in pace with the wide grown technology. Construction of these mobile towers and BTS in and near the populated areas has started the debate and hence concern regarding this constructions and technology. Cellular wireless telephone uses Radiofrequency (RF) signals, a form of electromagnetic radiation (EMR), for a distance of up to 2-1/2miles. The RF energy of non ionizing radiation can heat the body tissues though in very substansive amount and hence arises a great deal of concern regarding the health consequences of the mobile towers and base stations. IARC (International Agency for Research in Cancer) has classified RF as possibly carcinogenic to human in Group 2B not in Group 2A, which is probably carcinogenic. WHO (2014) stated that till date no adverse effect is seen by cell phone use. Hence it is clear that more research is needed to study the long term effect of mobile tower radiations on human health[1,2].

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DIFFERENCE BETWEEN BASE TRANSRECEIVER STATION (BTS) AND MOBILE TOWERS

Firstly it is essential to understand the basic difference between a Base Transreceiver Station (BTS) and Mobile Tower**.** BTS contains many individual radio transmitters with same maximum output power. They are mostly established at suitable locations for proper coverage of the area as per RF Network Planning[3]. Mobile towers on the other hand are metal structure with 3 or more antennas. They are generally mounted on the roof tops of building or are free standing and are provided with a down tilt to direct the signals towards ground level.

FREQUENCY RANGES OF MOBILE TOWERS AND SAR VALUES

The Antennas of the mobile towers are divided into the following range based on the frequency range[4] (Table 1).

Table 1. Frequency range of different base stations

Base Station	Frequency (MHz)
CDMA	869-890
GSM 900	935-960
GSM1800	1805- 1880
3G	2110-2170

The frequency of different base stations are further divided to several operators for example the frequency of GSM 900 base station is 935 to 960 MHz. The frequency band of 25 Mhz is further divided into 20 sub bands of 2 MHz, which is allocated to various operators. A single operator may transmit 50 to 100W power, so there may be 3-4 operators on the same tower, adding the total power to about 400W. Therefore the number of mobile towers is directly proportional to the population density of that area[5].

Another crucial factor is the distance from the source of radiation which determines the radiation effect. The power density varies according to: $\frac{1}{R^2}$, where R is the distance.

As one moves away from the antenna, the less is the radiation. Since a cell phone tower is shared by many operators, the more the number of antennas, the greater is the power intensity in the nearby area. In mobile phones, frequencies ranging from 800 MHz to 2100 Mhz are normally used. However, the EMF radiation levels are within limits because the power radiated from the headset is very low (around 1W) and each headset operates within a prescribed Specific Absorption Rate (SAR). SAR is a measure of the rate at which energy is absorbed by the human body when exposed to EMF, measured in Watts per kilogram (W/kg). The limits for SAR, as determined by the strength of the electromagnetic field necessary to reach the body are accordingly set and they are an indicator for ensuring that equipment like mobile phones are operating within the prescribed parameters. It has been made mandatory for mobile phone manufacturers to display the SAR level. Every country has prescribed a specific SAR value (Table 2)[6].

Table 2. SAR values for mobile handsets

Countries	SAR Limit
Australia	1.6 W/kg averaged over 1 g of tissue
Brazil	2W/kg averaged over 10g of tissue
Canada	1.6 W/kg averaged over 1 g of tissue
China	2W/kg averaged over 10g of tissue
Europe	2W/kg averaged over 10g of tissue
Ghana	2W/kg averaged over 10g of tissue
India	1.6 W/kg averaged over 1 g of tissue
Japan	2W/kg averaged over 10g of tissue
Nigeria	2W/kg averaged over 10g of tissue
Rep. of Korea	2W/kg averaged over 10g of tissue
Singapore	2W/kg averaged over 10g of tissue
USA	1.6 W/kg averaged over 1 g of tissue

MOBILE TOWER CERTIFICATION AND TESTING PROCEDURE IN INDIA

All mobile service providers and telecom operators should ensure that radiation from mobile towers is within the prescribed limit. This is governed by the Department of Telecom (DOT). To monitor this all mobile service providers has to submit annual or biannual self-compliance report to the telecom department. Further Telecom Enforecement Resource and Monitoring (TERM) tests BTS's in their jurisdiction per year as per DOT, there is a provision of penalty for the BTS where the radiation limit exceeds.

Further the Mobile towers and BTS are covered under various legal references. The radiations from mobile towers, phones and BTS are covered under:

- Indian Wireless Telegraph Act, 1993
- The Indian Telegraph Act, 1885
- The Telecom Regulatory Authority of India Act, 1997

BIOLOGICAL EFFECT OF MOBILE TOWERS AND BTS ON HUMANS

The RF energy is a non ionizing radiation with relatively low frequency, *i.e* unlike ionizing

radiation it has no effect on chemical bonds or D.N.A. Further the biological effect of RF radiation can be divided into two categories :

1. Thermal effect and
2. Non Thermal Effect

Thermal effect : One of the well-known effects of RF exposure is heating effect. In a person using a cell phone the heating will occur in the surface of brain, which is of very short duration and magnitude and the brain has the ability to dispose the excess heat. However prolonged thermal effect may lead to increase in body temperature.

Non-Thermal Effects : These are the electromagnetic effects inside the biological cells of the body. These includes :

Cancer : Scientific evidence indicates that exposure to RF fields is unlikely to induce or promote cancers. Studies using animals have not provided enough evidence in support of RF exposure and cancer. There have been some cancer reports near cell phone base stations; however studies have been inconsistent with regard to the relationship between cell phone use and tumors. Overall, epidemiological studies have not supported a convincing relationship between RF exposures and increase risk of cancer.

Cellular Effects : Exposure to low-levels of RF fields, produce heating, it has been found to change the changing calcium ion mobility and hence effect the electrical activity of the brain in some animals. This effect has also been reported in other tissues and cells alter enzyme activity or affect the genes in the DNA. However, these effects are not well established, nor are their implications for human health are sufficiently explained to provide a basis for restricting human exposure.

Electromagnetic interference and other effects**:** Mobile telephones can cause electromagnetic interference in other electrical equipment. Therefore; caution should be exercised when using mobile telephones around sensitive electromedical equipments such as cardiac pacemakers and hearing aids, *etc.*

CONCLUSIONS

The rapid development of cellular communication all over the world has resulted in the appearance of many hundreds of mobile tower base stations in and near the populated area. Installations of base station antennas have produced concerns about health and in some cases have resulted in several litigations in court. Independent researches and measurements on electromagnetic fields and RF exposure limits in areas close to base stations and mobile towers are carried out in many countries. However as such no strong evidence connecting these two has been reported, many case studies have shown a probable cause effect. However it is essential to follow the regulations and norms as mandated by the DOT, in order to avoid any future health issues regarding this mobile tower radiation hazards. Hence it is very essential for the common public to know the basic function, regulations and laws regarding the installing and operation of BTS and mobile towers, to ensure that the mobile operators are following the same.

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INTERNET OF THINGS

Jyotsna Verma

This article, discusses about Internet of Things (IoT) which is a new and emerging technology. Internet of Things is nothing but the interconnection of the physical objects with the internet for communication with each other. The physical things areable to share, and exchange data with each other by automatically identifying the things with their unique digital identities through IoT. This article covers the IoT architecture, challenges of IoT and its applications world-wide.

INTRODUCTION

Probably, Internet of Things (IoT) has made the significant impact on the world we live in and hasnow entered into our day to day lives. It is changing our world from the way we drive to, how we purchase things and even how we get energies for our homes. Imagine a world where we can communicate with the things or the physical objects which we live in with like home appliances, vehicles and other electrical things. To your surprise, these all can actually be possible with the Internet of Things.

Internet of thingshas created a big revolution in the IT world. The term "Internet of Things" was coined by Kevin Ashton in 1999. Way back in the twentieth century, computers had no senses; they only had brains that could understand what we told them to do. But, with "Internet of Things" this is not the case;rather the computers and other physical things can sense for themselves.It is the network of physical objects that are connected to the internet allowing them to send, receive and exchange data.

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HOW INTERNET OF THINGS WORK?

In "Internet of Things" each physical device over the network has a unique identity. Thus, things in IoT[1], are embedded with sophisticated sensors for sensing the environment of the application scenarios and RFID (Radio Frequency Identification) chips. RFID chips basically play a key role in IoT[2] which is used for automatic identifying the things with which they are connected and allow the physical objects to have unique digital identities which can be integrated into the network.

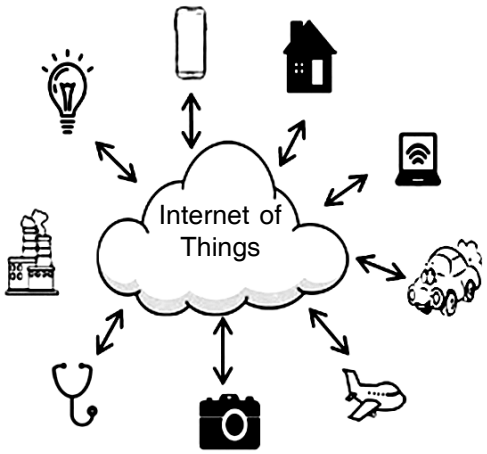

Fig. 1. Internet of Things

Now, question arises how they exchange such large quantities of data?Where they put all of these data and how they apply these information to the various application scenarios? Whether the information is about improving production of a factory, real time updates on vehicle traffic or the monitoring personal health; it is the "Internet of Things" platforms that brings the diverse information together and provides the common language for the devices and applications to communicate with each other. The process starts when the devices communicate securely with the IoT platform which integrates the data from several physical devices and applies analytics to share most valuable information to the applications.

IoT ARCHITECTURE

With the invention of IoT, which combines the digital and physical devices together to create the smart products for making life easier, it became possible to digitize the world. As can be seen in Fig. 2 each smart device in IoT is enabled with RFID technology along with the embedded sensor chips and actuators to communicate with other smart devices.

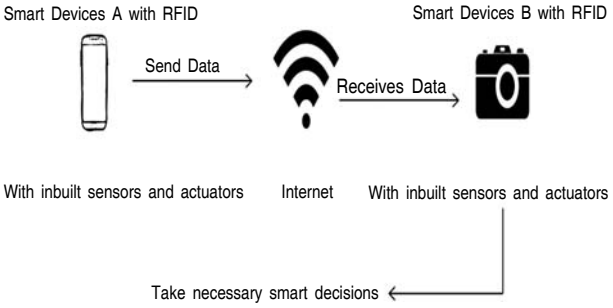

Fig. 2. Architecture of Internet of Things

Internet of things has the capability to sense the environment, making it possible to create smart application scenarios for global level. But, it has limited storage and processing capability with the least number of energy computation resources which make them unsuitable for complex data processing.

ADVANTAGES AND DISADVANTAGES OF IoT

Great technologies come with certain limitations. Internet of things has several advantages which make life simpler and easier but there are various limitationsassociated with it which need to be resolve for making it a better technology.

LIMITATIONS OF IoT :

1. **Security :** The communication between the physical devices needs to be secure.
2. **Processing capabilities :** Physical devices in IoT have limited processing capabilities.
3. **Storage capacity :**The physical devices in IoT have limited storage capacities.
4. **Energy Constraints :**The physical devices in IoT have limited energy resources.

ADVANTAGES OF IoT :

1. **Data :** IoT provides lots of information which helps us to make right decisions at right time.
2. **Time :** IoT technology saves lots of time by providing accurate and real time information on time.
3. **Economical :** IoT technology is very economical depending upon the application scenarios.
4. **Tracking :** IoT helps in keeping track or monitoringvarious physical objects which in turn save time and money.

APPLICATIONS OF IoT

There are diverse ranges of applications in IoT which can be found in day to day lives. Smart industries are the most prominent area of IoT applications, next to this, IoT application areas include smart home, security systems, intelligent thermostats, smart city applications,

smart energy applications, smart transportation systems and monitoring of real time parking spaces etc.

Internet of Things is transforming our lives in countless ways. For example imagine a scenario where smart traffic camera monitors the road, for traffic congestion, accidents, weather conditions etc., and communicate that status to the gateway that combines with the data obtained from other smart traffic cameras; creating an intelligent city wide traffic system. Now this intelligent city wide traffic system can be connected to other city wide transportation systems which get data from their own intelligent devices creating an ever-larger system of systems. These ever-larger systems can helpin analysing the end-to-end data across that system ofsystems.For example, a scenario of the city intelligent traffic system which detects the massive congestion due to an accident, that insight can be sent to the city wide transportation system which can analyse the accidents on other city systems; recognising the accident is near the airport and to city schools it could notify those so they can adjust flight and school schedules and can find the optimal route around the accidents and send those instructions to city digital signage system to guide drivers around the accident. This is just one example from the number of various potential applications benefits of the IoT when intelligent devices share insight with other systems forming ever-expanding systems of systems.

CONCLUSION

IoT represents the future internet which opens the door for new research directions and technologies. The solution of the issues pertaining to the IoT can take this technology to the next level and make a significant contribution to the IT world. This article discusses how IoT works, challenges of IoT and application of IoT.

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EFFECTS OF CONSANGUINEOUS MARRIAGES

V. Lakshmi

Consanguinity is the marriage between close relatives. Though consanguineous matings have cultural and socioeconomic advantages, their offspring have an increased risk for recessive disorders. The risk is not uniform in all cases and it varies based on several factors. The article discusses the different type of measures that can be taken by a consanguineous couple before and after marriage to avoid genetic disorders in their progeny.

INTRODUCTION

If two individuals have a common ancestor, they are said to be consanguineous. A marriage between closely related individuals, up to second cousins is considered to be consanguineous marriage. Charles Darwin, Albert Einstein, Queen Victoria, Franklin Roosevelt etc are some of the famous persons who married their cousins.

Most human societies however primitive or geographically isolated, prohibit parent-offspring or brother-sister matings (marriage among first degree relatives) and this taboo is based on observation of abnormal children from such matings. Consanguineous unions are practiced among more than 1 billion of the world's population[1], however the amount of inbreeding varies in different populations. It is controlled by traditional and cultural practices. Though it is not allowed in some countries like China, Ethiopia, Philippines, Taiwan etc. it is high in North Africa, the middle East and South Asia and is common in our country[1].

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PROS AND CONS

There is a great controversy on the benefits and risks of consanguineous marriages. The positive social effects of consanguineous marriages are strengthening kinship relations, stable marital relationship, financial advantage, cultural continuity, maintenance of family structure, political alliances etc. which are the reason for the preference for consanguineous marriages. The effects of consanguinity on normal human variartions is not known. The negative health effects are increased incidence of rare genetic disorders, increase in mortality and morbidity. Though the effects of consanguinity on non communicable diseases is still largely unexplored, a recent study revealed a significant increase in the incidence of common adult diseases like cancer, diabetes, hypertension etc.[2] in consanguineous population.

We all carry more than 25,000 genes in each cell as pairs, usually a pair for each character (some characters like tallness can be governed

by more than one pair of genes). Out of these, about 3-6 genes are deleterious, but as they are recessive or weak they do not manifest the disease. The reason is the other member of the pair is normal and dominant (heterozygous) and suppresses the deleterious effect of the gene. The deleterious genes will be expressed only if there are two copies of them in an individual (homozygous recessive).

Individuals with common ancestors are likely to share the same alleles and their progeny has an increased chance of being homozygous. Deleterious alleles are more frequently expressed in homozygotes, resulting in a variety of genetic disorders such as birth defects, mental retardation, deafness and blindness or reduced viability known as inbreeding depression. One of the consequences of consanguinity is an increase in frequency of homozygotes. Increase in homozygosity is applicable not only for abnormal alleles but also for normal alleles, i.e., consanguinity can also result in perfectly healthy offspring[3] . For example Cleopatra who is known for her wit, beauty and intelligence was the daughter of a brother and sister and great grand daughter of another brother and sister. The adverse genetic effects on health do not affect 90% of the offspring of consanguineous marriages[4].

Consanguinity risk is highest among families which carry severe autosomal recessive diseases. Though the risk of congenital anomalies among the newborns of first cousin matings is claimed to be double the frequency among general population, the genetic implications is not the same for all the cousins. The magnitude of risk depends on the frequency of defective genes in the population, the degree of relationship between the parents, whether there are repeated cousin marriages in the family etc. It may be more than double in certain populations basing on repeated cousin marriages through several generations. Sibs share 50% of their genes where as uncle niece and first cousins share 25% and 12.5% respectively while second cousins share only 3% of their genes. In marriage between individuals beyond second cousins, the risk will be almost the same as that in general population. Hence there is no deleterious genetic effect on health in consanguinity beyond second cousins.

The few deleterious recessive alleles present in any population, rarely achieve homozygosity if population is outbreeding. They are mostly passed on to future generations silently (hidden or masked state), that is in a single copy or heterozygous state and when the allele comes in contact with the same allele in the partner the genetic disease will surface again.. Unrelated couple may also produce a child with serious birth defect if unfortunately both of them have defective alleles of the same gene which happens when the frequency of the recessive allele is high in the population. High levels of endogamy in the population can dramatically increase the possibility of homozygosity at any locus. That is the reason for the high frequency of rare autosomal recessive disorders in regions where consanguinity is high.

According to one school of thought by avoiding consanguineous marriages, the gene will be carried on to the future generations silently without elimination. Some experts believe that inbreeding is helpful to a population by constantly exposing harmful recessive genes to selection and thereby eliminating them from the population.

CONCLUSION

Inbreeding is a controversial subject and it is very difficult to run experiments to determine its possible effects in humans. It is not always

harmful. It can produce perfectly normal offspring also provided there is no genetic disease running in the family or there is no earlier history of consanguinity. It is important to remember that random mating does not eliminate deleterious genes from a population, but merely covers them up. While inbreeding does not create harmful genes, it merely tends to bring them out.

It is wise to consider the possible genetic consequences before marriage itself, especially if there are any deleterious recessive genes running in a family. Premarital counseling is important as it causes awareness of the possible harmful consequences among the related young adults who are going to marry. Already married cousins can use preconception counseling services to maintain health and in case of couples with affected children, prenatal diagnosis can be done to avoid genetic disorders.

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IMPACT OF COAL MINING AND MINE FIRES ON THE LOCAL ENVIRONMENT IN JHARIA COALFIELD, JHARKHAND

Varinder Saini

Coal mining though provides a precious resource but is also a process that leads to degradation of the local environment to a large extent. Jharia coalfield holds unequivocal importance in the Indian context as it is the only source of prime coking coal in the country. Haphazard mining over nearly a century has led to environmental changes to a large extent such as degradation in quality of air, water, soil, changes in landform, land use/land cover, vegetation distribution. Jharia is also infamous for widespread development of surface and subsurface fires due to unsustainable mining practices. This article outlines the environmental issues related to coal mining in Jharia coalfield, Jharkhand.

INTRODUCTION

Coal is one of the most abundantly available fossil fuels around the globe which meets a major part of the energy need for human consumption. It is used in various industries such as power, steel, cement, alumina refineries, as well as for domestic purposes. India is the third largest coal producer in the world after China and USA. Geological Survey of India has estimated a cumulative total of 301.5 bn tonnes of coal resources in the country as on 1st April 2014[1]. The State of Jharkhand tops the list with the maximum coal reserves at 80 bn tonnes. Coal accounts for 55% of the country's energy need and is the major source for power generation in India. However, coal mining adversely affects the environment of the area. A typical coal mining area has many negative impacts such as deforestation, changes in vegetation pattern, damage to the ecological system, loss of agricultural land, loss of biodiversity, degradation of the air, water and soil quality, changes in topography and land use/land cover (LULC)[1].

The first published record of coal mining in India dates to the year 1774 in Bengal. The main coal fields in India are Jharia, Raniganj, Singareni, Talcher, Neyveli, Singrauli, Nagpur and Chandrapur. Jharia has a long history of mining, which started towards the end of the 19th century. The mining activities intensified in Jharia in 1920 and thereafter it has been growing extensively and exponentially. At present, there are around 35 large underground and opencast mines in the Jharia coalfield (JCF). Economically, JCF produces largely bituminous coal. JCF is important in the Indian context as it is the most important storehouse of prime coking coal that

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feeds major percentage of our industrial demand. Coking coals are defined as those coals that on carbonization pass through softening, swelling, and re-solidification to coke. Coke is a solid fuel made by heating coal in the absence of air so that the volatile components are driven off.

Like any other large coal mining area, over the last century, JCF has also undergone a sea-change affecting the environment. The coal mining has affected air, water and soil resources, topography, land use/land cover, vegetation patterns and has also led to the infamous coal mine fires that have remained active underground for more than a century. The first coal fire was detected in 1916. These fires constitute a major cause of hazard and have also been spoiling the precious natural resource. The present article aims at outlining the environmental issues prevalent in JCF due to coal mining and associated fires.

ENVIRONMENTAL ISSUES IN JHARIA COAL FIELD

1. Air pollution

In the JCF, air pollution due to coal fires is also a severe problem. The major pollutants are oxides of nitrogen and sulphur, fine coal dust, suspended particulate matter, respirable particulate matter, polyaromatic hydrocarbons and benzene soluble matter. The major sources are drilling and blasting operations, coal fires, vehicular traffic, heavy trucks plying on haul roads, loading/unloading of coal, wind erosion from overburden dumps. Most of the dust is categorized into respirable particulate matter which causes diseases of lungs and skin such as asthma and chronic bronchitis[2,3]. The soot and particulate matter released from coal mine fires decrease the visibility in the area. Also, coal fires volatilize many potentially harmful heavy metals like arsenic, selenium, mercury, lead, sulphur and fluorine. These could condense on dust particles and get inhaled or ingested by the local people or they could gain entry to local water bodies and thus enter food chain causing severe diseases[4]. There have been documented reports of stroke, pulmonary heart disease and chronic obstructive pulmonary disease due to air pollution. Heavy metals along with PAHs can cause a number of ill effects on health like cancer, neurotoxicity, cardiotoxicity, immunotoxicity, arsenosis, fluorosis, CO poisoning etc.[5]

2. Water pollution

During underground mining, excavated waste materials are dumped and piled at the ground surface creating runoff that both pollutes and alters the flow of local streams. As rain percolates through these dumps and piles, soluble components are dissolved in the runoff and cause the increase of total dissolved solids in local water bodies. The erosion from overburden dumps and spoil heaps lead to increase in sediment load of streams, lakes and ponds and thus leading to siltation of surface water bodies. This may sometimes lead to alteration in their regime. Many of the mines exist below the ground water level, which demand pumping out of water. This can lower the water table and even dry up nearby wells. Moreover, when a mine is located below the water table, water seeps into the mine and must be pumped out. Further, physical disruption of aquifers can occur from blasting which can cause the groundwater to seep to a lower level or even connect two aquifers (leading to aquifer contamination). Huge volumes of polluted water from underground mines are channelled into the Damodar thus polluting it chemically. The mine water discharged from underground mines has high hardness due to dissolved sulphates and chlorides. Apart from

actual mining activities, coal beneficiation and preparation plants also release a large amount of water effluents in the river which poses a threat to aquatic ecosystem and prevailing biodiversity[6]. Besides, there is a scarcity of potable water due to both, increased demand and contamination.

3. Soil pollution

In JCF, soil is polluted due to strip mining as it involves removal of top soil, wind erosion from overburden dumps, coal heaps, tailing ponds, dust generated due to heavy machinery used for extracting coal, burning of coal, loading and unloading of coal as this dust settles on nearby areas. Soil has poor texture, low organic matter, and exhibits change in nutrient content due to heavy metal toxicity, change in pH and electrical conductivity. Also, the soil above the fire areas is devoid of moisture and is baked making it biologically sterile[7]. The soil friendly organisms (bacteria, nematodes, earthworms, etc.) die under such harsh conditions, thus limiting the ability of the soil to support vegetation. The existing vegetation also dries up and ultimately dies due to the lack of water and other nutrients. Thus, it is observed that soils have poor potential for plant growth in JCF.

4. Changes in Vegetation Pattern

In mining areas, vegetation plays a significant role in modification of water balance, erosion control and landscape rehabilitation[8]. During mining, the vegetation cover and the draining regime are disturbed over enormous areas. In Jharia alone, hundreds of square kilometres of land are currently affected by surface and subsurface mining, out of which a significant portion is without vegetation cover. Also, the vegetation pattern changes as once the diverse vegetation with full grown trees and under cover is changed to herbaceous vegetation growing on the overburden dumps and on areas immediately around the mines. Regrowing vegetation on overburden dumps and mine spoils is a gigantic task as the soil gets devoid of nutrients, has acidic pH, and is often contaminated with heavy metals such as Fe, Al, Mn and Cu. Further, Jharia is encountered with an additional problem of coal fires. This aspect cannot be ignored in any study conducted in this coalfield. The high temperatures associated with these fires lead to reduction in potential of soil to support plant growth.

5. Changes in Topography

Topography is defined as the arrangement of the natural and artificial physical features of an area like overburden dumps, hills, valleys, mine pits etc. Changes in topography in JCF are derived due to clearing of land for opencast mining, erecting infrastructure related to underground mining, dumping of overburden in nearby areas, subsidence due to fires as there is volume loss when coal turns to ash. JCF is facing significant subsidence due to underground mining[9]. Generally, subsidence occurs after mining has ceased in an area. But sometimes it occurs when a mine is still in function. In such a scenario, it may lead to destruction of mining infrastructure and a lot of mine able coal becomes locked and inaccessible due to subsidence. Subsidence also leads to damage of manmade infrastructure such as houses, roads, pipelines etc. In rare cases, subsidence could also lead to changes in natural drainage pattern of the area.

6. Changes in Land Use/Land Cover (LULC)

Land cover data documents how much of a region is covered by forests, wetlands, impervious surfaces, agriculture, and other land and water types. Land use shows how people use the landscape – whether for development, conservation, or mixed uses. LULC changes occur due to both opencast and underground mining

and surface and subsurface coal fires. Since coal mining is a dynamic process, the areas regularly undergo changes with one land use class changing to another. These changes may be easily quantified using temporal change detection from satellite data. LULC maps of different times throw valuable light on the changing LULC pattern. Earlier, LULC maps were prepared using field data and toposheets but now remote sensing data is widely used because of its ease of availability and periodic and synoptic coverage of an area. Many studies have been conducted and it has been reported that JCF has undergone many changes that have remodelled its face.

7. Surface and Subsurface Fires

Fire has beset Indian coal-fields since the earliest days of mining[10-11]. In 1986, 163 coal mine fires were identified in India. Surface and subsurface fires are also serious problems in some coalfields. Considerable environmental and economic problems are directly related to coal fires. Apart from consuming a valuable resource, the fires pose operational difficulty in mining by increasing the cost of production. Coal fires cast a serious impact on the environment. Noxious gases such as SO_2, carbon monoxide, oxides of nitrogen (NO_x) and CO_2 often affect the immediate surroundings of active coal fires. These greenhouse gases affect the local as well as global climate. NO_x and SO_2 react with volatile organic compounds (released due to coal fires) in the presence of sunlight to form smog. During rainfall, NO_x and SO_2 combine with water droplets and their pH is reduced leading to acid rains. The soil above the fire areas is devoid of moisture and is baked. The existing vegetation also dries up and ultimately dies due to the lack of water and other nutrients. Smoke emanating from coal fires and windblown ash also affect the health of the people residing near the coalfields[9]. Other effects of coal mining include cracking and subsidence of land surface. Subsidence causes enormous damage to agriculture, buildings, transport network etc. Detecting the area covered and the extent of the fires may give estimates of the amount of gaseous pollutants released into the atmosphere. And knowing the direction of propagation of fire will lead to the estimation of how much additional area would come under fire in a particular time period. This information could be very helpful to mine planners for planning strategies so as how to control the spread.

SUMMARY AND CONCLUSION

JCF has a long mining history. Intensive mining activities in the JCF over more than a century have brought out significant environmental changes in the area that are reflected in terms of degradation of the air, water and soil, damage to the ecological system, loss of agricultural land, and change in the vegetation pattern.

Briefly, air pollution occurs due to blasting and drilling operations, wind erosion from various dumps, vehicular traffic, and burning of coal fires. Particulate matter, coal dust and soot cause respiratory tract problems such as asthma, bronchitis etc. Acid rain damages infrastructure, crops and vegetation and pose a threat to the aquatic biodiversity.

Water pollution is caused due to erosion from overburden dumps and spoil heaps leading to increase in sediment load of the streams, lakes and ponds. The effluents from coal mine related industries lead to increase in the heavy metal concentration. Field data on some parameters such as TDS, Fe, nitrite, hardness, conductivity and heavy metals indicate that their

concentrations exceed the permissible limits in some areas.

The soil quality is affected by removal of top soil and low accumulation of humus resulting in lower organic content. The soils have high bulk density, large grain size, acidic pH and high electrical conductivity, which cumulatively make the soil less potent for plant growth. Besides these, other environmental effects include cracking and subsidence of land surfaces, change in landform and topography of the area due to regular excavations and dumping of overburden material. These environmental effects results in reduction of clean areas for developing recreational facilities and ultimately destroys the aesthetics of the area.

It could be summarily concluded that the environment in JCF has deteriorated over the years. All these factors cumulatively take a toll on the environment. Therefore, it becomes important to study the ecology of the coal mining area to assess the damage to the environment and consider appropriate remedial measures to minimize or restore the damaged areas. Thus, these areas must be studied at regular intervals and the impacts need to be monitored regularly.

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CLEANER TECHNOLOGY WITH ENFORCED HUMAN DISCIPLINE: KEY FOR SUSTAINABLE HEALTH OF THE GLOBAL ENVIRONMENT

Pooran Koli

ABSTRACT

World over, there is hue and cry over the adverse impact of climate change. The global community under the aegis of Intergovernmental Panel on Climate Change (a scientific and inter-governmental body) is dedicated to the task of providing the world with an objective, scientific view of climate change and its political and economic impacts. Here in this regard, The author would like to analyze in broader way who to be blamed for this state of affairs of adverse effects of climate change, and what should be the core of initiatives for tackling the concerned problems?

INTRODUCTION

All living beings on earth are disturbing fine balance of the nature. In this regards, the humans have dubious distinction of being main contributor to deteriorating health of the mother earth. The ecological and environmental challenges to global environment are imminent. Therefore, we cannot escape from damage to nature, but we can minimize it by way of more and more use of eco-friendly technology with enforcement of human discipline. The human discipline should be at core of all cleaner technology and policy framework.

DISCUSSIONS

The self-propagation and growth of living beings necessitates consumption of natural resources

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The Earth and its environment consist of non-living and living beings. The core difference between non-livings and living beings is based on self-propagation and growth. The non-livings never self-propagate it and never grow in mass. For example, a ball cannot reproduce another ball and it can never grow in weight by itself. But, the living beings have capacity to reproduce their siblings (childrens). At birth, the normal weight of a child say of human beings is about 2.5 Kg - 5 Kg. As child grows in age, his/her weight increases. Here is the importance of the first law of thermodynamics. According to the first law of thermodynamics, the energy can neither be created nor be destroyed but its one form can be changed to another form. As per the Einstein's mass energy equivalence law ($E = mc^2$; m is mass, c is light velocity, and E is energy), the mass is also one of the form of energy. Therefore, the first law of

thermodynamics also expands to cover mass to energy change or vice-versa, and mass to mass interchange. So given the first law of thermodynamics, the growth and weight gain of living being unavoidably requires to consume natural resources like food, water, minerals and other nutrients from the nature. So this process of growth and weight gain of living beings like animals and plants put pressure on natural health of globe and its environment. This pressure is further aggravated by the infallible concept of second law of thermodynamics which states that no process is 100 % efficient, in simple words; it means the weight of product manufactured is always less than the weight of raw materials. Therefore, the intake of one Kg food not leads to permanent increase in weight of animal by one Kg.

All living beings including plants, animals, human beings, etc. causing damage to earth and its environment

We the scientists, academicians and all individuals are discussing the environmental problems and its adverse effects on life and health of the earth. For all the ills of Earth, we are blaming ourselves (humans). But it is not whole truth. The truth is that the plants, animals, micro-organisms are also damaging the globe but the humans far ought weigh others.

A small tree standing in farm land grows by taking nutrients from productive land. In the course of time, the fertile farm land nearby to this tree turns barren. How a big tree like Neem, Pipal, etc. standing in farm land deteriorates land fertility is very common. Similarly, the unwanted plants like weed adversely affect the health of the crop. The unbridled growth of algae and other vegetation pollutes the water bodies.

Termites play havoc with the crops, vegetables, and plants. The over grazing of grass and plants by animals leads to *land degradation, soil* erosion, desertification and loss of useful species.

Golovatin *et al*[1] has demonstrated that reindeer overgrazing has resulted in a substantial transformation of vegetation mostly in lichen tundra and close to total extinction of lichen pastures on the Yamal peninsula. Overgrazing has drastically reduced the total availability of grasses and shrubs. Overgrazing has also affected the animal populations and has reduced tundra birds**.**

The micro-organisms also harm the sustainable health of global ecology by causing various diseases to animals and plants.

Humans causes more damage to Mother Nature

The plants, organisms, and all animals (other than humans) harm the health of Mother Nature but the humans far outweigh others. The reasons for this is that the humans have some peculiar characteristics-

One, the humans uses natural resources not only for food and nutrition but for clothing, transportation and other luxury also. Whereas, the plants and animals uses natural resources only for food and nutrition.

Two, the humans have capacity to moulds natural factors to their will. The animals use natural resources in the form in which they occur in nature. For example, an animal will eat brinjal, grass, plants, etc. in raw form. But, the humans have capacity to mould form of the natural resources. Humans may fry brinjal with oil and spices before eating it. Similarly, the humans have capacity to change the atmospheric temperature by closing himself inside AC room. This way human can protect themselves from very uncomfortable temperature and wind velocity. Other animals like cow, buffaloes, wild animals, etc. cannot modify atmospheric temperature and wind velocity.

Most of the people justify the peculiar behavior on the basis that humans are most intelligent animals on this earth. But in my opinion, other animals are intelligent as much as are humans. Even animals are more intelligent. No doubt animals are much more intelligent than we generally give them credit for. Then what is the god gift to humans which makes them superior than other animals? It is the dexterous hands of humans that enable them to manipulate objects and build things.

It is the hand with special thumb and fingers of humans. The long fingers with special thumb enable humans to have tight and precise grip of material and machinery to change the natural resources in to luxury of big houses, transportation, industry, etc. The humans are adaptable to most environments on earth because of their ability to use tools and in part to evolutionary traits.

All animals have hands but only humans can move their thumbs all across the palm to their ring and little fingers. Humans can also flex the ring and little fingers toward the base of their thumb. This gives humans a powerful grip and exceptional dexterity to hold and manipulate tools with. Animal say Cimpanzees have lower limbs with fingers that are specialized for manipulation. The term 'finger' is not applied to the digits of most other animals none of which can engage in fine manipulation with their forelimbs as a primate can. Chimpanzees make tools and use them to acquire foods. One example of chimpanzee tool usage behavior includes the use of a large stick as a tool to dig into termite mounds, and the subsequent use of a small stick altered into a tool that is used to "fish" the termites out of the mound. Chimpanzees are also known to use smaller stones as hammers and a large one as an anvil in order to break open nuts.

Again there is difference between Chimpanzee and in humans as far as the hand grip is concerned. Humans are very skilled in using their hands with opposable thumbs, and arms to throw objects. The freeing of the hands in humans from their walking requirements is the most important factor leading to the habile hand and its thumb. The humans have specialized and precision gripping hand equipped with opposable thumb. The thumb, unlike other fingers, is only digit to oppose or turn back against the other four fingers enabling the hand to refine its grip to hold objects which it would be unable to do otherwise. Living great apes like chimpanzees and gorillas do not have special bony contours in thumb. They can only manipulate small objects by gripping them between the thumb and index finger tip-to-tip or pad-to-side, a pad-to-pad grip being impossible for them. Australopithecines also lack these grip-enhancing contours[2].

So this is the luxury of humans with their capacity to modify the natural resources prime reasons that humans causes more damage to mother earth.

Remedy for sustaining regenerative health of the global environment

The animals including humans, the plants, and the micro-organism are in some way or other way responsible for environmental challenges. But, the humans have contributed most to environmental challenges by damaging the regeneration power of the natural resources. Therefore, it is the duty of humans to take steps to remedy the environmental challenges. It is also because the plants and other animals cannot do this. To remedy the problem of global health, the task should be to bring nature in equilibrium. The nature has inherent regeneration power of restoring ecological balance if damage to nature is limited. The nature has limited power to

remedy the less natural disturbance. If the damage to natural resources is very high in magnitude then restoration of natural equilibrium is difficult leading to multiplication of problem to alarming level. It is also pertinent to mention here that some damage to Mother Nature is imminent as we humans including other animals and plants have to take food from nature for survival. Therefore, we humans have to take steps to reduce problem like pollution to minimum level. In my opinion, this can be done by use of cleaner technology with enforced discipline. Again, I want to mention that no technology is clean (100 % eco-friendly). Every technology causes damage to the environment. The difference is merely of relativity. Some technology is more polluting and some are less polluting. For example, the use of earthen cup (***kulhar)*** instead of plastic cup may be good idea for the health of environment. But, it is to be mentioned that the earthen cup technology is not totally eco-friendly. The making of earthen cup will require clay from land causing land degradation. A lot of amount of grass and wood will be required to klin the kulhar causing damage to forest, air, and useful microorganisms.

Similarly, the use of jute bags, paper bags and clothing bags is good idea for the health of nature. But again it is to be noted that the use of jute, paper and clothing will not remove pollution problem altogether *vis-a vis* problem created by plastic bags.

Similar is the issue of power generation techniques like thermal power, hydro power, wind power, solar power, nuclear power, etc. The thermal power (from coal, oil, gas) is dubbed as highly polluting energy technology, and other techniques like hydro, nuclear, wind, solar, etc are held relatively eco-friendly technology. But the point to be noted is that the use of solar, wind, hydro, etc. is not totally eco-friendly. The wind by itself cannot generate electricity. For this to happen, we have to manufacture metal/ alloy made turbines, blades, poles, etc. The mining of metal ores, alloys formation, manufacturing of turbines, and their disposal (when they outlive their utility) involves polluting processes. Similar logic may be given for solar, hydro, nuclear and other relatively eco-friendly technology. Quantitatively in terms of CO_2 pollution, all energy technology causes CO_2 pollution and difference is only of relative amount of CO_2 pollution[3] (Table 1).

Table 1. CO_2 (in gm) emitted per unit (KWH) of electricity[3].

Energy technology	Japan	Sweden	Finland
Coal	975	980	894
Gas Combined Cycle	519	450	472
Solar Photovoltaic	53	50	95
Wind	29	5.5	14
Nuclear	22	6	10-26
Hydro electric	11	3	–

Here, it is to be noted that we should focus on problems like air pollution, land pollution, water pollution, nuclear pollution, food adulteration, etc. The control of air pollution holds special significance as it is used by living beings throughout the whole life (every seconds from birth to death). During the last days of life, some old and ill humans abandon eating and drinking but they continue breathe air (oxygen). No human drink water continuously every time from birth to death. Similarly, no human eat food continuously every time from birth to death. But, every human breathe air continuously every time from birth to death. Therefore, the control of air pollution needs more attention. The emphasis must be more on energy technology as they cause about 40 % air pollution. We should focus on use of renewable and cleaner technology like solar, wind and hydro power. The shift to these

renewable power technologies is also being seen world over. To tackle the environmental problem, we should move towards cleaner technology in all sectors like agriculture (like organic farming), cosmetics (like herbal), packaging (like jute, etc.), chemical synthesis (like green chemistry), etc.

The human shift towards the use of cleaner technology alone will not be suffice in itself to restore the natural equilibrium. The human discipline is at the core of all activity; therefore, the environmental problems cannot be tackled without its help. The shift to cleaner technology will be possible only when humans are enough disciplined towards cleaner technology. It is the lack of human discipline that we are wasting electricity by operating electrical appliances even when they are not in use. A bit element of human discipline will enable saving of natural resources while using electricity at household and offices and PHED water supply. A disciplined planning for the amount of food to be cooked at household and various celebrations may save huge amount of edible materials. A disciplined way of use of clothing may reduce pressure on textile industry and in turn on natural resources. Human discipline may play crucial role in different walks of life leading to the economic use of natural resources. This human discipline may be inculcated by awareness, counseling, motivation, encouragement, incentives, enactment and enforcement of unambiguous law, and finally by severe punishment. The governmental agencies should not hesitate from punishing defiant humans because it not only has deterrent effect on punished human but also on others. Punishment is also the law of the nature. The nature is very smart when to punish man and when to give pleasure to man. The nature makes a man to feel energetic and fresh in morning if that man has taken sound sleep overnight. The nature punishes those men in morning and over whole day that have not slept well over night.

CONCLUSION

The fine balance of nature may be restored only by use of cleaner technology coupled with change in human behavior for more discipline in life through awareness and punishment. The enforcement of human discipline through awareness and counseling failing which through severe punishment is even more significant than cleaner technology.

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ALTERNATIVES TO FOOD CROPS FOR BIOFUELS PRODUCTION IN INDIA

R. T. Gahukar

Energy security looms as one of the most important challenges of this century for scientists and users in India. Resources alternative to fossil including fungi, grasses, algae, waste oils and non-food crops are being studied. In future, biofuels should ideally create the environmental, economic and social benefits to the communities and reflect energy efficicency. Thus, there is need for a roadmap for the industry to produce new generation biofuels.

CURRENT SITUATION OF BIOFUEL DEMAND AND PRODUCTION

Supply of bioenergy looms as one of the important challenges of this century for the country. This fact also reflects indirectly on food security[1]. It is now necessary to reduce pressure on fossil-based diesel since this natural source is limited. Other bioenergy sources include bioethnaol, biobutanol, biodiesel, bio-oils, cellulosic ethanol, biohydrogen, biomethyl ether, dimethyl tephthalate, biomethanol, 2-5-dimethylfuran, hydro-thermal upgrading disel, Fischer-Tropsch diesel, mixed alcohols, wood diesel, and biofuel from grasses, algae and fungi. High energy biofuel from agricultural residues and energy crops is also envisaged.

Biofuels are meant to fight against climate change by decreasing our dependence non-renewable deposits of coal and petroleum. India is the sixth largest energy consumer with 150-200 tonnes of ethanol used annually for fuel blending and current demand (annual rate of 4.8%) would grow to 5.8% till 2030. In future, the importance of biofuels will depend upon petroleum price, progress in bioscience and technology, and awareness among people about dangers of climate change.

India meets about 70% of its requirement in crude oil and petroleum products (diesel and aviation fuel) through imports. It is speculated that biofuel production on large scale will result in non-availability of foods and increase in their prices, deforestation, diminution in biodiversity and undesirable impact on local land and water resources. Public and private firms are therefore working on technologies for the biofuel production from agricultural residues and energy crops. The government has plans to execute greening of countryside by providing green fuels for rural electrification programmes along with employment opportunities as production will trigger huge growth in domestic plantation and processing. This venture is welcome since availability of land and the low cost of production has made India as one of the most favoured and potential countries for biofuel production. In this

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sector, major activities include community development through plantations, incentivizing the operations across the value chain, regulating the markets by curtailing import of free fatty acids, restricting movement and distribution within and outside the states, and revising periodically the sale prices for the growers.

The government has announced the National Policy on Biofuels on December 23, 2009. The goal of this policy is to ensure a minimum level of biofuels and meet the public demand. For this, 20% blending of bioethanol is proposed by 2017 instead of current mandatory 5% blending of ethanol and optional 10% mixing. Although statistics on use of biodiesel is not available as it is mostly distributed through unorganized means, the national mission on biodiesel forecasted blending of biodiesel with high speed diesel up to 20% by the end of 2012. For this, 11.19 m ha of land has to be converted into plantations of which 7.98% ha under jatropha *(Jatropha curcas)* alone. The policy also encourages industry with subsidies to boost biofuel processing. But the present feedstock can meet the demand of only small biofuel processing units. Therefore, basic custom duty on biodiesel will be reduced from present 7.55 to 2.5% at par with petro-diesel. If diesel or petrol price falls below the minimum purchase price, the marketing companies will be duly compensated by the government.

PRODUCTION OF BIOFUELS

Among renewable energy sources, biofuels are gaining importance and there had been scientific progress in developing biofuels from different sources, The followings are the landmarks in research and development activities.

The first generation bioethanol is generated by fermenting plant-derived sugars to ethanol. Thus requires the use of field crops such as, corn, cassava, sweet sorghum, sugarcane etc. and biodisel is derived from seed oils, animal fat, oilseed crops, forest trees, fats and greases. In general, bioethanol is produced by the fermentation of molasses (by-product of sugar mills) since sugarcane produces about 35-40 tonnes of dry mass/ha, and one tonne of molasses can produce 12 litres of bioethanol, and is regarded as energy efficient and sustainable in the long run[2]. But the sugar or starch-based ethanol can be used as an additive rather than an alternative to fossil fuels.

The statutory minimum price mechanism determines the price for commercial crops like sugarcane and the processors/mill owners have their profit based on byproducts and processing (distilleries). But the supply of soybean, rapeseed and other feed stocks will be limited by competition from other uses and land constraints. Similarly, utilization of the food crops for biofuel is in a big controvercy since India is facing scarcity to supply sugar and foods. Thus, biofuel production may not be possible without threatening food security and biodiversity 1. There is already stress on the wasteland for plantations which may make the land vulnerable leading to grabbing by corporate sector and farmers will be pushed from their own lands. Some food crops such as, beet root, corn and wheat need high doses of fertilizers which augment the emission of the Green house gases (GHGs). Coarse grains are fed to animals and prices of animal feed and meat may go up. Moreover, increasing corn on large scale for biofuel production reduces the biocontrol services in agricultural landscapes[3]. It seems that first generation biofuels are not cost-competitive with existing fossil fuels, their life cycle emissions often exceed than that of fossil fuels, and some of them produce only limited GHGs emission savings.

The second generation biofuel is produced by using biomas of residual non-food parts of field

crops such as, stems, leaves and husks which are left in the field after harvest. This woody and fibrous biomass is locked in with useful sugars by energy-rich cellulose and lignin; cellulose is a tough polymer from which cell walls of plants are made. The lignocellulosic ethanol is made by freezing the sugar molecules from cellulose using enzymes, steam heating or other pre-treatments. These sugars are fermented to produce ethanol in the same way as first generation bioethanol production. One tonne of cellulosic biomass yields up to 400 litres of bioethanol making it potential and feasible option. The byproduct (lignin) of this process is burnt as a carbon neutral fuel to produce heat and power for the processing plants and electrification. When cellulose alone is used for biofuel, other biomass is used for human beings and animals. Another advantage is that lignocellulosic ethanol can reduce GHG emissions by about 90% compared to fossil petroleum.

Amongst available non-food crops such as, certain oilseeds, forest trees, cereals bearing little garins, rubber and industry waste (wood chops, skins and pulp from fruit pressing unitsj.jatropha has been considered as an ideal crop from the view of land use pattern (cultivation along with horticultural and medicinal plants), GHGs emissions and upliftment of marginal farmers for better livelihood. But in fact, contiguous land is needed for jatropha cultivation and its oil content is often over-estimated. Therefore, irrespective of long plant development period, an indigenous tree karanj (*Pongamia pinnata*) may be a viable choice. Since it is a leguminous tree, soil fertility is maintained. It grows well in wasteland. Its seed contains 30-40% oil that can be converted to biodiesel[1].

The current approach is solely based on non-food crops/feed stocks to be raised on degraded or fallow land, in forest and non-forest areas and wastelands that are not suitable for agriculture. Thus, a possible conflict of fuel versus food security could be avoided. There is no danger for these crops since ethanol is obtained from residues and does not hamper crops for animal grazing. Research is in progress to modify plants genetically to suit biofuel production. For example, biofuel produced from indigenous brown rice in Japan is blended up to 3% with petrol. In Europe, flax rich in cellulose produces 0.3 kg ethanol/kg of dry biomass. Likewise, biofuel from a crucifer, *Brassica carinata* through enzymatic hydrolysis followed by fermentation and distillation is encouraged for mixing with petrol. The difficulty is how to separate energy-rich cellulose from the wood to make ethanol and it is a costly process requiring high amount of heat and caustic chemicals. Moreover, fungal enzymes that attack lignin are not very efficient in breaking up lignin and not easily available. Therefore, instead of decreasing lignin content, its biosynthesis or the structural rigidity of the plant and other mechanisms will have to be searched.

The third generation biofuel is extracted from several recently identified sources such as, water melon juice, algae, fungi, grasses etc. The water melon juice contains 7-10% of glucose, fructose and sucrose and 15-35 μ mol/ml of amino acids. High water content in fruit helps dilute molasses in biofuels by 25% although concentrated juice (3 times) can only be used.

Conversion of carbon emissions into biofuel through industrial bio-sequestration is possible because this process converts waste CO_2 into oxygen and biomass through photosynthesis of micro-algae[4]. Up to 60-80% of this biomass is converted into oil or lipids and a maximum annual yield of oil (182000 litres/ha) can be

obtained. Algal fuel leaves no carbon residue since up to 99% of CO_2 in solution can be converted and returned into the air when biofuel is burnt. From this emitted CO_2, 50% can be used for algal farming and 25% for farming Spirulina (edible algae). Bioreactors tap CO_2 streams from coal-based thermal power plants to produce rich algae. Thus, CO_2 content can be reduced for lowering global warming effect. Some algae secrete hydrocarbons in a form that can be continuously collected for use as fuel[5] and produce nearly 300 times more oil per unit area than soybean or jatropha because of its short harvesting cycle (1-10 days) thereby lowering the production cost. Similarly, marine algae such as, *Thraustrochytriurn* sp., *Crypthecodiniurn cohnii, Schizotrichiurn* sp. can be grown in costal areas in India as a source of fatty acids[6]. The major constraints are: expensive oil than other commercially available fuels, difficulty in cultivation and harvesting under controlled condition.

The endophytic fungi are well known for production of volatiles including low molecular mass hydrocarbons[7]. A reddish endophytic fungus, *Gliocladiurn rose urn* which lives between living plant cells is found abundantly in the rainforests in Brazil. It is capable of producing a mycodiesel hydrocarbons and hydrocarbon derivatives that are similar to diesel. Fungus can even make these diesel compounds from cellulose which contributes to organic waste. Search for such organisms in the environment needs to be launched because it may be possible in .future to produce fuel straight out of tiny plants and microbes by using genetic engineering.

The buffalow grass *(Buchloe dactyloides),* duck weed *(Lernna gibba)* and switch grass *(Panicurn virgaturn)* have been identified as a potential source ofbiofuel. The genotypes that are suitable for economic production are being studied to identify genetic basis for traits particularly for disease and drought resistance and the composition of cells. But the breaking down of cell walls which is an essential step in producing ethanol from cellulosic biomass seems to be difficult at present. Recently, another grass, *Brachypodiurn distachyon* has been considered as a model organism for biofuel, because it is easy to cultivate, its genome is similar to that of switchgrass but being smaller, its cell-walls can be broken down easily. It facilitates to find genes linked to specific traits such as, stem size and disease resistance, and to insert foreign DNA into it to study gene function and targeted approaches. The slurry of duck weed has been found suitable for making medium for the growth of yeast, *Saccharomyces cereviceae*[8].

CHALLENGES AND PERSPECTIVES

1. Research is needed on waste (old/expired) cooking/vegetable oil, rejected oil from animal fats particularly the tallow (from beef and mutton fat) collected from restaurants and food processing units. Biofuel from these sources emits significantly less GHGs than normal diesel. On business side, there are no established players since technology is still in development and demonstartion stages.
2. The biggest challenge is how to secure quality seed stocks to keep up with growing demand. Contract farming in the degraded and non-forest lands involving farmers and landless labourers can be tried. Otherwise biofuel crops may attract deforestation. Another way is to link employment wages injatropha and other plantations with National Rural Employment Guarantee Act. Spending on research and development activity should. be prioritized in future programmes; for example, cultivation of grasses on marginal lands should be

sponsored because energy crops need fast growing cellulose. Policy on the Minimum support price for jatropha seed and the Minimum purchase price for biodiesel needs to be redefined with assessment of financial feasibility and commercialization while considering economic, social and environmental needs. Planting and processing of biofuel crops if looked after as primary sector by the financial institutions including banks, there would be an attraction for innovative techniques, development and extension.

3. Biofuel production might increase the emission ofGHG through burning of fossil fuels during cultivation and industrial processing. Therefore, raising the target to 20% blending is rather questionable. As such, specifications and standards for the quality production and blending of ethanol in gasoline have to be set up. Paying subsidy to farmers and industries to encourage lower GHGs emissions and utilization of waste land may prove as viable solution.
4. Biofuels can be toxic to micro-organisms which convert the biomass into biofuel resulting in death of bacteria and stopping the conversion process.
5. Few NGOs argue that if government can provide irrigation for biofuel crops, why it is not provided for pulses and oil seed crops of which country is facing acute shortage?
6. Patents on jatropha hybrids have been awarded recently to private firms. This procedure may be detrimental in future as it may result in reduction in genotypic variability, exploitation of farming communities and introduction of rrionopoly system in villages.

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ECO-TOURISM : ROLE OF SOCIETY IN THE ENVIRONMENTAL UNDERSTANDINGS OF SUNDARBAN

Sisir Chatterjee

Eco-tourism, as a catchword describing the development of tourism and environmental conservation, has become a global tourism agenda since the 1990s. Similar to the rise of the environmental protection movement, eco-tourism has likewise originated from the West. Nevertheless, the notion has swiftly spread to the Sundarban and has thus been subject to much amendment under regional improvization and local practices.

INTRODUCTION

Since the late 1980s, eco-tourism has been endorsed by the World Tourism Organization. The 1992 United Nations Conference on Environment and Development in Rio de Janeiro, popularly known as the Earth Summit, provided a new orientation for the eco-development of the travel and tourism industry. Consequently, Agenda 21, the global environmental agenda, endorsed sustainable guidelines and principles for the travel and tourism industry.

The rapid spread of the term has much to do with the response of the tourism industry, which has capitalized on the public's environmental senti-ment to produce new tourism products. Green travel in many practical cases has income a marketing label and a mere strategy to devise a new market niche rather than fulfilling the programmes of conservation.

There has been a wide spectrum of definitions of the term eco-tourism. Popular understanding of the term often relates eco-tourism to nature and wildlife tourism. Scholars and conservation professionals, on the other hand, define it in a different light. Presently eco-tourists are not only environmentally conscious but also contribute a part of their travel expenditure to conservation programmes.

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TOURISM IN SUNDARBAN

The Sundarban mangrove forest; one of the largest such forest in the world (1,40,000 ha), lies on the delta of the Ganges, Brahmaputra and Meghna rivers on the Bay of Bengal.[6]

The tourism industry has become very growthful in the Indian part of Sundarban, with annual visitation increasing from around 50,000 in 2002 to around 117,000 in 2010. Now it is more than 2 lakh because of the regular sightseeing of the main attraction for the tourists, the Royal Bengal Tiger.7 Although the growing commercialisation of tourism business benefits the local economy, it has sometimes detrimental to the ecosystem of the Sundarbans due to river bank erosion, habitat destruction for hotel construction, contamination by waste disposal, unhealthy sanitation and pollution caused by mechanized boats. Commercially successful

tourism is likely to lead to clearings of vegetation for more roadways construction and erosion of peat banks, which will result in changes in substrate structure, faunal diversity and species composition.'

In order to reduce the external cultural effects on the environment, eco-tourism is being encouraged in the Sundarban. One of the benefits of eco-tourism is the economic favourability for local people who is one of its targeted beneficiaries. Due to Sundarban's residents' high dependency on the forest, an effective conservation strategy needs to provide for sustainable living. Eco-tourism is seen as both environmentally sustainable and economy boosting that's why the residents with income generation opportunities linked to forest protection with micro-level initiatives.

CHANGING NATURE OF ECO-TOURISM IN SUNDARBAN

Depletion of Sundarban has gone hand in hand with the progress of civilization. Infact, decline in the geography and ecosystem of Sundarban has kept pace with human progress and under prepared and untimed technological advance and associated policies. The permanent human habitation being established in the area since 19th century through the clearing of forest in low laying tracts. The first forest Mangement Devision to have jurisdiction over the Sundarban was established in 1869. Despite several regulation on land use and mangrove protection in Sundarban between 1873 to 1968, the mangrove covered area decreased by about half because of conversion of forest to agricultural land and settlements. This can be attribute to rapid migration to the Sundarban after partition in 1947.4 But man has not always been the sole cause for this man-nature conflict. People realise that the primary thrust of a conservation policy is to establish a regular system in an endangered area. Ecologically the Sundarban is very much concerned with the success of Social-forestry schemes, habitational crisis of Tiger and unwise Prawn fisheries system.[6]

Considering the ecologial concerns social forestry scheme of Forest department must be regularly practiced in the Sundarban region. Biannual Tiger census has to be arranged by the Forest department using modern devices in order to prevent decrease in number of Tigers. Tigers the most valuable part of sustainable Sundarban are to be kept under constant watch by the forest guards to protect them from the greedy eyes of poachers. Ten forest protection committees and fourteen Eco-development committees have been formed in the fringe of Sundarban Tiger Reserve to help in this regard. In 2014, a study by the National Tiger Conservation Auttority and the Wildlife Institute of India had pegged the tiger count at 76.[5]

Sundarban with luxuriant ever green tide inundated mangroves lining the inlets, creeks and river side and tiger lurking inside the *Phoenix* (Rental) bushes, has just the perfect blend of natural beauty and mystery to make it a thrilling experience for any tourist visiting the place. The Mangrove Interpretation centre is established at Sanjekhali to make the community and tourists aware of the significance of conservation of the unique mangrove ecosystem. Eco-tourism is now flourishing in the deep forests particularly in the buffer zones of Sundarban. Of late a few private organisations are coming up with many new tourist projects.[3]

- involving travel to natural destinations;
- minimizing impact to the hosting environment and communities;
- developing environmental awareness;

- bringing net benefits to the environment;
- providing direct financial benefits for conservation;
- providing financial benefits and empowerment for local people; and
- respecting local cultures, and religious sentiments.

Indeed, nothing in it is new if eco-tourism merely means appreciation of nature and natural landscapes during travel. The recent trend of eco-tourism not only in Sundarban but also in other part of India development entails a deeper understanding of the impacts of tourism activities on nature and culture, and a moral obligation to respect nature, support conservation and responsible travel. However, popular understanding of the term still varies in different perspectives. Sundarban is also within the debate since its identy as Wildlife Sancturary (1977). Recently a proposal of hotel construction including heli-pad in the core area of Sundarban is reviewed and rejected by forest depertment of both central and state government only to address ecological sustainability issue. Retrospectively, eco-tourism is recommended as an alternative kind of tourism with conservation purposes.[1]

In Sundarban, the upsurge of claims to eco-tourism development has to do with the government's awareness of the development constraints that the tourism industry began to face in the later half of the 1990s due to the emergence of many other forest tourism destinations. By 2000 tourism-related departments such as the West Bengal Tourism Ministry and the Agricultural, Fishery and Sundarban Development Department have begun to river as well as creek-way journy in Sundarban. Most of the time, 'eco-tourism' is understood as something related to nature-based tourism in conjunction with some sort of environmental education. With the inclusion of the Sundarban area in academic field around 2004-05 the term popularised after its consideration as a World Network of Biosphere Reserve (Man and Biosphere Reserve) from 2001 and promoted locally in Bengalees well as internationally.

Sundarban, a world Heritage site (announced by UNESCO in 1987) evokes the message of nature through out the world. The worlds largest esturion forest Sundarban is popular for close encounter with the wild environment.

The development of eco-tourism in Sundarban takes on another approach. It has been promoted by the government to combine leisure, family, culture and environmental and wildlile education. In contrast to eco-tourism elsewhere, which, emphasize donations to conservation work, Sundarban eco-tourism is heavily subsidized by the local government.

CHALLANGES OF ECO-TOURISM : POST 'AILA' SCENARIO IN SUNDARBAN

Eco-tourism, in Sundarban, is now facing some challanges like basic amenities like drinking water particularly after cycole AILA in May, 2009. 'AILA' cyclone that drove the *Bengali* to 'new' nature cannot be fully explainable here. The high-profile official promotion of eco-tourism is not at all a solution here. It will be interesting to trace the future evolution of post-disaster forms of eco-travel. The affected area, the Sundarban is known for its wide range of fauna, including nearly 250 bird species, the Royal Bengal Tiger and others threatened species in land and water.[7]

Now eco-tourism development activities are undertaken to minimise negative impact on habitat and wildlife. It should increase visitor's concern for conservation of nature. Development

of eco-tourism in the biotic region of Sundarban is facing some problems as follows :

- There is insufficient modern amenities like hotel, lodges, holiday-homes for enough accommodation for the tourists visiting Sundarban. Home-Stay is still not popular here.
- Poor transport network, particularly tidal inlets, creeks and rivers are the only of ways by boats communications till date due to lack of sufficient metalled roadways.
- Lack of co-operations and co-ordination among different administrative departments like Forest Dept., Tourism Dept., Fisheries Dept. Sundarbans Development Board Irrigation Dept. and Inland Waterways Department etc. for sustainable tourists packages.

COMPARISON BETWEEN ARRIVALS OF TOURISTS FROM JUNE TO DECEMBER OF 2008 AND 2009 : CASE STUDY OF GOSABA REGION

On 25th may of 2009 the occurance of cyclone AILA has created a devastating impacts on the Gosaba area of South 24 Parganas district. Therefore the arrival of tourists has declined from June 2008 to December 2009. The number of tourists arrival has declined in some hotels of Pakhirala area are follows... In *Chital* from June to December 2008 the number of tourists arrived was 288 and from June - December 2009 the number of tourists arrival has decreased to 144. In *Apanjon* from June-December 2008 the number of tourists arrived was 284 and in 2009 the number has declined to 128. In *Swastika* from June-Dccember 2008 the number of tourists arrived was 127 and in 2009 the number has declined to 27 only. In *Hemanta* from June-December 2008 the number of tourists arrived were 170 and in 2009 it has declined to 60.[3]

SOCIO-ECONOMIC COMPULSIONS AND THE CRISIS OF ECO-TOURISM

Sundarban is still socio-economically a backward area. Here, a mouza of Rangabelia nationally recognized for a well known school and a legendary headmaster Padmashri Tusher Kanjilal is set against a background of extreme rurality with poverty. The lack of basic services is highlighted in the absence of proper health centers, proper electricity etc. Most of the villagers are stagnently engaged in primary activities.

Here we all know that the socio-economic structure is the outcome of the physical setup. The socio-economic structure has been evaluated to find out the living standard of the villagers, educational status, income structure based on agriculture and tourism.

- **House type :**

In a rural area, one is bound to come across kuccha houses. In the study area of Sundarban also kuccha house type is very common. At the same time pucca houses are also comparatively frequent. Few semi-pucca houses are noticed at places. Home-stay for tourists is not popular in the island areas.

- **Sources of drinking water :**

The different sources of drinking water are taps, tube wells and ponds. Out of all these, villagers mostly make use of the tap water. While surveying it was noticed that at places villagers are collecting water from roadside running water. The regular supply of water gets hampered at the time when the area is faced with any kind of calamity like flord or the tropical cyclones. This situation is not acceptable for tourists at any point of consideration.

- **Health condition :**

It is needless to say that villagers usually suffer from various chronise diseases. In most of the

areas villagers complains about fever, cold, flu, stomach ache etc because of crunch of medical support and awareness. The incidences of water borne diseases and skin diseases are no exceptions for visiting tourists also.

- **Modes of entertainment :**

Though the findings revealed the use of radio to top the list but the use of mobiles, television and even telephones are further surprising in many parts of the Sundarban which is not comfortable and acceptable for tourists. In addition to this the striking fact is that the various mobile networks are not running properly even in peripheral areas.

- **Extreme hazards :**

The study area, being the very part of Sundarban is most vulnerable to hazards like flood, cyclone, river bank erosion and salinity. Peoples perception study in hazard intensity revealed that cyclones are the most furious and extreme of all the hazards.

According to the regular tourists, the area mostly faces the fury of flood hazard followed by cyclone. Though, hazards like river bank erosion occupies a comparatively lower proportion but their effect and importance cannot be ignored even in tourists season. after more administrative involvment.

ROLE OF CULTURE AND LIVELIHOOD IN SUNDARBAN ECO-TOURISM

Entire communities in the Sundarban depend directly on the forest and its waterways for their livelihood, from fisheries to honey production on average 500 quintals of honey and 30 quintals of wax are collected each year by local people under the legal permission of Forest department. Almost 85 percent of the people living in Sundarban are dependent on agriculture. Socio-economic status is heavily determined by possession of land. Mangrove and other plants are planted in the triger area to meet the local need of fuel wood for about 1000 villages and to conserve the buffer area.

Tourists, as external visitors are frequently affected by human-animal illegal conflicts; a few tiger and crocodile attacks every year are common. In 2008, six people are known to have been killed by tigers inside the Sundarban Tiger Reserve. Because of issues such as deaths due to human-animal conflict, illegal population influx, over-fishing and deforestation, the state administration imposed justifying restrictions not only on livelihood practices but also the movements of tourists.

Studies have shown that majority of population understand and support the conservation of mangroves and the ecosystem. However, perceived socio-cultural factors such as poverty, lack of political understandings and absence of community level interaction on village economy as well as forest issues are often barriers to the successful implementation of conservation policies. That's why services towards tourists are still not truly professional here.

Presently quality of infrastructure facilities like agro-service centres, fishing harbors, boat building facilities, cold storages, are growing in numbers to meet the requirements of social-developmental activities. This situation has affected the positive communications with tourists for longtime.

RUSH FOR TIGER SIGHTING THROUGH MEDIA HYPE

Tiger sightings in the Sundarban have led to a sudden rush of tourists particular in winter season. The forest, which experiences heavy footfall of tourists between October and January, is witnessing additional load in 2017-18. The simple reason is the multiple sightings of tiger since November, 2017 inside the tiger reserve

area, compared to minimum sightings during the same period in 2016-17. Foresters are generally observe this as an indicator of a good habitat and healthy prey base where tourists are counting their luck.

Tripti Shah, DFO of South 24 Parganas forest division, said in media : "This is a good sign, an indicator of a good habitat. Both foresters and tourists have seen tigers this season. Tourists are informing us about sightings regularly." Tigers is the most valuable part of eco-tourism in Sundarban.[2]

Sundarbans Tiger Reserve is a maze of forested islands ruled by the tidal water that comes from the sea. There are two high tides and two low tides in a day at an interval of six hours each. The tide level and timings change every day. During the low tides the mudflats get exposed and that is when one needs to look around for the tiger. Local tour operators suggest that exploration routes for tiger sightings should be spatio-temporally planned depending on the sighting chances, rather than favourable current of concerned rivers to save fuel in one hand and disturbing biosphere in other. This is the another concern of eco-tourism.

CONCLUSION

The Sundarban is very vulnerable to a variety of anthropogenic activities, including intensive boating and fishing, and various forms of tourism. There are a number of endangered species in the Sundarban, including river dolphins and olive ridlay turtle and most inportantly Royal Bengal Tiger at risk because of anthropogenic environmental threats. Eco-tourism is one of the sustainable way of living addressing all the contemporary environmental threats. Both the local residents and the external visitors need to work cooperatively throughout the year to protect the biodiversity as well as macro-climatic uniqueness of this part of deltaic Bengal.

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LEISHMANIA VECTOR IN PROSPECTIVE

Girish Maheshwari and Anushka Chhonkar

Leishmaniasis is a vector borne disease which is caused by a protozoan *Leishmania* and is transmitted by Nematoceran insect viz. sandfly belonging to family Phlebotomidae. Study and identification of *Phlebotomus*, being the most important and proven vector of *Leishmania* parasite in the Indian sub-continent, have been a major research issue since long. In India, it is endemic mainly in four states namely; Bihar, Jharkhand, Uttar Pradesh and West Bengal. Although a number of cases were also reported from Delhi, Punjab, Gujarat, Sikkim, Assam and Madhya Pradesh occasionally. Some new foci of Leishmaniasis have been developed especially in Himachal Pradesh and Jammu & Kashmir and more than 200 cases of Visceral Leishmaniasis (VL) have been reported annually for last four years. Nowadays molecular tools & techniques along with the

INTRODUCTION

Phlebotomine sandflies are tiny haematophagous insects which morphologically resemble with mosquitoes, yet there are many differences which established them as a separate subfamily, Phlebotominae under family Phlebotomidae. They are widely spread in regions with warm temperate through sub-tropical to tropical zones. They originated about 120 million years ago before the mammals. About 800 species of sand flies have been described till now out of which 464 species are found in the New World and 375 in the Old World[1].

TAXONOMIC IDENTIFICATIONS OF PHLEBOTMINES

Phlebotmine sandflies can be distinguished with the help of few taxonomic characters, viz. the absence of an eye-bridge and the presence of five- segmented palp, biting type of mouth parts which are almost equal in length as that of the head, antennal segments fairly cylindrical and a five branched radial vein i.e. R_1 and four-branched radial sector. Apart from these identifications, when alive, Phlebotomines hold their wings above the body in a characteristic 'V' shape.

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VECTOR SPECIES

Sandflies feed on plant sap, nectar, honey dew, larva and nymphs inhabiting the surface of soil and blood. Feeding is mainly nocturnal and crepuscular. Why only female sandflies serve as vector for parasite transmission? The reason lies behind the fact that male flies feed on plant sap but never on animals while females feed on plant sap as well as blood of human, rodents and other animals for egg development. Females of *Phlebotomus* and *Lutzomyia* species mainly feed on mammals thereby serving as a vector for *Leishmania* transmission.

Besides this Autogeny i.e. ability to produce eggs without a blood meal has also been reported

for some sandfly species. It may help a sandfly population to increase within short span of time.

Fig. 1 : Blood fed female of Sandfly.

Thus bring a rapid onset of the maximum *Leishmania* transmission period.

In general, each species has fairly specific ecological requirements and in some cases these encompass the conditions in and around the dwellings of man or his domestic animals. The majority of peridomestic species are vectors of infections to man. The highly focal nature of various forms of Leishmaniasis might be a consequence of ecological limitations on the vectors.

MOLECULAR TECHNIQUES : IDENTIFICATION TOOL FOR TAXONOMY OF SANDFLIES

Sandfly taxonomy is based on the morphological and anatomical characteristic features, mainly internal structures such as the spermatheca, cibarium and pharynx in females, and terminal genitalia in males; which need dissection and mounting of freshly collected or preserved sandfly specimens. However, species identification is somewhat complicated because it requires a considerable degree of skill and taxonomic expertise. Along with it, morphological identification may be limited by deterioration of samples or by improper mounting techniques. But molecular tools can identify the species from a very small piece of tissue from both the sexes and any developmental stages of the organism and thus would be of importance in understanding the taxonomy of sandflies[2].

Several molecular approaches are being adopted by various researchers for the identification and taxonomic study of sandflies as random amplified polymorphic DNA-PCR (RAPD-PCR), restriction fragment length polymorphism (RFLP), multiplex PCR targeting, semi-nested PCR method; DNA sequencing of PCR- amplified segments for portions of nuclear and mitochondrial DNA and others. Maheshwari & Maheshwari, 2017 has provided COI DNA sequencing of all the species of India[3].

NEW FOCI FOR LEISHMANIASIS IN INDIA

Apart from the endemic states of Leishmaniasis occurrence in India namely: Bihar, Jharkhand, Uttar Pradesh and West Bengal; few sporadic cases were also reported from Delhi, Punjab, Gujarat, Sikkim, Assam and Madhya Pradesh. Some new foci of Leishmaniasis have been developed especially in Himachal Pradesh and Jammu & Kashmir and more than 200 cases of VL have been reported annually for last four years. But no information is available regarding the factors responsible for new foci in the virgin region. Transport and migration of workers from Bihar may be a major factor of dispersion of Leishmaniasis in the new foci of the high altitude.

SCOPE FOR RESEARCHERS

As in recent days, molecular identifications have been adopted by the researchers instead of the conventional tedious taxonomic identification of the vector species but in India, little work has been done on molecular aspect of this fly.

Table 1 : Indian species of *Phlebotomus* with distribution and specific *Leishmania* pathogen.

S. No.	Species of *Phlebotomus*	Location	*Leishmania* spp. isolated from the salivary gland of the fly
1.	***Phlebotomus gigas*** Parrot & Schwetz	Rohru (Himachal Pradesh)	**Not available**
2.	***Phlebotomus papatasi*** Scopoli	Agra (Uttar Pradesh)	***L. donovani*** (Laveran et Mesnil, 1903) Ross, 1903
3.	***Phlebotomus sergenti*** Parrot	Agra (Uttar Pradesh)	***L. donovani***
4.	***Phlebotomus chinensis*** Newstead	Agra (Uttar Pradesh)	**Not available**
5.	***Phlebotomus signatipennis*** Newstead	Randal (Himachal Pradesh)	**Not available**
6.	***Phlebotomus salehi*** Mesghali	Kishtwar (Jammu & Kashmir)	***L. donovani***
7.	***Phlebotomus tubifer*** Lewis & Lane	Rohru (Himachal Pradesh)	***L. donovani***
8.	New species near to ***Phlebotomus alexandri*** Sinton	Seemah (Himachal Pradesh)	**Not available**
9.	***Phlebotomus stantoni*** Newstead	Rampur (Himachal Pradesh)	***L. donovani***
10.	***Phlebotomus* sp. Nov.**	Neerath (Himachal Pradesh)	***L. donovani***
11.	***P. teshi*** Lewis	Una (Himachal Pradesh)	***L. donovani***
12.	***Phlebotomus purii*** Sinton	Kishtwar (Jammu & Kashmir)	**Not available**
13.	***Phlebotomus bergeroti*** Parrot	Kishtwar (Jammu & Kashmir)	**Not available**
14.	***Phlebotomus minuta*** Rondani	Kishtwar (Jammu & Kashmir)	**Not available**
15.	***Phlebotomus duboscqi*** Neveu-Lemaire	Kishtwar (Jammu & Kashmir)	**Not available**
16.	***Phlebotomus montanus*** Sinton	Doda and Karnah (Jammu & Kashmir)	***L. donovani***
17.	***Phlebotomus argentipes*** Annandale & Brunetti	Doda and Karnah (Jammu & Kashmir)	***L. donovani***
18.	***Phlebotomus eleanorae*** Sinton	Doda (Jammu & Kashmir)	***L. donovani***
19.	***Phlebotomus sergenti sergenti*** Parrot	Agra (Uttar Pradesh)	**Not available**

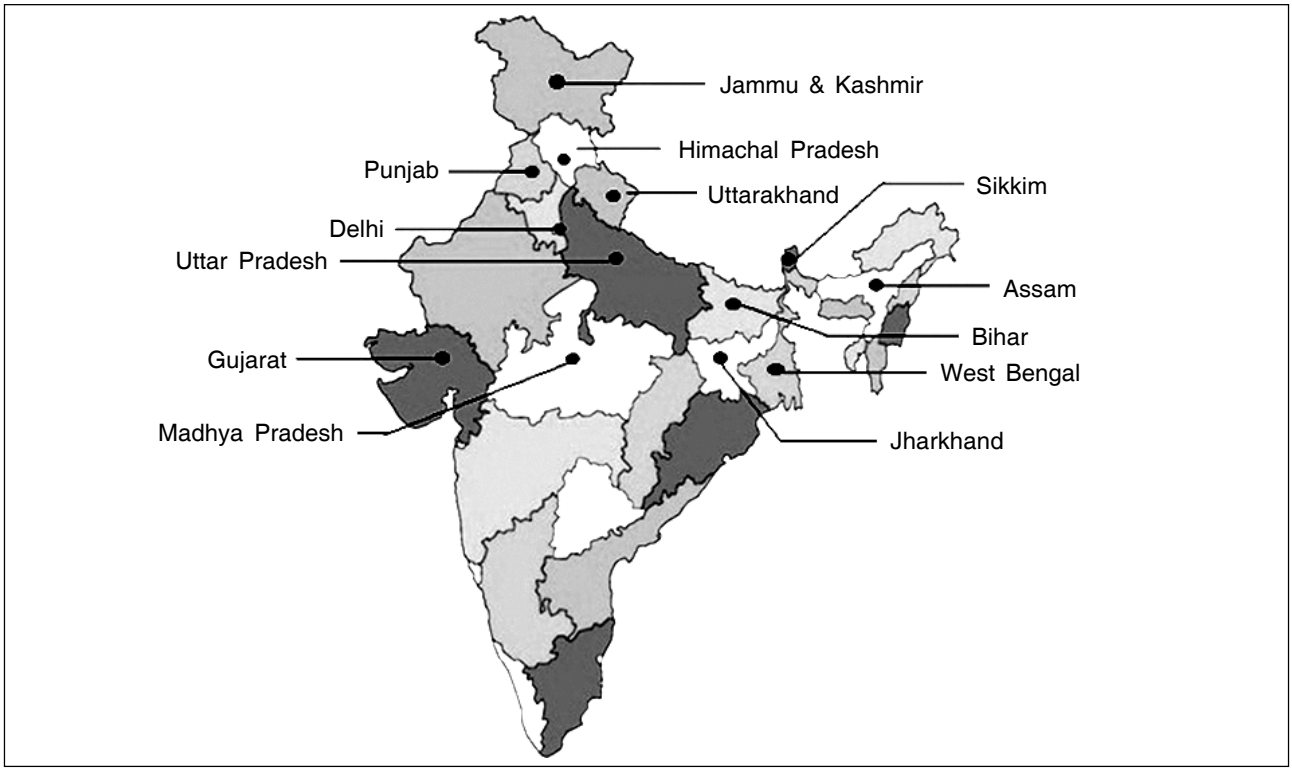

Fig. 2 : Endemic and new foci of Leishmaniasis in India.

Therefore intelligence is required to indulge in its study. It is to emphasize that not all but only approximately 7 % of the total Phlebotmines recorded serves as vector for disease transmission. Hence, vector status of many species is yet to establish. Moreover, attempts are required to explain the causes of formulation of new foci in the new ecological zone of the India.

CONCLUSION

As sandfly is potential proven vector for *Leishmania* parasite, we need to emphasize the study and researches focused on various aspects of this tiny fly. New foci of Leishmaniasis that are being developed in India are needed to be explored and apart from it researches based on molecular aspects must also be encouraged.

ACKNOWLEDGEMENT

Authors are grateful to DBT, New Delhi for major Project and the Principal, St. John's College, Agra for providing the opportunity to conduct advanced research on various aspects of Phlebotomine sandfly.

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REVERSE VACCINOLOGY : THE NEW TREND IN DEVELOPING VACCINES

Ratanti Sarkhel* and Avishek Paul**

The past two decades have seen the application of molecular genetics and its increased insights into immunology, microbiology and genomics applied to vaccinology. Reverse vaccinology is a milestone *in silico* method which employs computational techniques to select the best vaccine candidate eschewing rigorous wet lab techniques. Thus, this method has garnered attention in the modern time with a prime focus on pathogenic biology.

INTRODUCTION

Vaccination is a medical practice of ancient origin that possibly started in Asia. Buddhist monks drank snake venom to confer immunity to snake bite. In China during 17th century smears from small pox lesions were used to transmit a mild infection and thereby protect against more serious disease. The practice was formally introduced into Western medicine in 1796 by Edward Jenner, who used infected materials isolated from cows to immunize against smallpox and introduced the terminology "Vaccine". It was a century later, when it was discovered that microbes are the culprits for the cause of infections. It was Louis Pasteur who proposed the basic rules of vaccinology and started the rational development of vaccines. According to him, the tenet to be followed to produce a vaccine is "Isolate, inactivate and inject the microorganism" that causes the disease. Pasteur's rules were followed for a century by various vaccine developers. Jonas Salk developed a vaccine containing a poliovirus that had been killed by formaldehyde treatment. Albert Sabin used poliovirus that had been attenuated by serial passage *in vitro.* Hilleman developed vaccines against measles, mumps, and rubella by attenuating the viruses causing the diseases. Others, such as Ramon and Glenny, isolated essential components from bacterial or viral cultures, inactivated them, and paved the way for the development of vaccines against diphtheria and tetanus, *Neisseria meningitidis, Streptococcus pneumoniae, Haemophilus influenzae,* and so on. In the case of hepatitis B, it was found that the causative virus could not be cultured *in vitro.* As a result, the vaccine was initially developed by inactivating viral antigen present in the plasma of chronically infected people. The vaccines developed using Pasteur's rules became powerful tools in the history of medicine and, in less than a century, led to the elimination of some of the most devastating infectious diseases globally.

Most of the vaccines that could be developed by these traditional technologies had been developed by the end of the 20th century. Novel technologies were required to battle against the remaining pathogens. Milestones were achieved by introduction of new technologies such as recombinant DNA and chemical conjugation of proteins to polysaccharides, as well as advances in the use of novel adjuvants. In 1995. Craig Venter published the genome of the first free living organism. Thus, a new technology became available by which genomes of microorganisms could be accessed. This technological revolution allowed for the first time the capacity to move

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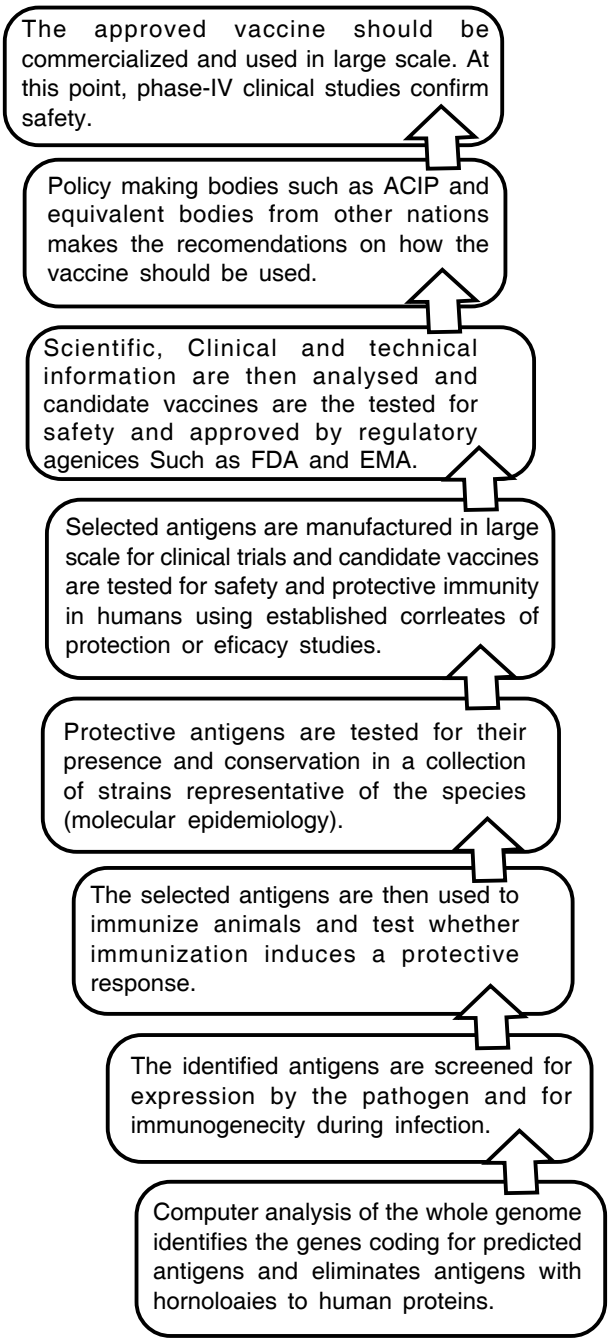
beyond the rules of Pasteur, using the computer to rationally design .vaccines starting with information present in the genome, without the need to grow the specific microorganisms. This new approach was denominated "reverse vaccinology".

The first pathogen addressed by the reverse vaccinology approach was *Meningococcus* B (MenB), a pathogen that causes 50% of the meningococcal meningitis worldwide. This bacterium had been refractory to vaccine development because its capsular polysaccharide is identical to a human self-antigen, whereas the bacterial surface proteins are extremely variable. The basic idea behind reverse vaccinolcgy is that an entire pathogenic genome can be screened for identifying suitable accine candidate by using bioinformatics approaches. Some of the traits that the genes are monitored for that may indicate antigenicity include genes that code for proteins with extracellular localization, signal peptides, and B-cell epitopes. Next, those genes are filtered for desirable attributes that would make good vaccine targets such as outer membrane proteins. Once the candidates are identified, they are produced synthetically and are screened in animal models of the infection. This allows the development of vaccines that were previously difficult or impossible to make and can lead to the discovery of unique antigens that may improve existing vaccines. The steps involved in development of vaccine using reverse vaccinolcgy can be elucidated as follows :



CONCLUSION

Unlike conventional methods, unraveling antigens and pathogens have become easier by employing the technique of reverse vaccinology. The only requirement for this technique is the availability of whole genome sequence of the organism from which the anti genic sites can be predicted computationally. Thus, Reverse vaccinology can lead to swift identification of potential vaccine candidates even for highly pathogenic microbes.

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The Indian Science Congress Association

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KNOW THY INSTITUTIONS

NATIONAL INSTITUTE OF HIGH SECURITY ANIMAL DISEASES, BHOPAL

The National Institute of High Security Animal Diseases (NIHSAD) of Indian Council of Agricultural Research is a premier institute of India for research on exotic and emerging pathogens of animals. NIHSAD came into existence on 8th Aug., 2014 as an independent institute under ICAR from its original status as High Security Animal Disease Laboratory (HSADL), a regional station of Indian Veterinary Research Institute (IVRI), Izatnagar. The institute has contributed significantly by detecting many animal diseases of exotic origin and preventing them from entering our country. The bio-containment laboratory of HSADL has been operational continuously since year 1998 for handling exotic/emerging animal diseases, providing rapid diagnosis and conducting basic and applied research on emerging animal pathogens. Realizing the challenging need of stringent biological safety measures in the era of globalized animal trade and the growing threat of novel pathogens, the HSADL, as part of IVRI, was upgraded as an independent national level institute for extending better services to the nation in animal health through its mandated programmes and objectives.

The institute has a BSL-3+ biocontainment facility having a laboratory wing and an animal wing. Both the wings have separate entries through shower system. The exit system with compulsory shower out has airtight doors operated with PLC control. The primary containment barrier is provided in the laboratory rooms where high risk organisms are to be handled for research purposes. The primary

barriers available in laboratory are biological safety cabinets (Class II B1 and Class II B2), isolators (Class III BSC), personal suits, respirators, laboratory coats, gloves, head, eye and face coverings. The secondary barrier is the infrastructural facilities, which play a key role in preventing the escape of organisms to the environment. These mainly include civil work, effluent treatment plant, air handling system, rendering plant, incinerator etc. The air-handling system of the facility is comprised of 23 air-handling units (AHUs) with 97 HEPA filters fitted in 92 filter housings. The entire laboratory including the animal wing functions under gradient negative pressure (-50 pascals to –200 pascals) to prevent the possibility of escape of pathogens to the exterior. All solid and liquid waste is decontaminated by heat sterilization, gaseous sterilization or liquid disinfectant. The materials are removed to outside through airlocks, dunk tanks and barrier autoclaves.

The laboratory wing has separate rooms for disease diagnosis, immunology, pathology, biochemistry and molecular biology, recombinant DNA work, radioisotope handling, media preparation, cell culture, RNA extraction and infection room. Additional facilities include cold rooms, incubator room, glassware washing and preparation room, storage facilities, first aid room, dirty dispatch areas and air locks. The animal wing has facilities for housing large and small livestock, and laboratory animals. The animal rooms have separate air handling systems, which prevent cross contamination among rooms and escape of pathogens to surrounding areas and the environment. For remote handling of experimental animals inoculated with hazardous pathogens, three isolators (class III BSCs) have been provided. In between the two rows of animal rooms, provision exists for post mortem facility with cold storage. The post mortem room is connected to the clean area by an alkali wash room. All solid and liquid waste is decontaminated by heat sterilization, gaseous sterilization, or liquid disinfectant. The materials are removed through airlocks, dunk tanks and barrier autoclaves. The animal carcasses from animal wing are processed through a rendering plant to ensure sterilization for safe discard.

Outside the main laboratory, animal facilities are also available for quarantine of incoming animals (animal receiving shed) and their breeding and maintenance (animal holding shed) for regular supply of experimental animals. Supporting facilities for functioning of the laboratory/ animal wing are steam raising plant (boilers) for sterilization, de-mineralization plant, soft water plant, air conditioning plant, air compressors, a 33 kv electrical substation along with DG sets, storage tanks for diesel and furnace oil and engineering workshop etc. For safe handling of pathogens in the laboratory biosafety guidelines are available.

The Mandate

- Basic and strategic research on exotic, emerging and re-emerging animal diseases.
- Biorisk management and capacity building in the areas of biosafety, biosecurity and bio-containment for handling high risk pathogens.

The objectives

The major objectives of the institute include :

- To carry out basic & applied research on exotic, emerging and re-emerging diseases of animals.

- To develop competency for diagnosis & control of exotic/emerging diseases of animals.
- To create & update repository and data-bank on exotic/emerging pathogens
- To develop skills in biorisk management & train manpower in the areas of biosafety, biosecurity and biocontainment.

Research Milestones

- Prevented entry of diseases like RHD in 2001, Avian Influenza H7N7 in smuggled pigeons in 2001 and MCF and BVDV (Exotic strain) in cattle imported from Australia that were detected and checked at point of entry in the country in year 2003.

❑ In 2006, when bird flu (Highly Pathogenic Avian Influenza entered in India) caused unprecedented mortality in poultry in Maharashtra and then started spreading in Gujarat and Madhya Pradesh, one cannot imagine what would have happened if the disease was not controlled quickly. The catastrophe could be averted only after the quick diagnosis by NIHSAD (formerly HSADL).

❑ During the last 15 years of functioning NIHSAD has confirmed the existence of Avian influenza, Swine Influenza, Bovine immunodeficiency virus, Bovine virus diarrhea, Border disease, Malignant catarrhal fever, Porcine Circovirus, Porcine Parvovirus, Porcine Reproductive and Respiratory Syndrome (PRRS) and Crimean Congo Hemorrhagic Fever.

❑ Phylogenetic analysis revealed that the viruses isolated from poultry in India belonged to two major genetic clades; clade 2.2 (isolated during 2006 to 2010) and clade 2.3.2.1 (isolated during 2011-13). Within clade 2.2, the H5N1 viruses formed four distinct groups; 2006 and 2007 isolates formed two independent groups. The 2006 Indian isolates shared grouping with 2006 swan isolates from Iran and Italy. The 2007 isolates of Manipur grouped closely with a guinea fowl isolate from China. During 2008-2010, two independent introductions of the H5N1 virus have been detected; one from Bangladesh probably through land-based poultry and another thorough migratory bird. The viruses isolated during 2011- 2013 from India belonged to clade 2.3.2.1, and grouped closely with isolates from Bangladesh and Bhutan. All the viruses were highly pathogenic to poultry; However, species specific variation within H5N1 viruses of both the clades have been found in mice and ducks.

❑ The H5N1 HPAI virus was isolated from other species including ducks [West Bengal and Assam (2008), Tripura (2008 and 2011), Odisha (2012)], Crows [Jharkhand (2011), Bihar (2012), Maharashtra (2012), Odisha (2012, 2014); Assam (2008)], Goose [Tripura (2008)] and Turkeys [Karnataka (2012)].

❑ Monoclonal antibodies against NS1and NP protein of avian influenza has been developed and characterized that are most useful for diagnostic purpose.

❑ Designing and validation of siRNAs (small interfering RNAs) against PB2, PB1, PA, NP and M2 gene inhibiting H5N1 virus (This research is helpful for deciding antiviral therapy).

❑ The study on "Environmental persistence of AI virus" gave an insight into the various factors involved in the persistence of avian influenza virus in feces, water and environment, on the basis of which recommendations have been framed regarding the temperature conditions for storage and dispatch of avian influenza samples and control of avian influenza infection in the poultry farms and laboratories.

❑ During 2003, H9N2 strains of Avian Influenza (low pathogenic-LPAI) were diagnosed in poultry from outbreaks in northern India. Since then, several H9N2 isolations have proved that this LPAIV is widespread in India. Low pathogenic H9N2 virus was demonstrated in the brain of chicken naturally infected with the virus for the first time.

❑ Surveillance of H1N1 influenza virus (swine flu) has indicated its presence in pig population in India. Two viruses (H1N1) have been isolated and characterized.

❑ Presently, the development of a DIVA-marker (Differentiating Infected from Vaccinated Animals) vaccine against Highly Pathogenic Avian Influenza (Lab-generated H5N2) ready for validation) is in progress under the National Fellow project at NIHSAD.

❑ During 2006 outbreak, as an emergency measure, AIV vaccine was developed and tested. However, Govt of India later decided not to adopt vaccination policy in the country.

❑ Developed Mab based ELISA for diagnosis of BVDV and BIV, and recombinant nucleocapsid protein based indirect ELISA diagnosis of PRRS.

❑ BVDV-1b was isolated from cattle for the first time in India. Phylogenetic analysis established prevalence of BVDV 1b & 1c subtype in Indian buffalo and close relationship between cattle and buffalo BVDV-1b viruses.

❑ Genetic and antigenic characterization demonstrated the first occurrence of BVDV-2 subtype b in sheep providing the evidence that this subtype can also occur in species other than cattle.

❑ For the first time in the world BVDV-1 was identified in yaks of Himalayan region.

❑ Recent surveillance of samples from Jammu area confirmed Border disease infection in small ruminants, first time reported from India.

❑ A TaqMan based one-step real time RT-PCR was developed and validated for simultaneous detection and genetic typing of BVDV-1, BVDV-2 and BDV in clinical samples.

❑ Detection of CpHV in ruminant population of India for the first time.

❑ BVDV-3 (HoBi-like) was identified in Indian cattle for the first time and the phylogenetic analysis revealed circulation of two novel and highly divergent lineages of BVDV-3 viruses in India.

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- Electrical Machines and Instrumentation
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- Signal, Image and Video Processing
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- Precision farming
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- Agroforestry systems and models
- Organic farming practices
- Energy systems in agricultural production
- Biodiversity
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- Soil health management
- Integrated pest management
- Innovative tools in technology transfer
- Sustainability and rural development aspects of food production
- Policy issues in climate change, its impact on agriculture and mitigation measures

Contact :

Thara Gabriel, 1 868 662 3719, Sally-Ann Henry, 662-2002 ext. 82113

World Congress on Cardiac Sciences-2018, 28-29 November 2018, Bengaluru.

Topics :

- Clinical & Interventional Cardiology
- Paediatric Cardiology
- Cardio-Oncology
- Nuclear Cardiology
- Cardiac Imaging
- Cardio-Nephrology
- Cardiovascular Disease
- Cardiovascular Nursing
- Cardiovascular Surgeries
- Cardiovascular MRI
- Cardiac Regeneration & Cardiomyopathies
- Current And Future Trends In CVD
- Cardiac Pharmacology
- Diabetes, Heart and Stroke
- Heart Failure
- Hypertension
- Vascular Biology
- Current Research in Cardiology
- Heart Regeneration
- Molecular Cardiology
- Cardiac Devices
- Cardiology - Future Medicine
- Case Reports on Cardiology

Contact :

World Congress On Cardiac Sciences-2018, Biogenesis Health Cluster, H.No. 362, 2nd Floor, 11th Cross, 4th Main, 2nd Block, Behind B.D.A. Shopping Complex, R.T. Nagar, Bengaluru-560 032, **T:** +91 80 2333 0019, **F:** 080 2333 0058

Third edition of International Conference on Soft Materials (ICSM 2018), 9-14 December 2018, Jaipur.

Topics :

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Bio-inspired materials
Colloids and interface
Dynamics of complex fluids
Drug design and delivery
Elastomers
Functional and nanomaterials
Gels and hydrogels
Hydrogen: Generation /Separation /Sensing and Storage
Liquid crystals
Materials for energy applications (photovoltaics, semiconductors, fuel cells, and energy storage)
Membranes
Nano and microfluidics
Nanocomposites and hybrid materials
Polymers
Self-Assembly
Self-propelled particles
Soft magnetic materials
Soft nanofabrication
Surfactants & lipids

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ICSM-2018, Department of Physics, Malaviya National Institute of Technology Jaipur-302017,
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International Conference on Smart Computer Applications and Innovations (ICSCAI 2018), 21-22 December, 2018, Aurangabad

Topics :

Image Processing and GIS

- Signal Processing
- Image Processing
- GIS in Renewable Energy Sources
- Remote Sensing in Urban Environment
- GIS in Mapping
- GIS and RS in Climate Change
- Spatial Analysis With GIS
- Disaster Assessment and Management

Intelligent Information Systems

- Artificial Intelligence
- IoT
- Neural Networks and Fuzzy Logic
- Expert and Multi-Agent Systems
- Ambient and Emotional Intelligence
- Data Mining
- Natural Language Processing
- Query Analysis and Processing
- Personalized Recommendations
- Robotics

Next Generation Networks and Security

- Cyber Security
- Protocols
- Cryptography
- Security Impact on Performance
- Electronic Data Interchange
- Biometrics

Data Science

- Cloud Computing
- Big Data Analytics
- Applications of Big Data Analytics
- Parallel and Distributed Systems
- Big Data and Database Security
- Cyber Threat Intelligence in Big Data

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S&T ACROSS THE WORLD

A EUROPEAN ORIGIN FOR LEPROSY?

New research by an international team including scientists from the Max Planck Institute for the Science of Human History, the University of Tübingen, EPFL Lausanne and the University of Zurich has revealed that there was much more diversity in the leprosy strains circulating in Medieval Europe than previously thought. This finding, based on the sequencing of 10 new ancient genomes from the leprosy-causing bacterium Mycobacterium leprae, complicates prior assumptions about the origin and spread of the disease, and also includes the oldest *M. leprae* genome sequenced to date, from about 400 AD in the United Kingdom.

Leprosy is one of the oldest recorded and most stigmatized diseases in human history. The disease was prevalent in Europe until the 16th century and is still endemic in many countries, with over 200,000 new cases reported annually. The bacterium Mycobacterium leprae is the main cause of leprosy. Previous research on the bacterium suggested that it clusters into several strains, only two of which were present in Medieval Europe. The present study, published in the journal PLOS Pathogens, 2018; 14 (5) :, aimed to further investigate the history and origin of *M. leprae* by looking for genetic evidence from a large number of ancient samples from throughout Europe.

10 new ancient genomes of *M. leprae* dating from approximately 400-1400 AD

The current study examined approximately 90 individuals with skeletal deformations that were characteristic of leprosy, from across Europe and from time periods ranging from approximately 400 AD to 1400 AD. From these samples, 10 new medieval *M. leprae* genomes were fully reconstructed. These genomes represent all known strains, including strains that are today associated with different locations around the globe, including Asia, Africa and the Americas. Additionally, in this study multiple strains were often found in the same cemetery, illustrating the diversity of the leprosy strains circulating throughout the continent at the time.

"We found much more genetic diversity in ancient Europe than expected," explains Johannes Krause, senior author of the study and a director at the Max Planck Institute for the Science of Human History. "Additionally, we found that all known strains of leprosy are present in Medieval Europe, suggesting that leprosy may already have been widespread throughout Asia and Europe in antiquity or that it might have originated western Eurasia."

OLDEST LEPROSY GENOME TO DATE

One *M. leprae* genome reconstructed by the team was from Great Chesterford, England, and dates to between 415-545 AD. This is the oldest *M. leprae* genome sequenced to date and comes from one of the oldest known cases of leprosy in the United Kingdom. Interestingly, this strain is the same found in modern-day red squirrels and supports the hypothesis that squirrels and the squirrel fur trade were a factor in the spread of leprosy among humans in Europe during the medieval period.

"The dynamics of *M. leprae* transmission throughout human history are not fully resolved. Characterization and geographic association of the most ancestral strains are crucial for deciphering leprosy's exact origin" states lead author Verena Schuenemann of the University of Zurich. "While we have some written records of leprosy cases that predate the Common Era,

none of these have yet been confirmed on a molecular level."

The abundance of ancient genomes in the current study has resulted in a new and older estimate for the age of *M. leprae* than previous studies, placing its age at least a few thousand years old. "Having more ancient genomes in a dating analysis will result in more accurate estimates," explains Krause. "The next step is to search for even older osteological cases of leprosy than currently available, using well-established methods for identification of potential cases."

Source : Max Planck Institute for the Science of Human History. https://www.sciencedaily.com/ 2018

CLIMATE CHANGE THREATENS MARINE PROTECTED AREAS

New research from the University of North Carolina at Chapel Hill and collaborators found that most marine life in Marine Protected Areas will not be able to tolerate warming ocean temperatures caused by greenhouse gas emissions. Marine Protected Areas have been established as a haven to protect threatened marine life, like polar bears, penguins and coral reefs, from the effects of fishing and other activities like mineral and oil extraction. The study found that with continued "business-as-usual" emissions, the protections currently in place won't matter, because by 2100, warming and reduced oxygen concentration will make Marine Protected Areas uninhabitable by most species currently residing in those areas.

The study, which will be published on May 7 in Nature Climate Change, predicts that under the Intergovernmental Panel on Climate Change's Representative Concentration Pathway 8.5 emissions scenario, better known as the "business as usual scenario," Marine Protected Areas will warm by 2.8 degrees Celsius (or 5 degrees Fahrenheit) by 2100.

The study concludes that such rapid and extreme warming would devastate the species and ecosystems currently located in Marine Protected Areas. This could lead to extinctions of some of the world's most unique animals, loss of biodiversity, and changes in ocean food-webs. It could also have considerable negative impacts on the productivity of fisheries and on tourism revenue. Many of these marine species exist as small populations with low genetic diversity that are vulnerable to environmental change and unlikely to adapt to ocean warming.

The study also estimated the year in which Marine Protected Areas in different ecoregions would cross critical thresholds beyond which most species wouldn't be able to tolerate the change. For many areas in the tropics, this will happen as soon as the mid-21st century.

"With warming of this magnitude, we expect to lose many, if not most, animal species from Marine Protected Areas by the turn of the century," said John Bruno, lead author, marine ecologist, and biology professor in the College of Arts and Sciences at UNC-Chapel Hill. "To avoid the worst outcomes, we need to immediately adopt an emission reduction scenario in which emissions peak within the next two decades and then decrease very significantly, replacing fossil fuels with cleaner energy sources like solar and wind."

Key takeaways include :

- There are 8,236 Marine Protected Areas around the world, although they only cover about 4 percent of the surface of the ocean.
- The projected warming of 2.8 degrees Celsius (or 5 degrees Fahrenheit) by 2100

would fundamentally disrupt the ecosystems currently located in Marine Protected Areas.

- Mean sea-surface temperatures within Marine Protected Areas are projected to increase 0.034 degrees Celsius (or 0.061 degrees Fahrenheit) per year.
- Marine Protected Areas in the Arctic and Antarctic are projected to warm especially quickly, threatening numerous marine mammals like polar bears and penguins.
- The Marine Protected Areas at the greatest risk include those in the Arctic and Antarctic, in the northwest Atlantic, and the newly designated no-take reserves off the northern Galápagos islands Darwin and Wolf.

"There has been a lot of talk about establishing marine reserves to buy time while we figure out how to confront climate change," said Rich Aronson, ocean scientist at Florida Institute of Technology and a researcher on the study. "We're out of time, and the fact is we already know what to do : We have to control greenhouse gas emissions."

Source : University of North Carolina at Chapel Hill, https://www.sciencedaily.com/releases/2018

GENE KNOCKOUT USING NEW CRISPR TOOL MAKES MOSQUITOES HIGHLY RESISTANT TO MALARIA PARASITE

Deleting a single gene from mosquitoes can make them highly resistant to the malaria parasite and thus much less likely to transmit the parasite to humans, according to a new paper from scientists at Johns Hopkins Bloomberg School of Public Health's Malaria Research Institute.

The scientists used the new CRISPR/Cas9 system, which permits precise DNA editing, to delete a gene called FREP1 from the genome of Anopheles gambiae mosquitoes, the chief transmitters of malaria to humans. Within the modified mosquitoes, malaria parasites were much less likely to survive and multiply. The CRISPR/Cas9 system used in this study was developed by Eric Marois, research scientist at the University of Strasbourg,

The study, published March 8 in PLoS Pathogens, is the first to show that deleting a gene from mosquitoes can make them resistant to malaria parasites. It also underscores the potential of this strategy to modify wild mosquito populations and thereby reduce malaria transmission to humans.

The CRISPR/Cas9 system is a set of DNA-editing molecules implicated in bacterial defense mechanism against viruses. In recent years, biologists have adapted it as a precise tool for genetic engineering—in scientific experiments, and in prospective genetic-modification strategies against diseases such as malaria.

"Our study shows that we can use this new CRISPR/Cas9 gene-editing technology to render mosquitoes malaria-resistant by removing a so-called host factor gene," says study senior author George Dimopoulos, PhD, professor in the Bloomberg School's Department of Molecular Microbiology and Immunology. "This gives us a good technological platform for developing advanced malaria-control strategies, based on genetically modified mosquitoes unable to transmit the disease, and for studying the biology of malaria parasites in their mosquito hosts."

The World Health Organization estimates there were more than 200 million cases of the disease in 2016 and more than 400,000 deaths, the majority occurring among children under age five in sub-Saharan Africa. A malaria

vaccine is available, but its protection is only partial and temporary, and like antimalarial medicines, the vaccine has a limited supply. Researchers are turning to potentially cost-effective strategies that target malaria-carrying mosquitoes to prevent the spread of malaria in the first place.

For the research, conducted in the insectary at the Johns Hopkins Malaria Research Institute in Baltimore, Dimopoulos and colleagues modified Anopheles gambiae mosquitoes by deleting the gene FREP1, which encodes an immune protein, fibrinogen-related protein 1. For reasons that aren't fully clear, the protein helps malaria parasites survive within the mosquito gut and progress to the developmental stages needed for their transmission to people. FREP1 is thus considered a malarial "host factor."

The elimination of this host factor via the deletion of the FREP1 gene had other effects besides reducing the number of mosquitoes infected with malaria. After the FREP1 deletion, most of the modified mosquitoes had no evidence in their salivary glands of the sporozoite-stage parasites that enter the human bloodstream through a mosquito bite.

"The resistance to malaria parasites that's achieved by deleting FREP1 is remarkably potent," Dimopoulos says. "If you could successfully replace ordinary, wild-type mosquitoes with these modified mosquitoes, it's likely that there would be a significant impact on malaria transmission.

Replacing ordinary mosquitoes in the wild with genetically modified mosquitoes hasn't yet been attempted, though scientists have been working on "gene drive" techniques that cause DNA modifications to spread quickly into a wild population via ordinary breeding. Gene drives use CRISPR/Cas9's DNA-editing ability to essentially hack the conception process, pushing a gene modification into all or nearly all the offspring of a modified animal. In 2016, for example, researchers reported that they had created a CRISPR/Cas9 gene drive that forces a fertility-reducing gene modification into female Anopheles gambiae mosquitoes—which could quickly reduce local Anopheles populations if unleashed in the wild.

In principle, the deletion or inactivation of FREP1 also could be incorporated in a gene drive system. Because it doesn't aim at reducing mosquitoes' health or ability to reproduce — reducing "fitness" in the Darwinian sense — a FREP1 inactivation would create less of an opportunity for mosquito mutations that resist its effects.

Dimopoulos and his research team found that deleting FREP1 entirely from Anopheles did however come with some fitness costs to the modified mosquitoes. Compared to their wild-type cousins, the FREP1-less mosquitoes developed into adults more slowly, were less likely to take blood meals when given the opportunity and laid fewer and less viable eggs.

"We're now making mosquitoes in which FREP1 will be inactivated only in the adult gut," Dimopoulos says. "We predict that when we do that, the mosquito won't suffer the same fitness costs."

In addition, he and his team are using their CRISPR/Cas9 DNA-editing platform to study the effects of deleting other potential malaria host-factor genes and to learn more about the roles of these host factors in mosquitoes. "We're focused not just on developing a malaria control strategy, but also learning more about the biology of malaria-carrying mosquitoes," Dimopoulos says.

Source : Johns Hopkins University Bloomberg School of Public Health. https://www.sciencedaily.com/releases/2018

FORM IV

Rule 8

1.	Place of Publication	The Indian Science Congress Association 14, Dr. Biresh Guha Street Kolkata 700 017 West Bengal
2.	Periodicity of Publication	Bi-monthly (Published every two months)
3.	Printer's Name Nationality Address	Dr. Ashok Kumar Saxena Indian The Indian Science Congress Association 14, Dr. Biresh Guha Street Kolkata 700 017 West Bengal
4.	Publisher's Name Nationality Address	Dr. Ashok Kumar Saxena Indian The Indian Science Congress Association 14, Dr. Biresh Guha Street Kolkata 700 017 West Bengal
5.	Editor-in-Chief's Name Nationality Address	Dr. Ashok Kumar Saxena Indian 7/182, Swarup Nagar Kanpur 208 002 Uttar Pradesh
6.	Name and Address of individuals who own the newspaper and partners of shareholders holding more than one percent of the total	The Indian Science Congress Association 14, Dr. Biresh Guha Street Kolkata 700 017 West Bengal

I, Ashok Kumar Saxena, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Date : 26/04/2018

Ashok kumar Saxena

(Ashok Kumar Saxena)
Publisher
Everyman's Science

भारतीय विज्ञान कांग्रेस संस्था

14, डॉ० बिरेश गुहा स्ट्रीट, कोलकाता–700 017, भारत

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वेबसाइट / Website : http://sciencecongress.nic.in ई–मेल / E-mail : iscacal@vsnl.net
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   सदस्यगण अपना पेपर कांग्रेस सत्र के समय पेश कर सकते हैं। उन्हें वार्षिक विज्ञान कांग्रेस सत्र की कार्यविवरण की एक प्रति बिना मूल्य में प्राप्त हो सकती है। इसके साथ वे संस्था के रोज़नामचा ''एवरीमैन्स साइंस'' की प्रति भी बिना मूल्य उस साल के लिए प्राप्त कर सकते हैं। सदस्यता के नवीकरण के लिए कृपया ISCA वेबसाइट से फार्म डाउनलोड करें।

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को वार्षिक विज्ञान कांग्रेस सत्र की कार्यविवरण की एक पूर्ण प्रति बिना मूल्य में प्राप्त हो सकती है। इससे साथ वे संस्था के रोज़नामचा ''एवरीमैन्स साइंस'' की प्रति भी बिना मूल्य प्राप्त कर सकते हैं।

5. **Institutional Member :** An Institution paying a subscription of ₹ 5,000/- (for foreign** U.S. $ 2,500) only, can become an Institutional Member of the Association for that financial year. It shall be eligible to nominate one person as its representative to attend Annual Session of the Science Congress. An Institutional Member shall be eligible to receive, free of cost, a copy of the complete set of Proceedings of the Annual Science Congress Session as also a copy each of the Associations journal Everymans Science.

6. **दाता :** कोई भी व्यक्ति जो एकसाथ ₹ 10,000/- (विदेशियों के लिए U.S. $ 5,000) मात्र दें, वह संस्था के दाता बन सकते हैं। एक व्यक्तिगत दाता को वह सारे अधिकार और विशेषाधिकार मिलेंगे जो एक सदस्य को उसके पूर्ण जीवन काल में प्राप्त होते हैं।

एक संस्थान जो एकसाथ ₹ 50,000/- (विदेशियों के लिए U.S. $ 25,000) मात्र दें, सदा के लिए इस संस्था के संस्थान दाता बन सकते है, जिसे वह एक व्यक्ति को नामांकित करके उसे अपने संस्थान के प्रतिनिधि के रूप में विज्ञान कांग्रेस के वार्षिक सत्र में भेज सकते हैं। एक संस्थान/व्यक्तिगत दाता वार्षिक विज्ञान कांग्रेस के कार्यविवरण और संस्था के रोज़नामचा ''एवरीमैन्स साइंस'' की प्रति भी विना मूल्य प्राप्त कर सकते हैं।

6. **Donor :** Any person paying a lump sum of ₹ 10,000/- (for foreign** U.S. $ 5,000) only, can become an Individual Donar of the Association, an ***INDIVIDUAL DONOR*** shall have all the rights and privileges of a member during his/her lifetime.

An Institution paying a lump of ₹ 50,000/- (for foreign** U.S. $ 25,000) only, can become an ***INSTITUTIONAL DONOR*** of the Association forever, which shall have the right to nominate one person as its representative to attend Annual Session of the Science Congress. An Institutional/Individual Donor shall be eligible to receive, free of cost, a copy of the complete set of Proceedings of the Annual Science Congress Session as also the Associations journal Everymans Science.

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* भर्ती शुल्क ₹ 50/- सिर्फ एक नये वार्षिक सदस्य के लिए ज़रुरी है। यह सत्र सदस्य/आजीवन सदस्य/संस्थान सदस्य/छात्र सदस्य/दाता के लिए ज़रुरी नहीं है।

* *Admission fee of ₹ 50/- is needed only for becoming a new Annual Member and not for Sessional Member/Life Member/Institutional Member/Student Member/Donor.*

** (एक विदेशी सदस्य का अर्थ हैं, जो भारतवर्ष के बाहर का नागरिक हों।)

** *(A Foreign Member means one who is normally Resident outside India).*

(अ) **पेपर पेश करना :** एक पूर्ण पेपर की प्रति उसके साथ तीन सारांश की प्रति जो 100 शब्दों से ज्यादा न हों और ज़िसमें कोई आरेख या फार्मूला न हों, वह प्रत्येक वर्ष 15 सितम्बर के अंदर अनुभागीय अध्यक्ष तक पहुँच जाना चाहिए।

(A) **Presentation of Papers :** A copy of complete paper accompanied by an abstract in triplicate not exceeding one hundred words and not containing any diagram or formula, must reach the Sectional President latest by September 15, each year.

(ब) सभी वर्गों के सदस्य जो विज्ञान कांग्रेस सत्र में भाग लेने के पश्चात लौटते समय के टिकट में रियायत प्राप्त कर सकता है, बशर्ते कि उनकी यात्रा के खर्च का थोड़ा भी भाग सरकार (केन्द्रीय या राज्य), कोई कानूनी

सत्ता या कोई विश्वविद्यालय या कोई नगरपालिका न उठाएँ और उनकी कुल कमाई या परिलब्धियां ₹ 5,000/- (प्रति माह पाँच हजार रुपए) से अधिक नहीं हैं। कृपया ISCA वेबसाइट से रेलवे रियायत फार्म डाउनलोड करें।

(B) Members of all categories are entitled to **Railway Concession** of return ticket by the same route with such conditions as may be laid down by the Railway Board for travel to attend the Science Congress Session provided that their travelling expenses are not borne, even partly, by the Government (Central or State), Statutory Authority or an University or a City Corporation and their total earning of or emoluments drawn do not exceed ₹ 5,000/- (Rupees Five Thousand per month). Please download the Railway Concession form from ISCA Website.

(स) संस्था के पुस्तकालय में सभी वर्गों के सदस्य को पढ़ने की सुविधा सुबह 10.00 बजे से शाम को 5.30 बजे तक सभी काम के दिनों में (शनिवार और रविवार) को छोड़कर प्राप्त होगी।

(C) Members of all categories are entitled to reading facilities between 10.00 a.m. to 5.30 p.m. on all weekdays (except Saturdays & Sundays) in the library of the Association.

(ड) समय समय पर संस्था द्वारा तय की गई मूल्य दरों पर विश्रामगृह, सभागार आदि सुविधाओं की प्राप्ति भी सभी वर्गों के सदस्य कर सकते हैं।

(D) Members of all categories may avail Guest House facilities, Lecture Hall hiring at the rates fixed by the Association from time to time.

(ई) भविष्य में भारतीय विज्ञान कांग्रेस संस्था द्वारा आयोजित परिसंवाद, सम्मेलन और वार्षिक कांग्रेस में सभीवर्गों के सदस्यों द्वारा भाग लेने के लिए अपनी—अपनी सदस्यता पत्र को लाना ज़रुरी होगा।

(E) Members of all categories should bring the Membership Card always for attending any Seminar, Conference and Annual Congress organized by ISCA in future.

ध्यान दें : (1) सभी बैंक ड्राफ्ट The Indian Science Congress Association के नाम से ही लिखा जाएँ, सदस्यता के विषय में बैंक ड्राफ्ट की प्राप्ति और जो कोलकाता के किसी भी शाखा में देय हों। सदस्यों से यह निवेदन किया जा रहा है, कि वे अपनी सदस्यता संख्या का उल्लेख भारतीय विज्ञान कांग्रेस संस्था के कार्यालय के साथ पत्राचार के वक्त अवश्य करें।

(2) भारतीय विज्ञान कांग्रेस संस्था द्वारा मनीऑर्डर, आई. पी. ओ., ई. सी. एस. या चेक से भुगतान ग्रहण नहीं किया जाएगा। कोई भी सदस्यता निर्धारित सदस्यता फार्म (आवेदन-पत्र नई सदस्यता/सदस्यता की नवीकरण के लिए) में विधिवत बिना भरने से नहीं लिया जाएगा।

(3) नकदी केवल ISCA मुख्यालय में हाथ से लिया जाएगा। कृपया डाक द्वारा लिफाफे के भीतर नकदी नहीं भेजें।

Note : (1) All Bank Drafts should be drawn in favour of *The Indian Science Congress Association,* membership subject to realisation of the bank draft, Payable at any branch in Kolkata. Members are requested to mention their Membership No. while making any correspondence to ISCA office.

(2) No money order, I.P.O., ECS or cheque will be accepted by ISCA. No Membership will be taken without duly filled in prescribed Membership Form (Application From for New Membership/Application for Renewal of Membership).

(3) Cash will only be taken by hand at ISCA Hqrs. Pl. do not send the Cash by Post within the envelop.

भारतीय विज्ञान कांग्रेस संस्था

14, डॉ० बिरेश गुहा स्ट्रीट, कोलकाता–700 017, भारत

THE INDIAN SCIENCE CONGRESS ASSOCIATION

14, Dr. Biresh Guha Street, Kolkata-700 017, INDIA

दूरभाष / Telephone : (033) 2287-4530, 2281-5323 फैक्स / Fax : 91-33-2287-2551
वेबसाइट / Website : http://sciencecongress.nic.in ई-मेल / E-mail : iscacal@vsnl.net
es.sciencecongress@nic.in

सदस्यता के लिए नया आवेदन पत्र/Application Form For New Membership

सेवा में/To

महासचिव (सदस्यता कार्य)/The General Secretary (Membership Affairs)
भारतीय विज्ञान कांग्रेस संस्था/The Indian Science Congress Association
14, डॉ० बिरेश गुहा स्ट्रीट/14, Dr. Biresh Guha Street,
कोलकाता–700 017/Kolkata-700 017

स्टैम्प आकार का फोटो / Stamp Size Photograph

महोदय/Dear Sir,

मैं भारतीय विज्ञान कांग्रेस संस्था का आजीवन सदस्य/वार्षिक सदस्य/सत्र सदस्य/छात्र सदस्य/संस्थान सदस्य/व्यक्तिगत दाता/संस्थागत दाता अपना नाम लिखवाना चाहता/चाहती हूँ।

I like to be enrolled as a Life Member/Annual Member/Sessional Member/Student Member/ Institutional Member/Individual Donor/Institutional Donor of The Indian Science Congress Association. (Pl. Tick)

मैं इसके साथ ——————— सदस्यता शुल्क के रूप में नक़द ₹ ———————/बैंक ड्राफ्ट संख्या ——————— दिनांकित ——————— प्रचालक बैंक ——————— 01 अप्रैल 20—— से 31 मार्च 20—— तक भेज रहा/रही हूँ।

I am sending herewith an amount of ₹ in payment of my subscription by Cash/Bank Draft No. dated issuing bank from the year 1st April 20_____ to 31st March 20_____.

मैं निम्नलिखित विभाग में रुचि रखता/रखती हूँ (कृपया किसी एक में निशान लगाएँ)/I am interested in the following section (Please tick any one).

विभाग/Sections

1. कृषि और वानिकी विज्ञान/Agriculture and Forestry Sciences
2. पशु, पशुचिकित्सा और मत्स्य विज्ञान/Animal, Veterinary and Fishery Sciences
3. मानवशास्त्रीय और व्यवहारपरक विज्ञान (जिसमें सम्मिलित, हैं, पुरातत्व-विज्ञान, मनोविज्ञान, शैक्षिक विज्ञान और सेना विज्ञान)/Anthropological and Behavioural Sciences (including Archaeology, Psychology, Education and Military Sciences)
4. रसायन विज्ञान/Chemical Sciences

5. भू-पद्धति विज्ञान/Earth System Sciences
6. अभियन्ता विज्ञान/Engineering Sciences
7. पर्यावरण विज्ञान/Environmental Sciences
8. सूचना और संचारण विज्ञान और प्रौद्योगिकी (जिसमें कंप्यूटर विज्ञान भी सम्मिलित है)/Information and Communication Science & Technology (including Computer Sciences)
9. भौतिक विज्ञान/Materials Science
10. गणित विज्ञान (जिसमें सांख्यिकीय सम्मिलित है)/Mathematical Sciences (including Statistics)
11. चिकित्सा शास्त्र (जिसमें शरीर विज्ञान भी सम्मिलित है)/Medical Sciences (including Physiology)
12. नया जीवविज्ञान (जिसमें जीव रसायन, जीव भौतिकी और आणविक जीवविज्ञान और जीव-प्रौद्योगिकी भी सम्मिलित है)/New Biology (including Bio-Chemistry, Biophysics & Molecular Biology and Biotechnology)
13. भौतिकीय विज्ञान/Physical Sciences
14. वनस्पति विज्ञान/Plant Sciences

(कृपया टंकित करें या ब्लॉक अक्षरों में भरें/Please type or fill up in Block Letters)

नाम/Name (ब्लॉक अक्षरों में/in Block Letters) :

श्री/सुश्री/श्री/श्रीमती/डॉ०/प्रो०/Mr./Ms./Shri/Shrimati/Dr./Prof (कृपया टिक करें)/(Please tick)

कुलनाम/Surname प्रथम नाम/First Name मध्य नाम/Middle Name

शैक्षणिक योग्यता/Academic Qualifications :

(अंतिम शैक्षणिक योग्यता प्रमाण-पत्र अंक-सूची का स्वत:सत्यापित जिराक्स प्रति संलग्न करना है/Self attested xerox copy of last educational certificate/marksheet must be attached)

पदनाम/Designation

सम्पर्क का पता/Address of communication :

(राज्य, शहर/नगर और पिन कोड सहित/including state, city/town and pin code)

दूरभाष संख्या/मोबाईल संख्या और ई-मेल/Phone No./Mobile Number & E-mail :

किसी भी सरकारी अनुमोदित पहचान पत्र (अनिवार्य)/Any Govt. approved ID Card (Mandatory) :

वर्तमान वर्ष विश्वविद्यालय प्रवेश-पत्र/Current Year University Admit Card :

स्थायी पता/Permanent Address :

दिनांक/Date : भवदीव/Yours Faithfully

हस्ताक्षर/Signature

ध्यान दें : (i) सभी बैंक ड्राफ्ट The Indian Science Congress Association के नाम से ही लिखा जाएँ, सदस्यता के विषय में बैंक ड्राफ्ट प्राप्ति और जो कोलकाता के किसी भी शाखा में देय हों।

Note : (i) All Bank Drafts should be drawn in favour of *The Indian Science Congress Association*, membership subject to realisation of the bank draft, Payable at any branch in Kolkata.

(ii) सभी सदस्यता और सदस्यता के नवीकरण के लिए आवेदन-पत्र आवेदकों को अपने खुद के पते उपलब्ध कराके करने चाहिए न कि देखभाल के पते प्रस्तुत करने चाहिए।

(ii) All Application Forms for Membership and the renewal of Membership must be submitted by providing the address of the applicants themselves only and not any care of address.

(iii) भर्ती शुल्क ₹ 50/- सिर्फ एक नये वार्षिक सदस्य के लिए ज़रुरी है। वह सदस्य/आजीवन सदस्य/संस्थान सदस्य/छात्र सदस्य/दाता के लिए ज़रुरी नहीं है।

(iii) Admission fess of ₹ 50/- is needed only for becoming a new Annual Member and not for Sessional Member/Life Member/Institutional Member/Student Member/Donor.

(iv) सदस्यों से यह निवेदन किवा जा रहा है कि वे अपनी सदस्यता संख्या का उल्लेख भारतीय विज्ञान कांग्रेस संस्था के कार्यालय के साथ पत्राचार के समय अवश्य करें।

(iv) Members are requested to mention their Membership No. while making any correspondence to ISCA office.

(v) भारतीय विज्ञान कांग्रेस संस्था द्वारा मनीऑर्डर, आई. पी. ओ., ई. सी. एस. या चेक से भुगतान ग्रहण नहीं किया जाएगा।

(v) No Money Order, I.P.O., ECS or Cheque will be accepted by ISCA.

(vi) कोई भी सदस्यता निर्धारित सदस्यता फार्म (आवेदन-पत्र नई सदस्यता/सदस्यता की नवीकरण के लिए) में विधिवत बिना भरने से नहीं लिया जाएगा।

(vi) No Membership will be taken without duly filled in prescribed Membership Form (Application Form for New Membership/Application For Renewal of Membership).

(vii) नकदी केवल ISCA मुख्यालय में हाथ से लिया जाएगा। कृपया डाक द्वारा लिफाफे के भीतर नकदी नहीं भेजें।

(vii) Cash will only be taken by hand at ISCA Hqrs. Pl. do not send the cash by Post within the envelope.