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CONTENTS

EDITORIAL

INFUSING SOCIAL HARMONY : A GREAT NEED FOR MAKING A DIFFERENCE

Accomplishing a pleasant and consistent wholesomeness can only be a course of infusing harmony in the social work that happens to be free from dissents, discrimination and exploitation of the marginalized people, where congenial cooperative, friendly, mindfulness and sympathetic outlook among the people of world occur in all the interactive situations. It also leads to make a person happy, warm-hearted and a useful citizen, which ensure a fairly integrated life usually devoid of prejudices, blind conformity and politicization. Making a difference has always been a call for a change that is to be positive. The difference between positivistic and negativistic outlook lies in the approach to focus any incidence. The existing issue is how to minimize or de-escalate the social distance found among various castes, religions, communities, cultures etc. in such a diversified world of different mindsets that is usually filled with suspense, narrow selfishness fanaticism misunderstanding marked unrest, state of indecision and with a feeling of letting down others. What we should we, be is a question, which is now in peril and greater need has arises to think that shall we like to denounce ourselves as separatist or we would like to record the preface of construction with destruction in the history of social development.

Life is not mere living with plan, dream and achieving worldly possessions under illusionized mode of living. Dreaming is good but the outcomes may not be as per desired at times, then felt cheated concerned and unable to cope with rapid pace of change. Threat and hyper level of fear are inevitable and usually play a contributing role in breaking the social harmony at all the levels of socio-cultural settings. In fact we must prepare to face the unseen nightmares and unexpected challenges with competence and should learn always to become a man of value who can spread smile, happiness and worth to masses for inculcating social harmony.

The need is to think and ponder ourselves in a right perspective to ensure a cohesive improvement in the society and ultimately in the social word. As time proceeds, we have to change our needs in relation to presses of society to accommodate everyone in the state of speed and time with a desire to make a fruitful and desirable difference in our communities as well as in the world. However this state of positive mindfulness cannot be attained without enhancing a scientific temper, by which one can judge what is right and what is not, what is desirable and not desirable and what to do and not do. This state of decision making could happen only to be the product of teaching and assimilation of science in one hand and to create and invent something

novel other hand. How to think? shall be the central construct as innovations are deemed to be the product of both science and technology which is regarded as Mother of Civilization. Complexities of problem can be resolved by the investment of human capital with ease and greater efficiency.

Therefore, improving scientific temper among all human being might be a tool for everyone to break the imbibed socio-cultural morbidity, owing to the dwindling standards of both moral and ethical code of conduct that may be sufficient enough to crumble the fabric of social harmony. Everyman's Science has to effectively manage the social vagaries of prejudices, stereotyped thinking, superstitions fanaticism, all type of discrimination at all levels and pseudo-regiousness and also to enrich social justice and scientific temper in making desirable changes to enhance the brotherhood, catholicity, equality, patience, cleanliness, self-control, righteousness, dutifulness, honesty and discipline in all walks of life for making a difference that is positive and progressive.

Dr. R. L. Bharadwaj
Agra

Science is a beautiful gift to humanity, we should not distort it
—A. P. J. Abdul Kalam

ROLE OF DIET, YOGA AND LIFE STYLE MODIFICATIONS IN CONTROLLING HYPERTENSION

Pradip Kumar Das and Eshita Das

Hypertension or high blood pressure increases the risk of heart disease, stroke and kidney disease. Adequate evidence is available, from studies conducted within and across populations, to link several food groups and dietary patterns with an increased or decreased risk of hypertension. Regular frequent intake of fruits and vegetables, exercise and yoga is protective against hypertension.

INTRODUCTION

Hypertension is now the rising trend in recent times. High blood pressure or hypertension has become a major public health problem all over the world. 15 to 20 deaths out of 100 are attributed to hypertension related diseases. One out of, 10 young people between the age group of 20 to 30 years are having high blood pressure and five out of 10 persons between the age group of 50 and above are having high blood pressure. Overall about 1/3rd of people are having high blood pressure. If high blood pressure is not properly treated it may cause stroke, heart failure, heart attack, irregularities in heart beat, eye diseases leading to blindness, chronic kidney diseases leading to end stage renal failure, and many psychological problems. Blood pressure is not a disease but a trait. Heart pumps out blood for circulation all over the body. It rushes out overcoming the resistance created by arterial walls. This pressure is called blood pressure. It is essential part of the circulatory mechanism. As the heart pumps blood in pulses, the blood pressure has a peak when the blood volume is maximum in the arteries and a trough when the blood volume is minimum. The blood pressure at the maximum is called systolic blood pressure and the blood pressure at minimum is called diastolic blood pressure. After birth of a child, blood pressure starts increasing and reaches about 120/80. It has been seen that if the systolic/ diastolic blood pressure increases more than 120/ 80, it starts affecting the blood vessels and other organs. The persons having systolic blood pressure between 120 to 139 and 1 or diastolic blood pressure between 80 to 89 are called Pre-hypertensive. People having systolic blood pressure between 140 to 159 and / or diastolic blood pressure between 90 to 99 mm of hg are called stage 1 expensive and people having systolic blood pressure above 160 mm of Hg and/

Swasthya Bhabna Welfare Society, Principal Investigator, Consultant Physician & Dermatologist, Ex Master Trainers & Supportive Supervisor in GFATM-Project-7, Serampore, Hooghly

or diastolic blood pressure above 100 mm of Hg are called stage 2 hypertensive. Usually there is no symptom specific to high blood pressure. Hypertension is called a 'silent killer'. Most of the time it is diagnosed as a chance finding when people visit doctors for any other ailment. Some times people having high blood pressure may complain of headache or dizziness. Heaviness in the head, pain in the occipital region or neck, irritation, disturbed sleep or tiredness may be felt by some individuals. Major symptoms appear when a target organ is affected. These symptoms are organ specific like stroke when brain is affected, chest pain when coronary arteries of the heart are affected, and breathlessness when heart failure occurs, swelling of foot when kidneys are affected or reduced vision or blindness when eyes are affected. Apart from the various risk factors like diabetes, smoking etc. changes in life style and food habits are one of the important culprits blamed for it. So patients of hypertension or coronary heart disease whether staying in primary health center or Sub Divisional Hospital or District Hospital and Medical colleges, they need the good nutritional advices which are often overlooked by us. In developing countries, practice of unhealthy dietary behaviors often occurs in association with other unhealthy behaviors such as physical inactivity and smoking. Moreover, unhealthy dietary habits such as high intake of saturated fats, salts as well as less intake of fruits and vegetables tend to cause hypertension or raised blood pressure, coronary heart disease and stroke[1]. The effects of diet, regular practices of yoga on multiple cardiovascular risk factors, ranging from body weight to blood lipids and blood pressure to thrombotic mechanisms, also raises the question of when and how far to adjust for these variables in evaluating the relationship of diet and yoga to hypertension and cardiovascular disease. So dietary advices and regular practices of yoga like *Sabasana, Bhramari Pranayama, Anulom-Bilom pranayama, Bajrasana, Gomukhoasana, Paddyasana and Siddyasana* have an important role in the non-medicinal management of Hypertension and Heart Diseases.

Research and Development in this subject: International status making low sodium and low fat foods widely available in the market through appropriate manufacturing practices and lowering the sodium content of regularly consumed foods like breads and cereals[2]. In clinical practice, the role of diet as an effective vehicle of primary and secondary prevention of CVD (Cardio-vascular disease) must be stressed in national and international guidelines. For the successful ernentation of these guidelines, health professionals must be trained to comprehend and communicate dietary advice through counseling, contacts with individuals and groups. Dietary advice, practice of particular Asanas regularly should be treated as an effective remedy to risk reduction. Food-related dietary guidelines and regular practice of yogas under a skilled trainer should be developed at the local, regional or national level to involve people, patients, professionals and policy makers to clarify the practical dietary measures and asanas needed to promote cardiovascular health.

DASH Diet (Dietary Interventions to Stop Hypertension)[3].:

- Involves eating more fruits, vegetables, whole-grain foods,
- Low-fat dairy, fish, poultry, and nuts.
- Eating less red meat, saturated fats, and sweets.
- Reducing sodium in our diet can also have a significant effect.

- Eating foods that are rich in magnecium, potassium and calcium.
- Addition of more whole grains and cereals like jowar, bajra, oats in the diet.
- Reduction of taking common snacks like chips, namkeen, biscuits
- Allicin in Garlic is the substance has been shown to relax the blood vessels and ultimately reduces the blood pressure.
- The long chain omega-3 fatty acids EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) obtained from the oily fishes and sea-foods, has been studied to improve the elasticity of the arteries which in turn reduce the blood pressure and vascular resistance.
- Coenzyme Q10 obtained from fresh fish, spinach, broccoli, peanuts, wheat germ and whole grains are very effective nutritional antihypertensive agent.

EFFECT OF FOOD HABITS

The effect of various dietary fats on the plasma lipids has constituted the key link in the causal pathway that connects diet to CVD (Cardio-vascular Disease). Fatty acids are grouped into three classes-SFAs (saturated fatty Acids), monounsaturated fatty acids (MUFAs) and polyunsaturated fatty acids (PUFAs). Outcome of large randomized clinical trials, in which replacement of saturated and trans fats by polyunsaturated vegetable oils effectively lowered CHD[6] Anti-oxidant nutrients, which can directly scavenge free radicals, would be protective against atherosclerotic vascular disorders. It has been studied extensively in animal experimental models, in epidemiological studies, controlled clinical trials and in population studies on restricted sodium[4]. This rise in blood pressure was related to an increase in salt consumption[5] and a reduced dietary intake of potassium. DASH (Dietary Interventions to Stop Hypertension) diet trial further strengthens the conclusion that salt restricted diets lowers blood pressure effectively. The effects of increased fruit and vegetable consumption on blood pressure alone or in combination with a low-fat diet, were assessed in the DASH trial[3]. Consumtion of healthy balanced diet in each day and regular exercise and healthy life style should be maintained. Periodical check up of health and body weight should be taken regularly. The diet should contain less saturated, trans fat and cholesterol and it should contain more vegetables specially beans and peas and adequate quantity of fruits. Red meat should be avoided and diet should contains poul products and fishes. During cooking, frying of foods is avoided and less amount of cooking oil should be used. Butter, ghee and vanaspati contain more saturated fats and cholesterol and must be avoided. Oil from vegetable sources like groundnut oil, sunflower oil, olive oil, which are heart friendly should be used in the cooking process. Dairy products like skimmed milk, curds which contain less fat should be included in the diet. Overweight causes problems to the heart, so those foods causing weight gain are avoided and regular physical exercise should be exerted to maintain a steady body weight. Regular walking for 30 minutes at a stretch is enough for maintaining standard body weight. Regular check up of blood pressure is required because high blood pressure may lead to heart attack. Moreover, high level of blood cholesterol can lead to heart attack, so regular testing of blood cholesterol is very necessary to lessen the risk of heart attack in women. While the combination of diet and regular practice of yoga like *Sabasana, Bhramari Pranayama, Anulom-Bilom pranayama, Bajrasana, Gomukhoasana, Paddyasana and*

Siddyasana have an important role in the non-medicinal management of hypertension and heart diseases and was more effective in lowering blood pressure.

Rich in Cholesterol and Saturated fats (to be avoided)

- Egg Yolk
- Fatty meat & organ meat(Liver)
- Butter chicken / Batter fried fish
- Milk fat - Desi Ghee, Butter, Cheese, Malai, Rabri, Khurchan, Doda, Ice Cream full cream milk,

> Hidden Fat like Bakery biscuits, Patties, Cakes, Pastries.

> Foods that contain coconut or palm oil

However, a balanced diet should include a small amount of unsaturated fat, which will help reduce cholesterol levels.

Foods high in unsaturated fat include:

- oily fish
- avocados
- nuts and seeds
- Sunflower, rapeseed, olive and vegetable oils.

> Switch to fat-free milk-toned/skimmed milk.

Cooking Oils: The mystery of PUFA / MUFA

- Saturated Fats: Increase Cholesterol- Avoid - Coconut oil. Palm oil, Vanaspati
- Monounsaturated Fats (MUFA): Heart healthy include-Olive oil. Groundnut oil. Canola oil, Mustard oil
- Polyunsaturated Fats (PUFA): Heart healthy include-Sunflower oil. Soybean oil Omega-3-Fatty acids Fish oil: Heart Healthy
- The TRAFA (Trans Fatty Acids) consumption is likely to be high in Asian Indians because deep-frying is a favorite mode of cooking at home as well as in restaurants. Repeated re-use of oils previously used for deep-frying may further increase the TRAFA content. Diets high in MUFA (olive oil, sunflower oil, canola oil) make LDL (Low Density Lipoprotein) resistant to oxidation, restore LDL-receptor activity, and markedly lower LDL levels. A high carbohydrate diet is associated with atherogenic, small, dense LDL particles, while high-fat diets are associated with less atherogenic, buoyant LDL particles. Consumption of fish is essential. N-3 PUFA displaces arachidonic acid from platelet phospholipid stores, thereby reducing the available substrate for thromboxane A2 synthesis. N-3 PUF A is antithrombogenic and antiarrhythmic. N-3 PUFA decreases 'BP' and serum homocysteine level. N-6 PUFA is antiatherogenic.

Life Style modifications, dietary contol and practice of yoga for prevention of hypertension

Regular exercise helps lower blood pressure. Adults should get about 150 minutes of moderate-intensity exercise every week. That could include gardening, walking briskly bicycling, or other aerobic exercise. Muscle-strengthening activities are recommended at least two days a week and should work all major muscle groups. Meditation can put our body into a state of deep rest, which can lower our blood pressure. Yoga, tai chi, and deep breathing also help. Stop smoking and reduce the intake of dietary saturated fat, Limit the consumption of alcohol to no more than 720 ml. of Beer, 300 ml of wine, and 60 ml of Whisky per day. Reduction of overweight and maintaining normal ideal body weight. Average blood pressure reduction of 6.3/ 3.1 mm of Hg have been observed with a reduction in mean body weight of 9.2 kg. It has been recommended that Body Mass Index (BMI) should be attained and maintained at 25 or less. BMI is calculated by

dividing weight in kg by square of height in meters. We may be able to lower our blood pressure by switching to a better diet. The DASH Diet - Dietary intervention to stop Hypertension—involves eating more fruits, vegetables, whole-grain foods, low-fat dairy, fish, poultry, and nuts. Adaptation of healthy life style that affects blood pressure is very important for both the prevention and the treatment of hypertension. Health promoting life style modifications are recommended for individuals with pre-hypertension and an adjunct to drug therapy in hypertensive individuals.These interventions will reduce not only high blood pressure but overall risk of cardiovascular disease. Though these modifications have more pronounced effect on individuals with high blood pressure, it has been seen that they may prevent development of hypertension in persons with risk of developing high blood pressure. In hypertensive individuals even if these modifications are not sufficient enough to stop drug therapy they certainly reduce the number and doses of medicines. Blood pressure is a silent liller and many individuals are unaware of their blood pressure status. Fresh herbs make many other foods heart-healthy when they replace salt, sugar, and trans fats. These flavor powerhouses, along with nuts, berries — even coffee — form a global approach to heart-wise eating. Blackbeans are packed with heart-healthy 'nutrients including folate, antioxidants, magnesium and fiber — which helps control both cholesterol and blood sugar levels. Salmon also lowers blood triglycerides and reduces inflammation. The American Heart Association recommends two servings of salmon or other oily fish a week. Tuna is a good source of heart-healthy omega-3s; it generally costs less than salmon. Albacore (white tuna) contains more omega-3s than other tuna varieties. Extra Virgin Olive Oil made from the first press of olives, is especially rich in heart- healthy antioxidants called polyphenols, as well as healthy monounsaturated fats. When olive oil replaces saturated fat (like butter), it can help lower cholesterol levels. Polyphenols may protect blood vessels. A small handful of walnuts (1.5 ounces) a day may lower blood cholesterol and reduce inflammation in the arteries of the heart. The green soybeans are moving beyond Japanese restaurants, where they're a tasty appetizer. They're packed with soy protein which can lower blood triglyceride levels. Sweet potatoes are a hearty, healthy substitute for white potatoes for people concerned about diabetes. Oranges are sweet, juicy fruit contains the cholesterol-fighting fiber pectin — as well as potassium, which helps control blood pressure. A small study shows that Orange Juices may improve blood vessel function and modestly lower blood pressure through the antioxidant hesperidin. Carrots are the latest research on carrots shows these sweet, crunchy veggies may help control blood sugar levels and reduce the risk of developing diabetes, They're also a top cholesterol-fighting food, thanks to ample amounts of soluble fiber—the kind found in oats. Milk is high in calcium and potassium and yogurt has twice as much of these important minerals. To really boost the calcium and minimize the fat, choose low-fat or non-fat varieties. The heart-healthy power of vegetables in our milk or on toast? Margarine, soy milk, ororange juice can deliver — when they're fortified with cholesterol-fighting sterols and stanols. These plant extracts block cholesterol absorption in the gut and can lower LDL levels by 10% without affecting good cholesterol. Coffee and tea may help protect our heart by warding off type 2 diabetes. Studies show that people who drink 3-4 cups a day may cut their risk by 25% — and even decaffeinated coffee works. Caution is due. however, for those who already have

diabetes hypertension; caffeine can complicate these conditions. Cherries are packed with antho cyanins an antioxidant believed to help protect blood vessels. Cherries in any form provide these heart-healthy nutrients: the larger heart-shaped sweet cherries, the sour cherries used for making, as well as dried cherries and cherry juice. Blueberries-the list of healthy nutrients in blueberries is extensive: anthocyanins give them their deep blue color and support heart health. Blue berries also contain ellagic acid, beta-carotene, lutein, vitamin C, folate, magnesium, potassum, and fiber. A 3,000 year old tradition, yoga, is now regarded in the Western world as a holistic approach to health. The word "yoga" comes from a Sanskrit root "yuj" which means union, or yoke, to join, and to direct 'and concentrate one's attention. In *Yoga Sutras*, Patanjali outlines an eightfold path to awareness and enlightenment called *ashtanga*, which literally means "eight limbs". Regular practice of yoga promotes strength, endurance, flexibility and facilitates characteristics of friendliness, compassion, and greater self-control, while cultivating a sense of calmness and well-being. Sustained practice also leads to important outcomes such as changes in life perspective, self-awareness and an improved sense of energy to live life fully and with genuine enjoyment In the Western world, the most common aspects of yoga practiced are the physical postures and breathing practices of Hatha yoga and meditation. Hatha yoga enhances the capacity of the physical body through the use of a series of body postures, movements (asanas), and breathing techniques (pranayama). Yogic practices enhance muscular strength and body flexibility, promote and improve respiratory and cardiovascular function, promote recovery from and treatment of addiction, reduce stress, anxiety, depression, and chronic pain, improve sleep patterns, and enhance overall well-being and quality of life[7].

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LATE ORDOVICIAN MASS EXTINCTION

Sanghamitra Pradhan and Shreerup Goswami

Out of several mysterious and unexplained events that had happened in the Earth's history over millions of years, mass extinctions are perhaps the most perplexing. Most of the fossil scientists proposed the Late Ordovician Mass Extinction (LOME) as second biggest mass extermination among the Big Five events in terms of percentage of biota extirpated. Multiple pulses of extermination event during Ordovician period ruined the new evolving biodiversity and wiped out 86% of all the species. The LOME was almost twice as severe as K-T extinction, believed to be occurred at the end of the Cretaceous period, approximately 66 millions of years ago, which is famous for bringing an end to the reign of Dinosaurs.

INTRODUCTION

Mass extinction is a global and widespread event, which involves the monumental loss of flora and fauna at an uneven rate over a short period. It is identified by rapid decrease or a sharp change in a global biota in the intervals, which demarcates the boundary among geological period. Understanding of the mass exterminations is greatly essential to understand the evolution of biosphere. In the history of 4.54 billion years, Earth has experienced many major as well as minor events of biotic crisis in which more than 75% species disappeared. Among those baffling events, scientists referred the five largest Phanerozoic events as Major Mass extinction events or Big Five namely Late Ordovician Mass Extinction event (LOME), Late-Devonian extinction, Permian-Triassic event (previously known as K-T mass extinction), Triassic- Jurassic event and Cretaceous- Paleogene event. In the scenario of these episodes, global marine as well as terrestrial biodiversity has been shattered for many times resulting in collapse and reordering of total ecosystem.

Late Ordovician mass extinction (LOME) event, one of the enigmatic events of annihilation is discussed in this article. It is believed to be taken place around 440 millions of years ago, in which 26% of families, 49% of genera and overall 86% of all species got eliminated. However, less severe ecological changes had accompanied the extinction event than that of others[1]. The extermination pattern in LOME was not a solo event. The Ordovician biota had experienced multiple pulses of obliterations. Unambiguously, the LOME was linked with various climatic changes and associated ocean transitions, which could have produced two major pulses of

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extinction[2, 3]. The first major pulse occurred at the Katian and Hirnantian boundary, which associated with global cooling and beginning of glaciations, led to expansion of south polar ice-sheet. The later one or the second pulse of extinction is believed to be taken place in mid-Hirnantian stage associated with warming of climate, melting of ice sheet and continental flooding[2, 4]. For indisputable connection between climatic transition and extinction pulses, the LOME has been agnized as a climatically driven event. Climatic changes and related oceanic interruption caused the habitat loss, disturbances in ecology and ultimately led to extermination of Ordovician biota[4].

During the Ordovician period, the Earth Surface was dramatically different than it is today. Most of the world's landmasses came together to create the Gondwana super continent; which include South America, Africa, Australia and Antarctica. Throughout the Ordovician, Gondwana shifted towards the South Pole and much of it was submerged underwater. From lower to middle Ordovician, the Earth experienced a milder climate and a lot of moist in atmosphere. Interestingly, glaciation was introduced in the Late Ordovician period, when Earth was going through an intense greenhouse interval, engendered the environmental changes and provoked the extinction of a great number of Ordovician organisms[5]. The rapid growth of continental ice-sheet on Gondwana land facilitated the substantial cooling of Tropical Ocean[2, 3, 6- 8]. Ordovician seas were filled with a diverse assemblage of invertebrates, dominated by brachiopods, trilobites, bryozoans, echinoderms, mollusks and graptolites. The first ever plants as well as the terrestrial arthropods had appeared on land. Change in marine environment caused the loss of species inhabiting shallow cratonic seaways. Aftermath extinction, the remaining biota started adapting in the new ecosystem with change in their body size. At the middle of Hirnantian stage suddenly the glaciations period ended, as there was a drastic change in climate, which led to rise of sea level and change in ocean circulation, initiated the second pulse of extinction.

POSSIBLE CAUSES

The causes behind the two pulses of mass extinction in Ordovician are still a matter of debate. Many researchers and palaeontologists have proposed many hypotheses regarding the destruction of Ordovician biota. The first phase of extinction had taken place due to draining of epicontinental seaways and shrinking of the tropical climatic belt[5,6,9]. It was suggested that a gamma ray burst might have been triggered the initial cooling event and aspects of extinctions[10]. The formation of major glaciations might have initiated a deep ocean circulation, which oxygenated the deep ocean water and opened up this habitat to oxygen demanding taxa. Carbon isotope studies[11] from modern geochemical evidences, zoo-planktonic biogeography and the results from ocean circulation modeling suggested that the Ordovician glaciations might have been occurred earlier than the Hirnantian i.e. Sandhbian or early Katian with a polar front position between 55^0 and 70^0 S[3,8]. The tropical sea temperature remained high throughout the Late Ordovician and only sharply dropped at the first pulse of extinction[3]. The possible causes behind the environmental changes, which led to the extinction during Ordovician glaciations[2]. According to him, two environmental changes

associated with the glaciations were responsible for LOME. At first, the global cooling was probably disadvantageous because the biota was previously adapted to an intense greenhouse environment. Secondly the fall in sea level caused by shrinking of water in ice cap, drained the vast epicontinental seaways and eliminated the habitat of many endemic communities. The marine sediment deposition section above storm wave base supported a regression near the end of the Ordovician[12, 13]. Basing on the displacement of various markers from preglacial to glacial times, it was proposed the decline in eustatic level in the late Ordovician time[14]. The evidences, have accentuated the erosional features in Laurantia midcontinent where, underlying marine sediments of Late Ordovician period were notched about 48 m during maximum glacial drawdown[15]. To produce a 48m incision, the drop in eustatic level had to lower the sea level to expose the former seabed, which had been several tens of meters below the storm wave base. Brenchley et al. first gave the concept of formation of Ordovician continental glaciations[7]. According to productivity hypothesis, new nutrients brought to the surface of the ocean by initiation of deep ocean circulation i.e. thermohaline circulation, which stimulated the primary marine productivity[2]. The oligotrophic-Ordovician oceans became eutrophic. Increased primary productivity added burial of organic carbon to the oceans, which decreased the atmospheric partial pressure of CO_2 levels (7 to 10 times of Present Atmospheric Level) and fueled the glaciations. When Gondwana supercontinent passed over the pole, glaciation ended and a change in climate was marked by reduced snowfall, melting of ice cap, which slowed down oceanic circulation. The stagnant ocean water dropped down the flow of nutrients so as the productivity and led to an extinction event.

In support of Ordovician glaciations event, a weathering hypothesis was proposed that during the glaciations the atmospheric pCO_2 was high[16]. The Ordovician mountain building activities resulted in to the exposure and weathering of silicate terrains, which is responsible for pCO_2 consumption. Decrease in pCO_2 level during the late Ordovician triggered the growth of ice sheet formation, further stimulated by albedo effects of the ice. As a result, glaciations were initiated. The albedo effect of glaciers then overcame by greenhouse effect and the glaciations were ended. This climatic oscillation brought huge changes in Ordovician biota, which leads to extermination. Although, a large portion of tropical-species was eliminated during cooling of climate, some of the population facilitated the adaption into new changing environment by necessary genetic isolation. A back and forth pattern of turnover and extinction with cooling climate caused warm adapted species to extinct and then global warming caused cold- adapted species to turn over.

Peters recommended that the common cause or the sedimentary record, responsible for LOME is alienated in to two hypotheses[17]. The Eustatic Common Cause hypothesis suggested that the Gondwana glaciations caused decline in biota, which leads to mass extinction by lowering eustatic sea level, accordingly lowering the total areas of shallow marine habitats, disrupting larval corridors. Another hypothesis, the Common Climate Cause postulated the cooling of climate that was responsible for sea level regression, and habitat losses, had a direct influence on extinction rate[18, 19].

EXTINCTION PATTERN AND EFFECT

The extinction pattern affected the Ordovician biota in different ways. For example, the biotas in epicontinental sea ways were strongly affected by fall in eustatic level, whereas the biotas in marine setting coast were not influenced by the same. Biota in higher latitude were severely affected by the environmental changes rather than that of tropical areas[9]. The biota in open oceans and along the margin of continents were cosmopolitan by nature, whereas the isolated epicontinental seas were restricted to provincial fauna[2, 20]. In the effect of glaciations, the drainage of seaways led to fall in eustatic sea level and purged the habitat. Majority of the biota were failed to adapt certain changes and forced to be diminished.

The oceanic disturbances followed by climatic changes, might have increased the upwelling circulation and fueled the extinction event. The initiation of glaciations and rough callous climate enhances the deep oceanic circulation, which intensified the pulse of extermination. Shrinking of open seas increased the area of shallow water and the event had minimal effect on the shallow benthos due to which survivors might have adapted to the new environment with loosing less number of species[21]. As the climatic condition returned to the preglacial condition in Hirnantian stage, the biota adapted to glacial regime died, which marked the second pulse of annihilation. The tropical climates did not experience pronounce changes in temperature[7, 22]. Thus, the biotas were not strongly affected by the changeover of climate. The alteration in oceanic circulation in central tropical area primarily affected the open environment, whereas it progressively affected the higher latitude biome[2]. As the glaciations escalated, the open oceanic pelagic faunas shriveled mid to high altitude regions. An initial pulse of extinction introduced in mid to high latitude realm as oceanic circulation surged, different nutrients and toxins from deep water instilled in to the ecosystem[23, 24]. Again, the preglacial arena returned, slacked the deep-water circulation and produced another pulse of extermination.

The Ordovician radiation, an extension of Cambrian explosion was marked by intense diversification of marine animals[25]. The multiple phases of extinction drew an end point to the radiation. Brachiopods were numerous and wide spread among the most common members of benthic communities in the latter part of Ordovician. In both phases of extinction, brachiopod diminished significantly. In the first pulse, changes in oceanic circulations and fall in sea level provided an adverse climate for brachiopods to survive. An account on decrease in extinction of brachiopod[20] was given. Many clades such as Spiriferids, Athyrids, and Petamerids expanded after the extinction but the groups like Orthids and Strophomenids sharply declined[2]. Inarticulate brachiopods like *Craniata* and *Lingulata* declined significantly. Overall, around one-half of Hirnanatian brachiopod genera became extinct at the end of Hirnantian stage, thus the second pulse of extinction comprise the Ordovician brachiopod mass mortality. During the first phase of abolition, the endemic brachiopods of epicontinental seas lost their habitat, which led to the extinction. The cosmopolitan brachiopods living at the margin of isolated continents, quickly invaded epicontinental seas after the extinction event[2].

Temple first coined the term Hirnantian fauna, which describes a wide spread brachiopod fauna that was dominated in the Late Ordovician[26]. The Hirnantian fauna got eliminated during the global warming episode that switched off the glaciation due to dysoxia and restriction of cold water habitats[2]. Some of Hirnantian fauna includes *Dalmanella testudinaria, Hirnantia sagittifera, Kinnella kielanae, Eostropheodonta hirnantensis, Plectothyrella crassicosta and Paromalomena polonica*. A few of Hirnantian clades survived in to the Silurian like *Hirnanta, Dalmeanella, Leptaena, Hindella* etc. Others include *Draborthis, Kinnella, Paromalomena, Pectothyrella* came to an end as the warming period started over the glaciations[27].

During Ordovician radiation, Tabulate and Rugosa corals originated independently. The generic abundance of tabulate corals exceeded than that of Rugosa corals in the Ordovician, but generic abundant of both were increased into Ashgill. Between two great coral realms in temperature realm, the solitary Rugosa coral was dominant; Tabulate corals were less diverse and total absence of Stromatoporoids was marked[28]. The tropical realm corals became extinct during first pulse of extinction due to initiation of glaciations. The second pulse of extinction had little effect on this biota due to apparent rise of sea level, which renewed the epicontinental seas[2].

In the first pulse of extinction near about 13 Echinoderm families (approximately 40%) became extinct. In Hirnantian stage, 70% of new genera evolved, which survived into Silurian[29]. Only about 13% of bryozoan family disappeared in the extinction event[29]. Substantial decrease in generic diversity did not allow two dominant groups of bryozoans i.e. Cryptostomata and Troptostamata, which never attained their former diversity[30]. In the first pulse of extinction, 86% of species and 21% of genera from endemic North American Bryozoans got eliminated. However, in Hirnantian Stage, only 7% of species and 5% of genera of North American Bryozoans were affected by the extinction event[31]. Nearly, 80% of conodont species became extinct in this event. Recovery of conodont aftermath extinction was high with simple cone morphology, which may have been associated with the pelagic habitat[32]. About one- third of ostracods got eliminated in the extinction and mainly replaced by batrachians[33]. Most important order of cephalopods experienced severe extinction, which led nautiloids to decline to a few genera[34]. The extinction was highly concentrated in cosmopolitan taxa, as a result the post extinction recovery faunas were endemic. Among eight Ordovician orders, one became extinct; three orders survived the extinction and regained their Ordovician diversity. However, four orders survived the extinction but never attained the prior diversity they had in Ordovician[35].

Graptolites were the most abundant and richly diverse faunas expanded during the early Ashgill. The annihilation patterns of Graptolites were abrupt and devastating. The abrupt extinction event declined the graptolites to about six species, which means it had experienced nearly total extinction in LOME. The initiation of glaciations caused loss of dysaeroic graptolite habitat and addition of toxic materials, which was brought by deep ocean circulation. After glaciation, anoxia once again introduced to the oceans and graptolites radiated from only a few species, which had the same pattern in colony development, led to development of many new taxa[6].

In the first pulse of extinction, 40%-50% *Rawtheyan* genera were eliminated and rest of them survived into Hirnantian stage. In deep ocean ecosystem, the extinction of trilobites was more severe and less severe in shallow depth[36]. The clades of Cambrian radiation were entirely eliminated during the LOME. Although the members of Whiterock fauna only survived the LOME, but were decreased by 26% of families. New clades of trilobites evolved during the Ordovician radiation. Gastropods were declined by only 31% across the extermination event[6].

CONCLUSION

In comparison to other major extinctions, it divulges that although the loss of biotas was greater in the LOME event, but the ecological consequences were less than that of other events. Few overriding groups disappeared during the extinction event; reefs recovered quickly aftermath extinction in Late Ordovician, but declined during Devonians and could not recover in the Paleozoic[1]. It took several years to recover from this major event. Remarkably, the new fauna, which were evolved aftermath of extinction event, had similar ecological patterns to the previously wiped out fauna. As a whole, climatic change, associated ocean level fluctuations and change in oxygenation were the main causes of destruction of biomes in Late Ordovician. At the Katian- Hirnantian stage, drop in mercury level caused the first pulse of Ordovician abolition and ended in mid- Hirnantian stage, which denoted the second pulse of extinction, associated with warming of climate. The cooling of global climate was a reason behind the decline of biodiversity because the Ordovician biome was adapted to an intense greenhouse prior to the Katian- Hirnatian. Sea level regressions purged the habitats of many prevalent communities[10, 12]. The glaciations ended when the Gondwana supercontinent moved over the South Pole, which reduced snowfall, size of the ice cap and slowed down the deep oceanic circulation. Productivity fell down as nutrient levels declined due to sluggish water circulation. In Middle Ordovician prior to the approach of Gondwana to the South Pole, the oceans were stable with warm, saline deep water. In the Late Ordovician, the stable ocean was introduced by mixing circulation known as thermohaline circulation, a deep-water circulatory system similar to the present oceanic function[13, 14]. Upwelling of nutrient rich water to the ocean surface stimulated the primary product. Sudden change of Glaciations was marked by rapid isotopic and eustatic changes. This remarkable change helped to explain how the Ordovician glaciations and deglaciations produced major pulses of Extinction. The loss of Ordovician biodiversity led to replacement of fauna by most of cosmopolitan biome in Phanerozoic and produced much simpler Silurian communities.

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MINERALS AND INDIAN HEALTH SYSTEM

Satyendra Singh[1] and Jnanendra Singh[2]

Rock forming and metallic and non metallic minerals, along with water or in combination with plants and animals, are used for curing a number of chronic diseases (i.e., respiratory, cardiovascular, neurological, and immunological disorders) throughout Indian subcontinent from immemorial times. This kind of medicinal system is termed in various countries as Unani, Aurvedic, Tibbi, Siddha, and Naturopathy or Alternative medicinal systems. These are today jointly called as Indigenous Medicinal System, while in U.S.A as Alternative Medical System. This system is getting more popularity in western countries after experiencing the side effects of synthetic drugs. The Alternative Medical System is a health care system rather than a health cure[1].

INTRODUCTION

The whole universe is composed of *Panch sukshma bhutas* (Subtile matter, forms of homogenous and continuous matter without any atomicity of structure[2a]) which again conglomerate to form bigger *Panch Mahabhutas* and thus the every thing in physical creation is composed of these five elements. Every physical thing means everything whether it is mineral, vegetation or animal living on the earth. Therefore, drugs also contain *Panch Mahabhuta.* These *Panch Mahabhutas* are five larger component known as space, water, air, earth, and fire[2]. Human body comprise of Panch Mahabhut and five *Tanmatra: Sound (Shab*da),Touch (Sparsh) Vision (Roopa) taste (Ras) Smell (Gandha)[12]. These Tanmantra are related with each sense organs Five sense organ (eyes, nose, tongue, skin, ear.), Five working organs: Hands, Sex, lungs, kidney, foot and heart[12]. Hence, Indian Health System believes that every substance existing in universe has medicinal values in specific geo atmospheric setting, these substance (Plants, animal and minerals) act as medicine alone or in combination of others. Adoption of specific food habits according to specific geo atmospheric setting increase immunity in body According to view of ancient health system, raw products such as plants and animal giving used for medicinal preparations must be of same region or geo atmospheric settings. In ancient Indian Health System, certain minerals are used after their medicinal detoxication or in combination with plants parts and animal products. Certain minerals are harmful for human, if above permissible limit, these minerals (arsenic, lead, mercury and sulphur, after medicinal purification) are mixed in plants or animal givings/derived for making medicinal preparation and used for curing

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diseases with little or no side effects. These preparation are termed as herbo-mineral/ metallic products.

In Indian Health System the material which are used as raw products are **Plants**; Roots, stem, leaves, bark, flower, seeds and fruits. **Animal**: nail, bones, hair, gall bladder, eyes, **Minerals**: Metallic and non metallic, bio-mineralized shells.

80% drugs of Indian health system/ Ayurvedic are plants and animals products only 20% incorporate minerals and metals. Metal based drugs are also termed herbo-metallic compounds. Now a days herbo mineral and metallic preparations are important in *Ayurvedic* pharma and have extensively been used in practice in different parts of India for many centuries. These medicines are held to be safe, efficacious even in minute doses. These herbo-metallic drugs have been used as wonderful life saving drugs from thousand of years without any side effects. Some of the metals (mercury, Lead, Arsenic, and silver) are toxic even in minor amount, but in ayurved these minerals, in combination with herbal juices, are successfully curing terminal diseases. Many minerals and metallic elements have neither nutritional role nor essential for human body. They are toxic elements are used for killing harmful bacteria.

Ayurvedically detoxicated metals and minerals do not react with tissues of the body, hence, bhasma is considered to be more powerful than any other healing preparation and are widely used minerals and heavy metals in traditional medicine system.[11] These mineral/metal based Ayurvedic drugs are prescribed in treatment of many chronic diseases like acidity, asthma, anemia, cardiovascular, renal, hypertension and in skin related problems[11].

MINERALS USED AS RAW PRODUCTS IN BHASMA ARE:

Agate: Mixture of crystalline silica and hydrated silica (SiO_2) composed of different coloured bands sometimes with sharp lines of demarcation[5] used in heart, brain, liver and spleen disorders, so it is beneficial in diseases of these body organs[8].

Bitumin: Hydrocarbons of the Paraffin series, C_nH_{2n+2} and of the naphthene series C_nH_{2n}. Bitumin occurs in solid and liquid of light yellow colour oil of 0.77 sp.gr[5] Curative properties— Locally anteseptic, anodyne, parasiticide and anti phlogistic. Internally alternative tonic, slightly laxative, cholagogue, respiratory stimulant, disinfectant and expectorant intestinal antiseptic, diuretic and litontriptic.

Biotite: It is silicate of magnesium, iron, aluminium and potassium, with hydroxyl and fluorine. Colour black or dark green Lustre splendent or pearly, opaque hardness 2.5-3 Sp.Gr. 2.7 -3.1. Cleavage perfect basal, crystals, are six sided prismatic. Used in gastritis, renal disease, skin disease and mainly in rejuvenation . Curative properties—Abharkh bhsama has hypoglycemic, hepatoprotective, anthelminthic and antimicrobial properties.[5,8]

Borax: Hydrous sodium borate, Colour white sometimes tinge of blue, grey or green, Lustre vitreous rarely earthy, Hardness: 2-2.5, Sp.Gr. 1.7, Cleavage present, Fracture. Subconcoidal. It is useful in loss of appetite, painful dyspepsia, cough, asthma, skin disease and diarrhoea, it is also used for procuring abortion and promoting uterine contraction.[5,8]

Talc: Hydrous magnesium silicate, Colour. White, silvery white greenish grey lustre. Pearly

Hardness. 1 Sp.Gr. 2.7-2.8 Cleavage Basal feel greasy widely used in loss of appetite, dyspepsia, vomiting, urinary disease, aphrodisiac.

Galena : Lead sulphide, Colour. Lead grey, Lustre. Metallic, Hardness 2.5 Sp.Gr. 7.4-7.6 Fracture. Even,flat,Cleavage. Perfect cubic[5]. Used as cosmetics for the eyes and eye diseases.[8]

Orpiment: Arsenic trisulphide Colour. Lemon yellow Lustre. Pearly or brilliant .Hardness 1.5 - 2 Sp.Gr. 3.4-3.5 Cleavage. Basal[5]. Used in cure of skin disease, to increase strength and beauty also used in fever.[8]

Cinnabar: Murcury sulphide Colour.Liver brown. Lustre. Dull. Hardness. 2-2.5 Sp.Gr. 8.99.Cleavage. Prismatic. Fracture. Subconcoidal or uneven Curative properties: Used in Juandice, bronchitis and cough, useful in nervous disorder, insanity, deafness, noise in the ears, paralysis of the tongue, insomnia, pneumonia, syphilis, rheumatoid, disease of the female and urinary organs.[5,8]

Chalcopyrite: Sulphide of copper and Iron. Colour. Brass-yellow Lustre. Opaque Hardness. 3.5-4 Sp.Gr. 4.1-4.3 Fracture. Subconcoidal, uneven[5]. Useful in anaemia, urinary disease, ascitesa, anasarca, prurigo, eye disease.[8]

Antimony: mineral stibnite (Sb_2S_3 = Sulphure 28.3, antimony 71.7) Colour lead grey, steel grey, blackish. Lustre metallic, highly splendent, Cleavage highly perfect, fracture subconcoidal, hardness 2, Sp.gr. 4.52-4.62 is used in making surma.[5,8]

Kaolin: A hydrated Potassium aluminium silicate[5] Colour white, grayish white, yellowish, Lustre dull, Cleavage basal, Perfect. Hardness 2-2.5, Sp.gr. 2.6-2.63 formed by biochemical action on potassium aluminium silicate mostly in hot humid climate extensively used in preparation of Ayurvedic drugs.[5,8]

Iron Pyrites: It contains bisulphide of irons, Colour brass yellow Lustre Metallic Hardness. 3.5-4 Sp.Gr. 4.1-4.3, Fracture. Concoidal, uneven.[5] Its tonic used in anemia,urinary diseases, ascites and eye diseases[8].

Gypsum: Hydrated Calcium Sulphate Colour. Colourless, grey, yellowish or red. Lustre Shining, pearly or silky.Hardness. 1.5-2 Sp.Gr. 2.3 Cleavage perfect basal[5]. Used in retain broken bone in fixed position in fracture of limbsand ribs and in disease of spine astringent and antacid and useful menorrhagia and acidity of stomach and is given in fever[8] .

Diamond: Pure Carbon. Colourless or white, yellow red or green rarely blue Lustre. Admantine Hardness. 10, Sp.Gr. 3.52, Fracture. Concoidal Cleavage. Perfect octahedron.[5] It is used as stimulant alterative tonic improves nutrition increase strength and firmness of body prevents premature death.[8]

Iron: Iron oxides Colour. iron grey, Iron black, blood red Lustre Metallic. Hardness. 5.5-6, Sp.Gr., 5.18, Fracture Concoidal, Cleavage poorly octahedral.[5] It is used to improve the quality of blood functional activity of all the organs of body.[8]

Gold: Pure gold, or gold alloyed, Crystal rare, Colour Yellow, coppery or bronze yellow, Lustre. Metallic, Hardness. 2.5-3, Sp.Gr. 12-20[5], It is Aphrodisiac, tonic resolvent, emmenagogue, improve intellect and memory, clear the voice and increase sexual power, kidney causing diaphoresis and diuaresis. Increased menses in women.[8]

Emerald: Beryllium aluminium silicate, Colour. Pale green or green Lustre. Vitreous, Hardness. 7.5 -8, Sp.Gr. 2.7, Cleavage Indistinct,

Fracture. Concoidal or uneven. Used in Fever, vomiting, respiratory, swelling, jaundice.[10]

Topaz: Aluminium fluosilicate Colour wine-yellow, straw yellow white, grey or pink Lustre. Vitreous or transparent Hardness. 8, Sp.Gr. 3.5-3.6 Fracture. Subconcoidal or uneven Cleavage Basal. It is antitoxic, vomiting, Antileprotic.[10]

Tin: Tin oxide Colour bright, white colour Lustre. Adamantine Hardness 6-7 Sp. Gr. 7.3 Fracture subconcoidal or uneven. Used in genitor-urinary organs, blood and lungs.

Corundum, fuller earth, garnet, litharge, pyrolusite, realgar, ruby, rock salt, red ochre, stibnite, sapphire, serpentine, sulphate, tin, white arsenic, zinc, cats eye (Fibrus Chalcydony), and sunstone[4].

Diamond in Heerak Bhasm, Garnet (Almandine variety), deep red colour, silicate of iron and aluminium for making Fitkari Bhasm. Pure Copper is used in Tamra bhasm. Gold and silver thin films are also wrapped on sweets, In Dabur Chayanprash gold and silver both are added ingredients, gold is used sharp brain activity and silver for good physique and antibacterial activity as claimed by manufacturer, but caloric value of silver is yet to be proved.

Similarly, a number of biomineralized animal shells that are formed by process of natural water are used in manufacture of ayurvedic drugs, i.e. bivalves shell in Sukti Bhasm. Sinistral coiled gastropods for Shank bhasm, Pearl in Moti Bhasm. Cyprea, a gastropod is used as raw product in Kauri bhasm. All these are calcium carbonate and their polymorph arranged different pattern with or without Conchiolin, a proteinaceous material[6] .

Major raw product in the Shankh Bhasma, Kapardak Bhasma are Gastropod shell of Mollusca phylum In shankh Bhasma sinisterly coiled shell is used and there are a few gastropod which are sinisterly coiled and their shell composition unique, Sukti Bhasma, Bivalve Shell (Ostrea) Mollusca Phyllum, Praval Bhasma (Coral) belongs to Coelantrata phyllum, chemically it is calcium carbonate but it is not a single mineral but a group of mineral., minor elements (Less than 1 ppm) are different in each shell, when they are heated above 200^0 C new minerals are formed depending upon miner element (Sillica, Titania, Magnesium, Alumina). Mukti Bhasma Moti (pearl), is used. Chemically all are Calcium Carbonate ($CaCO_3$) but mineral composition is different. Calcium carbonate recrystallized in many form calcite, aragonite, ankerite, dolomite (Calcium magnesium carbonate) noncrystalline calcium carbonate. Different minerals have different physical, optical properties and different atomic structure then naturally their interaction with human body may be different .The animal shells are in combination of calcite, aragonite and Nacre (a proteinous material), the proportion of these minerals vary in shell of one phylum to other phylum, better to say from genus to genus.

Counch (Shankh Bhashm) : Sinisterly coiled Gastropod shell are used. Shell composed of crystals of calcite and aragonite may be intermeshed with some organic matter. Shankh Bhasma used in cure of dyspepsia,liver,respiratory Problems. Enlargement of spleen, hyperacidity, jaundice[8].

Cowari Bhasm: Cyprea is gastropod whose shell is used in manfacture of cowari Bhasma. Shell is oblong or oval shape of white red or yellow in colour, composed of non crystalline calcium carbonate beneficial in diuretic problems, enlarge spleen[8].

Shukti Bhashm: Among bivalve, Ostrean Shells is used for manufacture of Bhasma shells are oval or pear shaped, white, yellowish or cream in colour, with a rough surface showing pale brown or bluish concentric bands on the right valve. The two valves are quite different in shape and size. Outer prismatic foliated shell layers was calcite with traces of aragonite and halite. The inner nacreous shell layers were mainly built of magnesium calcite. Shukti Bhasma is used in Anti diarrhoeal, eye disease, leucoderma[8].

Moti or Kapardk bhasm: Spherical to sub spherical white, greenish in colour. It is chiefly carbonate and oxides of lime, It is aphrodisiac, laxative, sedative, emetic and nutritive Diuretic, enlarge spleen, anti diarrhoeal, anti spasmodic, In digestion, or colic, peptic ulcer, cough, phthisis and asthma and also used as antacid[8].

Praval bhasm : Praval (Coral) is exoskeleon is excreted by coral a marine invertebrate, made up aragonite (polymorph of Calcite) Praval Bhasma is used in T.B., eyes Problem, digestion, low grade fever, urinary disorder, asthma, excessive sweating.

These Bhasm are prepared by repeated roasting of minerals and metals at low temperature for long duration in clay pots in absence of oxygen and mixed with precise dose of particular plant juices or animal givings or derived (honey, milk cow urine etc.) Temperature may reach more than 1000 Centigrade, but certainly above 300 Centigrade because these Bhasm as transform into ashes[4]. Toxic metals and minerals are harmful in free state but not, if they are in combination with other organic materials. Treatment with plant juices/animal products increase therapeutic actions and reduce harmful effects and suitable to absorb in body.

PROPERTIES OF BHASM:

(Rasshastra Ayurvedic[4],)

- All the bhasm are of nanoparticles (size Ranges between 40-50nanometer).

- Bhasm should not be recrystallized .

- Bhasms are readily soluble and absorbed in adequate amount in digestive tract through mixing of gastric fluids and gets distributed in the various body organs.

- Bhasm should not have metallic lustre.

-There should be no crystalline mineral/ metals recorded when studied under Petrological Microscope.

MINERAL BASED BHASMS

The drugs manufactured from minerals are Abhrak Bhasm, Lauh Bhasm, Heerak Bhasm, Tamra Bhasm, while the drugs prepared from biomineralized animal shells are Shankh Bhasm, Shukti Bhasm, Moti Bhasm and Kapardak Bhasm. Tamra Bhasm and Moti Pisti are prescribed for curing anaemia, asthma, acidity and antiseptic cathartic disease[3] . This kind of treatment is cheaper as is mostly given through oral ingestion. In indigenous system of medicine the purification and toxicity of rocks, metals and vegetable drugs is removed by various kinds of natural treatment e.g curd treatment, oil treatment, vegetable quath (extract), cow urine treatment, mud treatment and lastly water treatment under various condition of temp. & Pressure in order to minimise toxicity & side effects in comparison to synthetic drugs manufactured in unnatural laboratory conditions with huge investment in medical operations. Mercury and sulphur is widely used in Ayurvedic medicines. preparations. i.e. Shwans Kuthar, Kasturi Bhairav, Vat Kulantak, Brihat vat Chintamani, Basant Kusamakar Ras, Shwanskasa Chintamani Ras,

Chandramrit Ras, Mritunjya Ras, Mahalaxmi Vilas Ras[3]

Conclusion: These metal / mineral based Bhasm are effective and show fast pharmacological actions but little excess of certain mineral may have fatal results[7] . Toxic mineral/metal are purified with the help of plants juices, these plant juices may contain minor amount of metals depending upon soil types and agricultural practices.

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RADIOACTIVITY AND RADIATION IN OUR ROUTINE LIFE

Ashwani Kumar

Radioactivity is everywhere and has been around since the universe was born. It is part of our earth and lives. We are exposed to radiations all the time. Radiation reaches us from outer space and is also emitted from radioactive substances in the ground, in the sea and in the air. Even our bodies are radioactive. Naturally occurring radiations are present in the earth's crust, the floors and walls of our homes, schools, and offices and in the food we eat, drink and the air we breathe. Man has always been exposed to natural radiation arising from earth as well as from outside. Our own bodies- muscles, bones and tissues, contain naturally occurring radioactive substances. Most people, upon hearing the word radioactivity, think only about something harmful or even deadly; for example events such as the atomic bombs that were dropped on Hiroshima and Nagasaki in 1945, Three Mile Island (TMI-1979) or the Chernobyl Disaster of 1986.

INTRODUCTION

Radioactivity is the term used to explain disintegration of atoms. The atom can be identified by the number of protons in the nucleus. Some natural elements are unstable. Therefore, their nuclei disintegrate there by, releasing energy in the form of radiation. This physical phenomenon has been referred as radioactivity and the radioactive atoms are called nuclei. The radioactive disintegration is expressed in units called becquerels. One becquerel equals one disintegration per second. The decay of a radionuclide takes place at a particular rate that remains constant in spite of external influences, such as temperature and pressure. The total time taken for half the radionuclide to decay is called half-life and half-life is the characteristic of a particular radionuclide. This differs for each radioelement, ranging from fractions of a second to billions of years. For example, the half-life of Iodine 131 is eight days, where as for Uranium 238, it is 4.5 billion years.

Origins of radiation can be completely studied by acquiring the knowledge of atoms and its impact that could have on the human body and the environment surrounding us. All materials in the universe are formed from the combination of basic substances called chemical elements. There are 116 different chemical elements in nature known so far. The smallest unit of particles, into which an element can be divided without losing its original properties, are called atoms, which are unique to a particular element. All substances are composed of atoms that are made up of three subatomic particles: protons, neutrons, and electrons except hydrogen (which may have no neutrons). The protons and neutrons are tightly

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bound together in the positively charged nucleus at the center of the atom, while a cloud of negatively charged electrons orbits the nucleus. The nucleus consists of subatomic particles called protons and neutrons. Atoms vary in size from the simple hydrogen atom, which has one proton and one electron, to large atoms such as uranium, which has 92 protons, 92 electrons. Radioactive elements are those in which the atoms are unstable and breakdown to form atoms of another element. This decay is accompanied by the release of radiations[1].

RADIATION AND THEIR TYPES

Radiation is energy that comes from both natural sources, and manmade sources that provide many of the conveniences and necessities of modern living. Radiations can be most basically classified into two major classes, on the basis of their energy and penetrating capabilities, they are ionizing and non-ionizing radiation.

Non-ionizing radiation has lower energy levels and longer wavelengths that is they are unable to directly alter the chemical structure of materials, examples includes radio, microwaves, visible light and infra-red rays.

Ionizing radiation has higher energy levels and smaller wavelengths that is they have enough energy to withdraw electrons from atoms in the materials they penetrate, e.g. our bodies. Its ability to ionize is what makes ionization radiation potentially harmful to life. Ionization causes chemical bonds to break up; it can therefore harm the human body because it changes chemical bonds in the body. Ionizing radiation cannot be felt, smelt, tasted, seen or heard. The principal kinds of ionizing radiation are:

Alpha radiation consists of heavy, positively charged particles emitted by atoms of elements (fig. 1) such as uranium and radium. Alpha radiation can be stopped completely by a sheet of paper or by the thin surface layer of our skin (epidermis). So, they cannot penetrate the skin on their own however, if these are taken into the body by breathing, eating, or drinking, they can expose internal tissues directly and may, therefore, cause biological damage.

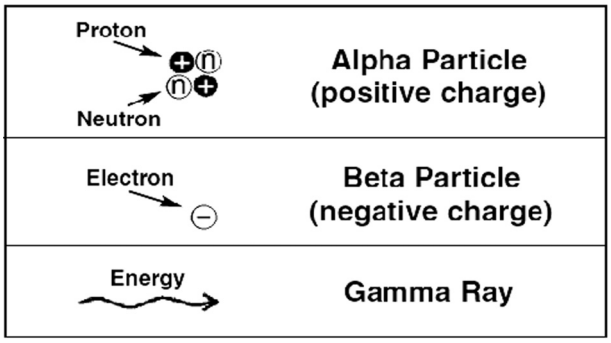

Fig. 1: Types of ionizing radiation (Source[2])

Neutrons are neutral particles which can have a varying degree of energy and do not produce ionization directly. But, their interaction with the atoms of matter can give rise to alpha, beta, gamma, or X-rays which then produce ionization. Low-energy or slow neutrons have the ability to transform elements, but are not very penetrating. However, fast neutrons can be destructive to human tissue and can be stopped only by thick masses of concrete, water and paraffin.

Beta radiations are fast moving, negatively charged particles and can travel much further through air than alpha particles. They are more penetrating (i.e. can penetrate the skin) than alpha particles and can pass through 1-2 centimeters of water. In general, a sheet of aluminum a few millimeters thick will stop beta radiation. They are more harmful if ingested or inhaled release of radiation in the form of invisible small particles and high energy waves. Uranium, thorium and potassium are examples of naturally occurring elements that are slightly radioactive.

Gamma radiations are electromagnetic radiation similar to light, but they have much higher energy and can travel great distance

through air. They are very penetrating and require shielding of thick walls of concrete or lead. Unshielded Gamma rays are harmful inside and outside the body.

X-rays are lower energy Gamma Rays similar in nature to light. X-rays can more easily penetrate the skin than the bones, and X-ray photographs work on this principle.

SOURCES OF IONIZING RADIATION

Depending on their origin, primary sources of radiation can be broken down into two classes, namely, natural or manmade radiation. We are all exposed to natural radiation to a greater or lesser extent, and for most people it is the major source of radiation exposure. Background radiation is that which is naturally and inevitably present in our environment.

There are three main sources of natural radiation are as

Cosmic Radiation

Cosmic radiation from outside the Earth's atmosphere includes high-energy protons, electrons, gamma rays, and X- rays that hit the Earth as it moves through space. Fortunately, the Earth's atmosphere absorbs much of the energy from cosmic radiation. The sun and stars send a constant stream of cosmic radiation to earth, much like a steady drizzle of rain. Differences in elevation, atmospheric conditions, and the earth's magnetic field can change the amount (or dose) of cosmic radiation that we receive. About eight percent of our annual exposure comes from cosmic radiation. However, cosmic radiation increases at higher altitudes, roughly doubling every 6,000 feet.

Terrestrial radiation

The earth itself is a source of terrestrial radiation. Radioactive materials (including uranium, thorium, and radium) exist naturally in soil, water and rock. Essentially all air contains radon, which is responsible for most of the dose that people receive each year from natural background sources, and all organic matter (both plant and animal) contains radioactive carbon and potassium. The dose from terrestrial sources varies in different parts of the world, but locations with higher soil concentrations of uranium and thorium generally have higher doses.

Internal Radiation

About 11 percent of the average person's total annual exposure comes from radioactivity within our own bodies. Radioactive materials in the air, water, and soil are absorbed in food and then by the body's own tissues. Internal radiation from natural elements in our bodies (such as radioactive potassium) and some foods that contain small quantities of radioactive elements (such as radium -226 in eggs, and potassium-40 in bananas and some vegetables and carbon-14 inside their bodies from birth until death). Potassium and carbon are two of the main sources of internal radiation exposures. They enter our bodies through the food we eat and the air we breathe. Potassium, essential to life, is distributed throughout our bodies. A small portion (about one one-hundredth of a percent) of natural potassium consists of a naturally radioactive isotope called potassium-40. This isotope is the chief radioactive component in normal food and human tissue. Carbon-14, a radioactive isotope of carbon created by cosmic radiation, makes up a small fraction of all carbon in our bodies. The variation in dose from one person to another is not as great as that associated with cosmic and terrestrial sources. Although all people are exposed to natural sources of radiation, two distinct groups are exposed to man-made radiation sources, namely the general public and radiation workers.

General Public

The use of radiation in medical procedures, such as diagnostic x-rays, nuclear medicine, and radiation therapy, is by far the most significant source of manmade radiation exposure. In

addition members of the public are exposed to radiation from consumer products, such as building materials, combustible fuels (gas and coal), television, cellphones etc. Individuals who fly frequently wonder about the extra cosmic radiation exposure they receive at higher altitudes. It depends on several things, including how long the flight lasts, how high the plane flies and, of course, how often a person flies. Of lesser magnitude, the public is exposed to radiation from nuclear sites. Radioactive discharges from nuclear sites account for less than 0.01% per year of the average dose. The final sources of exposure to the public would be shipment of radioactive materials and residual fallout from nuclear weapons testing's and accidents like Chernobyl.

BIOLOGICAL EFFECTS OF RADIATION

Radiation can be either harmful or beneficial, depending on its application, duration and extent of exposure. To understand the dangers of radiation in the correct perspective, people should be well informed on the effects that radiation may have on their body. Since we are already subject to background radiation, we should not unnecessarily increase our exposure to additional radiation, as it is known that exposure to radiation carries a risk. Risk is something we live with daily. Whenever we drive a vehicle, there is a risk of accidents and possible injury or death. Most of us consider the risk acceptable because the benefit outweighs the risk. The same argument can be applied to the use of radiation. If the benefits outweigh the risk and the risks are acceptably small, there is a justified reason for its use. When ionizing radiation interacts with cells, it may or may not strike a critical part of the cell. Chromosomes are considered to be the most critical part of the cell since they contain the genetic information and instructions required for the cell to perform its function and to replicate itself. Also, there are very effective repair mechanisms at work constantly to repair cellular damage - including chromosome damage[3]. Depending on the extent of radiation, four primary categories of damage are possible:

Cells damaged, no repair

Ionization may form chemically active substances which in some cases alter the structure of the cells. These alterations may be the same as those changes that occur naturally in the cell and may have no negative effect on the operation of the cell.

Cells damaged, repaired, and function normally

Some ionizing events can produce substances not normally found in the cell. These can lead to a breakdown of the cell structure and its components. Cells can repair the damage if it is limited. Other events can damage the chromosomal structure, which is usually repaired. Many thousands of chromosome aberrations (changes) occur constantly in our bodies. We have effective mechanisms to repair these changes.

Cells damaged, repaired, and function abnormally

If a damaged cell needs to perform a function before it has had time to repair itself, it will either be unable to perform the repair function or perform the function incorrectly. The result may be cells that cannot perform their normal functions that now cause damage to other cells. These altered cells may be unable to reproduce or may reproduce at an uncontrolled rate. Such cells can be the underlying cause of cancer.

Cells damaged, and die

If a cell is extensively damaged by radiation, or damaged in such a way that reproduction is affected, the cell may die. Radiation damage to cells may depend on how sensitive the cells are to radiation. The destruction of cells by radiation is also be used to treat some types of cancer.

Effects of radiation on unborn babies

An embryo/foetus is very sensitive to radiation, because an embryo/foetus' cells are rapidly dividing. Protection of the embryo/foetus is

important because the embryo/foetus is considered to be at the most radiation sensitive stage of human development, particularly in the first 20 weeks of pregnancy. Limits are established to protect the embryo/foetus from any potential effects which may occur from a significant amount of radiation. This radiation exposure may be the result of exposure to external and internal sources of radiation. Special considerations are given to pregnant radiation workers. Potential effects associated with prenatal radiation doses include:

- Growth retardation
- Small head/brain size
- Mental retardation
- Childhood cancer

APPLICATIONS OF RADIATION

Radiation can be used to improve the quality of life in many more ways than people realize. Nuclear energy, which uses radioactive materials, has a variety of important uses in electricity generation, medicine, industry, agriculture, as well as in our homes. Whenever or wherever it is used, it is incumbent on qualified individuals and responsible organizations to ensure that the radioactive material is prepared, used and disposed of in a safe manner.

Electricity Generation

The demand for energy increases with the world's booming population and expanding economy. Nuclear energy is one of the solutions to meet this ever increasing demand of energy and generates electricity in an environmentally responsible manner[4].

Medical applications

There are many applications of radiation in the medical field, ranging from diagnostics, to treatment and disease management. Many of these use radioactive elements (more specifically radio isotopes) produced from either reactors or cyclotrons. Necsa through NTP is one of the world's leading suppliers of radioactive elements and is playing the leading role in supporting the practice of nuclear medicine globally. Radiology is the broad area of using images produced through radiation, to diagnose and treat disease. The most well known technique is X-rays, which is normally used to examine whether bones are broken. However, radiology includes specialized techniques such as mammography, computed tomography (CT) and nuclear medicine (where radioactive material is usually injected into the patient. With advanced imaging computing technologies, a three dimensional picture of the inside of a patientcan be generated.

Industrial Applications

Industries around the world use radioactive materials in a variety of ways to improve productivity and safety, and to obtain information that could not be obtained in other ways. The applications include fields such as civil engineering, materials analysis, measuring devices, process control in factories, oil and mineral exploration, and checking oil and gas pipelines for leaks and weaknesses. These uses directly and indirectly influence our everyday lives. For example, measuring devices containing radioactive materials are used in tasks such as:

Ø Testing the moisture content of soil during road construction,

Ø Measuring the thickness of paper and plastics during manufacturing,

Ø Checking the height of fluid when filling bottles in factories.

Radioactive materials are even used in devices designed to detect explosives.

Radioisotopes are employed in smoke detectors, and as lasting, fail-safe light sources for emergency signs in aircraft and public buildings.

Agricultural Applications

Radioisotopes as a research tool help develop new strains of food crops that are more nutritious,

resist disease, and produce higher yields. For example, radiation has been used in producing peanuts, tomatoes, onions, soybeans, barley, and the "miracle" rice that has boosted rice production in Asia. Radioisotope tracers in plant nutrients aid in reducing soil and water pollution by helping researchers to learn how plants absorb fertilizer and how to calculate the optimum amount and frequency of fertilizer applications. Moisture monitoring with nuclear density gauges can measure the moisture content of soil, helping make the most efficient use of limited water sources for successful crop production. In agriculture, radioactive materials are used to improve food crops, preserve food, and control insect pests. They are also used to measure soil moisture content, erosion rate and the efficiency of fertilizer uptake.

Food irradiation

The use of gamma rays and electron beams in irradiating foods to control disease causing micro-organisms and to extend shelf life of food products is growing throughout the world.

Insect control

Radioisotopes assist in enhancing food production. One method is the control of insects, including the control of screw worms, fruit flies and tsetse flies, is through the

Insect Sterilization with radiation results in mating without offspring, thus limiting insect population growth. With fewer pests, food crop productivity increases. The tsetse fly causes the transmission of a parasitic disease, trypanosomiasis, which slowly destroys livestock herds in sub Saharan Africa. It also causes the spread of the human form of the disease, known as sleeping sickness. Diseases transmitted by tsetse flies kill over 250,000 people per year.

Applications in consumer products

One of the most common uses of radioactive materials in the home is in smoke detectors. These devices contain tiny amounts of radioactive material which make the detectors sensitive to smoke. They can eliminate dust from computer disks and audio and video tape. Sterilize baby powder, bandages, cosmetics, hair products, and contact lens solutions (Exposing these materials to radiation, usually gamma radiation from cobalt-60 kills bacteria and germs.). Control the thickness of many sheet products, such as paper, sandpaper, or aluminum foil and the amount of liquid in beverage can (Detectors measure, highly accurately, the amount of radiation passing through the materials and compare it to the amount that should pass through the desired thickness). Attach a non-stick surface to a frying pan. Brighten the porcelain in false teeth to make them look more real.

Environmental Applications

Radioactive materials are used as tracers to measure environmental processes, including the monitoring of silt, water and pollutants. They are used to measure and map effluent and pollution discharges from factories and sewerage plants, and the movement of sand around harbours, rivers and bays. Radioactive material used for such purposes have short half-lives and decay to background levels within days. Generally, material destined for transport on public routes is packaged in a manner that even if the public or workers were to come into contact with it, there would be no risk to their health.

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ILIZAROV TECHNIQUE—A GIFT TO MODERN ORTHOPEDICS

Bipul Borthakur and Manasjyoti Das

Ilizarov technique is a newer addition to the armamentarium of orthopaedic surgery. The popularity of this technique is increasing rapidly owing to its varied and numerous applications. Certain diseases and disorders like limb length discrepancy, bone loss following trauma or resection of bone tumour, multiplanar deformities etc. cannot be addressed by conventional technique, here Ilizarov technique plays a very important role.

INTRODUCTION

The term orthopaedics is derived from Greek word, 'ortho' meaning straight and 'paeds' means children. It was originally applied to the art of correcting deformities in children. The term first used by Nicolas Andry, French physician in 1941 who published a book on the correcting and preventing deformities in children.[1]

The first specialised training in orthopaedics started in Great Britain just before 20th century by Hugh Owen Thomas (1834 – 1891) of Liverpool; and his nephew Sir Robert Jones was pioneer of laying the sound foundation that the orthopaedic surgeons enjoy today. He was instrumental in training the first batch of surgeons from Britain and America, who were among the first to devote their professional lives entirely to the practice of orthopaedics.[9]

The landmark inventions in medical science during the industrial revolution of Europe has contributed immensely to a greater height to which medical science enjoys today. Orthopaedic surgeons are also equally benefited.

The invention of microscope by Hans and Zucharias Janssen in 1590, x-rays by Roentgen in 1895, Ether by Crawford Long of Athens and WTG Morton from Boston, the discovery of Louis Pasteur on bacteria and subsequent introduction of antiseptic protocols by Joseph Lister of Glasgow, Scotland, invention of penicillin antibiotic by Sir Alexander Fleming in 1928 helped the surgical aspect of medical science to develop rapidly.[9]

The modern orthopaedics that is practised throughout the world is immensely contributed by the principles and technique laid by AO foundation (Arbeitgemein schaftfur oesteosynthese Fragen) formed under the leadership of Muller from Switzerland in 1958. AO also known as ASIF (Association of Study of Internal fixation) is the pioneer for laboratory analysis of various fracture morphology, their numerical classifications, and principles of internal fixations with various implants. And their principles are widely accepted by the orthopaedic community of world today and used for day to day practice. However, it has its own limitations in addressing certain complex orthopaedic problems by conventional methods and here comes the role of Ilizarov technique.[2]

WHO IS ILIZAROV

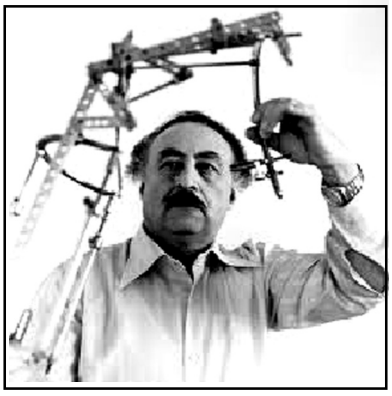
Gavril Abramovich Ilizarov was born a sixth child to a poor Jewish peasant family on 15 June 1921.After finishing medical education in 1944 Ilizarov was sent to a rural hospital in Dolgovka,

Department of Orthopaedics, Assam Medical College & Hospital, Dibrugarh.

a village in Kurgan Oblast in Siberia, 2000 km east of Moscow. In 1950 he obtained a position within a General Surgery Department of the Kurgan Regional Hospital which included a duty as a surgeon with the air ambulance. In 1955 he became Chief of the Department of Trauma and Orthopaedics in the Regional Hospital for War Veterans in Kurgan.[8]

Ilizarov's residency was carried out in orthopaedic surgery, during which he developed an external fixator system (1951). He discovered that by carefully severing a bone without severing the periosteum around it, one could separate two halves of a bone slightly and fix them in place, and the bone would grow to fill the gap.[10]

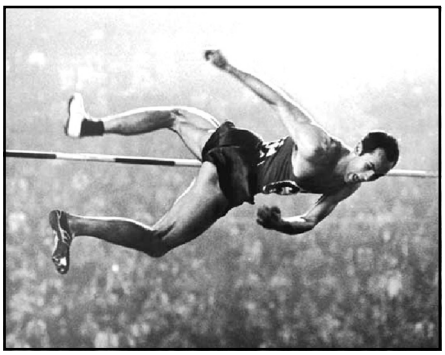
These experiments led to the design of what is known as an Ilizarov apparatus, which holds a bone in place, by virtue of a framework and pins through the bone. The procedure was inspired by a shaft bow harness on a horse carriage. Originally bicycle parts were used for the frame.



For long time, Ilizarov faced scepticism, resistance and political intrigues from the medical establishment in Moscow which tried to defame him as a "quack". However, successful treatments of patients led to a growing fame of Ilizarov. He became known among patients as the "magician from Kurgan". In 1968 Ilizarov defended his doctoral thesis in Perm and was awarded the title Doctor of Sciences bypassing the Candidate of Sciences degree for which the thesis had originally been prepared.[8]

THE BREAKTHROUGH

In 1968, Ilizarov successfully operated on Valeriy Brumel, the 1964 Olympic champion and a long-time world record holder in the men's high jump, who injured his right leg in a motorcycle accident. Before coming to Ilizarov, Brumel spent about three years for unsuccessful treatments in various clinics and underwent seven invasive and 25 non-invasive surgeries.[8]



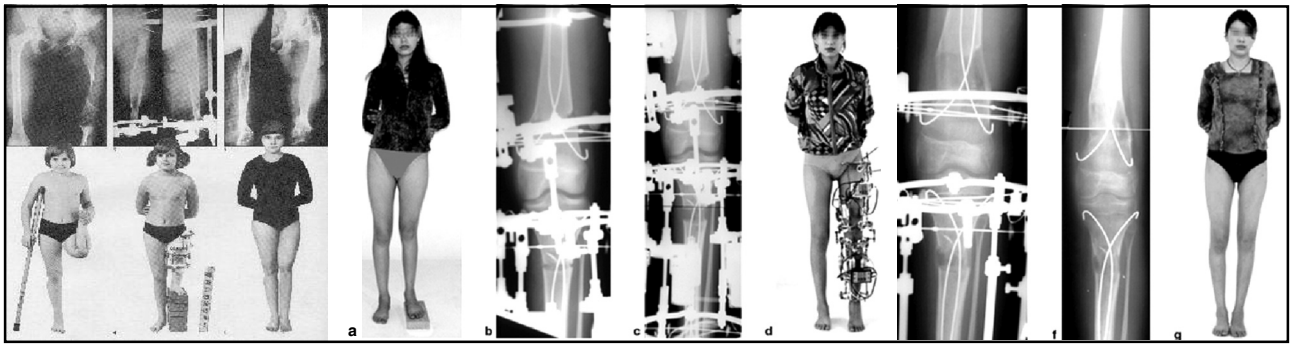
PRINCIPLE OF ILIZAROV

If a bone is cut carefully without injuring the periosteum (corticotomy) and held in position by a device and gradually distracted one from another, that leads to formation of not only new bone in the gap but also elongation of all the surrounding structures which include muscles, tendon, vessels, nerve, skin, soft tissue etc.[3]

APPLICATIONS

This technique is very much useful in limb length discrepancy where one limb is greatly shorter than the other side. The shorter limb can be elongated to equalise with the other limb which helps in better locomotion or walking without limp.

In today's high speed road traffic accidents, patients attend hospital leaving behind a big piece of bone at the accident site. Filling up this gap by conventional technique is not possible. Here Ilizarov technique is useful to fill up the gap. Also in tumorous condition of bone, wide resections leave a gap that can filled up by this technique.[10]

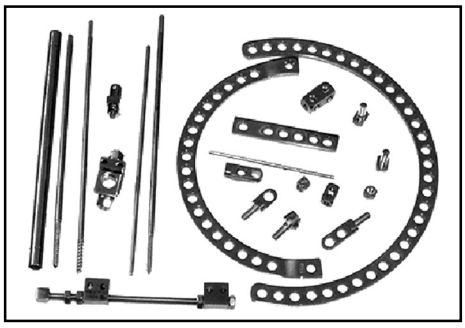


Some deformities of foot or limb, congenital or acquired, following burn or post traumatic which cannot be corrected by conventional methods can be managed with the Ilizarov technique.

Fractures involving the joints can be fixed easily by the Ilizarov technique.

Ilizarov technique can also be used for treatment of fractures of bones, the greatest advantage being fracture fixation is done without opening the fracture site and hence limiting the infections.[4]

Other uses include bone thickening for cosmetic and functional reasons, percutaneous one-stage treatment of congenital or traumatic pseudoarthroses, correction of long-bone and joint deformities including resistant and relapsed club feet, treatment of septic non unions, filling of osteomyelitic cavities by the gradual shifting of one cavity wall, lengthening of amputation stumps etc..However the list is unending and it can be used in varied conditions.[4]

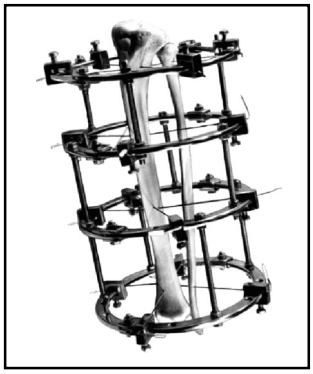


BASIC COMPONENTS OF ILIZAROV APPARATUS

- half rings arches

- long connecting plates, shorter straight
- connecting plates
- curved plates
- twisted plates
- posts with either a threaded end or a threaded hole
- Wires come with or without beads.
- Wire fixator's are either clamps, with a solid frame or an open frame or bolts
- The treaded rods come in solid and telescopic models
- Threaded sockets, serrated washers, circular and semi-circular plain washers, lock washers, bolts and nuts[10]

Where the wire is passed through the bone, the holding capacity is increased only when tension is applied to it or the wire is stretched. So every wire is tensed with the help of tensioner (instrument) and secured with the help of bolt and nut passed through the hole in ring. And the direction of passing of the wire through the ring depends on the safe corridors without injuring the vital structures. That is why multiple holes in the ring is useful to accommodate wires in the Ilizarov apparatus. K wires of diameter 1.5 mm, 1.8mm and 2mm are usually used.[5]



SAFE CORRIDORS

Before passing the wires through the bone, the k wires have to pass through the tissues surrounding it which includes nerves as well as vessels. Hence safe anatomical corridors have been described for insertion of wires in order to avoid injury to neurovascular structures.

Besides avoiding neurovascular structures, it is important that pins be inserted in subcutaneous locations; subcutaneous insertion avoids muscular impingement which decreases pain and increases function.[7]

Other advantage includes decreased swelling and decreased pin infection.

DISADVANTAGES

The application of Ilizarov ring for a prolonged period of months together decreases the patient's compliance towards it. Patients usually find it difficult to continue.

Also the weight of the apparatus makes it cumbersome for day to day activities.[7]

RECENT ADVANCES

To overcome these situation ASAMI (Association for the Study and Application of the Method of Ilizarov International and External Fixation group) and pioneering orthopaedic surgeons have modified this technique called hybrid external fixator. Here the number of rings are reduced and schanz pins are used to decrease the size and weight of the apparatus making it user friendly as well as less cumbersome. Also carbon fibre rings are commonly used now a days reducing the weight further.[5]

ADVANTAGES

The primary advantage of the apparatus is that the patient can do normal activity with the ring early which is not possible through conventional

bony fixation techniques. The patient is allowed to walk from day one of surgery itself. Ilizarov also allows good range of movement at the adjoining joints of the surgery.

Another advantage lies in the area that fracture fixation can be done without opening fracture site thus preventing infections associated with surgery.[6]

DISCUSSION

Ilizarov technique has enriched the armamentarium of the orthopaedic surgeon. But a thorough anatomy knowledge and adherence to the principle of safe corridor technique is a must so as to avoid undesirable complications of injury to the vital structures. Before embarking on this technique it is essential to undergo a practical training under an expert in the field so as to give benefit to the patient without any complications.

CONCLUSION

The modifications of the Ilizarov technique has taken the art of healing of difficult fractures of bones and other disorder of bones and soft tissues to the next level and has produced amazing results in the field of orthopaedic surgery. However it has its own shortcomings. It takes a prolonged time for healing and often patients find difficult to continue with the apparatus. Apparatus is very bulky.

However the modifications by ASAMI and pioneering orthopaedic surgeons; by reducing the weight of the apparatus and reducing the hardware (called as hybrid external fixator) has made the apparatus less cumbersome and patient acceptability has increased.

Medical science is an ever evolving subject and it will be worth noticing the upcoming advances in the field of Ilizarov.

Ilizarov has stood the test of time and its application in situations where all other techniques fail has definitely proved that it is a gift to modern medicine.

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STATUS OF BLUETONGUE DISEASE IN INDIA

Girish Maheshwari and Renu Mahore

Bluetongue Virus (BTV) is devastating hemorrhagic viral disease of both wild and domestic ruminants, classified among category "A" diseases notifiable to the World Organization of animal Health (OIE). The vector of the disease is biting midges of genus *Culicoides* (Diptera: Ceratopogonidae) and the disease is characterized by high morbidity and mortality resulting severe economic losses to sheep farmers. Over the five decades after the first report of BT in 1964, most of the known serotypes of Bluetongue Virus (BTV) have been reported by detection of serotype specific antibodies and rarely by virus isolation from the fly.

Although virus isolation and serotyping are the gold standards, rapid method based on the detection of the viral nucleic acid may be more suitable for India, yet for effective control of BT may be pertinent to introduce sentinel and vector traps systems for identification of the circulating serotypes and to evaluate herd immunity against them, so that relevant strains can be included in vaccine formulations. Recently, an inactivated pentavalent vaccine (BTV- 1, 2, 10, 16 & 23) is developed and commercialized in India[3].

INTRODUCTION

The disease is a vector- borne viral disease of ruminants such as sheep, goat, cattle, buffalo, white-tailed deer, antelope, sambar and camelid species such as camels and ilamas[6,7] mainly transmitted by midges of the genus *Culicoides* (Diptera: Ceratopogonidae). Bluetongue Virus is highly diverse, there are more than two dozen serotypes, and virus can reassort to form new variants. The virus is endemic in a broad, worldwide from tropical to subtropical zones with approximately 35° S to 40°N; however, outbreaks also occur outside this area, antivirus may persist long-term if the climate and vectors are suitable. In India, first outbreak of BT in sheep and goats from Maharashtra state was reported by Sapre[14]. After the initial report of BT in Maharashtra, the disease was reported in exotic sheep, namely Southdown, Rambouillet, Russian Merino and Corriedale between 1967 and 1970. Severe BT was also reported in the Dorset breed in Andhra Pradesh in 1974. However, the native sheep maintained in close proximity did not present any symptoms. During 1981, in Southern India, the disease was widely spread and many outbreaks were reported between 1986 and 1995 demonstrated by Sreenivasulu[4]. In Northern India, an outbreak of BT was reported from Dehradun,

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Uttarakhand (that time Uttar Pradesh), in that more than 60 goats died and have observed prevalence of BTV antibody in sheep, goat and cattle in different regions, ranges from 34.78 to 48.71%[9].

VECTOR

Maheshwari reported thirty valid species of biting midges and 29 species of *Culicoides* have uncertain systematic status. He has included eight new spp. of the fly[7]. Vasic provided detail on host preference by *Culicoides* vector and discussed nuisance value of the fly[16].

EPIDEMIOLOGY

BT in India is endemic to Tamil Nadu, Andhra Pradesh, Karnataka, Maharashtra, Gujarat, Rajasthan, Haryana, Uttarakhand, Uttar Pradesh, Himachal Pradesh and Jammu & Kashmir. In Tamil Nadu, 22 out of 23 districts were reported to be affected by the BTV (Bluetongue Virus). The reported cases of BTV among sheep and goats occur presumably in an epidemic form during the monsoon season. Although the history of reporting was not continuous, the number of outbreaks, attacks and deaths among ruminants reported is of great concern that needs immediate attention for the protection of livestock and economic growth. During 1997-98 from 12 districts in southern Tamil Nadu, outbreak of BT in sheep and goats swept in an epizootic form leaving alarmingly 5,23,203 infected and 2,98,018 dead.

Later the Bluetongue disease was reported from different states including Uttar Pradesh, Himachal Pradesh, Haryana, Karnataka, Maharashtra, Tamil Nadu, Madhya Pradesh, Gujarat, West Bengal and Andhra Pradesh. Bluetongue outbreaks were most important in 1998 with case fatality rate of 18.65% and over all Bluetongue outbreaks with case fatality rate of 18.85%. The investigations made by different authors demonstrating BTV antibodies established the fact that BTV infection is present in cattle, buffaloes and goats in India.

There are reports of 26 serotypes of BTV worldwide, of which 21 serotypes, of which 21 serotypes have been reported from India either on the basis of virus isolation or serology[4]. Seroprevalance of BT in ruminants in Kerala for the first time[2]. Although no frequent outbreaks reported after 2006 in India as such, yet very few sporadic cases for the seroprevalance of Bluetongue among ruminants have been reported from Haryana, Tamil Nadu, Andhra Pradesh and Kerala. It has been stated that a few serotypes may be involved in causing outbreaks every year, the combination of serotypes may change from year to year, therefore, it is important to identify the circulating serotype, so that relevant serotypes can be included in vaccine formation[14].

BLUETONGUE AETIOLOGY

Bluetongue disease is caused by Bluetongue Virus (BTV) of the genus *Orbivirus*, placed under the subfamily *Sedoreovirinae* and family *Reoviridae.* Bluetongue is listed as a multispecies disease by Office International des Epizootics (OIE).

BTV particle is ~65-80 nm diameters, non enveloped with icosahedral symmetry. Viral genome consist of 10 discrete double-stranded (ds) RNA segments which codes for seven structural (VP1-VP7) and at least four non-structural (NS1-NS3/NS3A and NS4) proteins. The complete genome of BTV is ~19.2 kbp in length where the length of ds RNA segments

varies from 3954-822 bp. The Bluetongue Virus with its 24 serotypes and high antigenic variation among the serotypes created a nasty confusion in controlling the disease since last two decades. The outstanding techniques, amplification of DNA by a polymerase enzyme, invented by the Kary Mullis in 1983 n American scientist, provided a solution for most challenging problems of biology[7]. With this technique, BTV became one of the most well studied viruses at molecular level.

According to USDA (2016), the numerous serotypes are the result of genetic shift (reassortment) and the drift (mutation) from alternating passage of BTV through ruminant and vectors.

In India, at least 21 serotypes have been recognized based on serology and/or virus isolation. Till date, 13 serotypes viz., BTV-1, 2, 3, 4, 6, 9, 10, 12, 16, 17, 18, 21 and 23 have been isolated by researchers involved in the All India Network Program on Bluetongue (AINP-BT) and other research laboratories[1]. Following figure shows a schematic structure of BTV core particle.

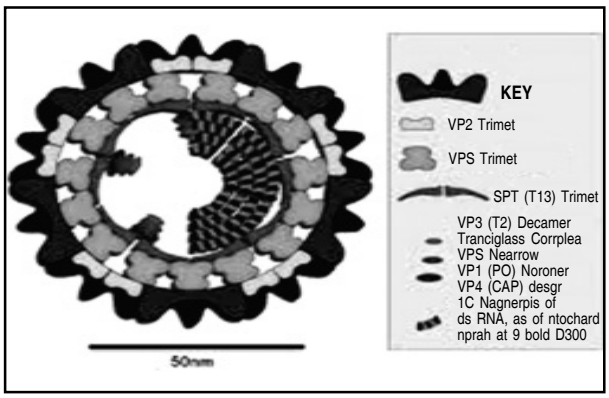

Fig 1: Structure of the Bluetongue Virus core particle (image source from: Mertens, P.P.C. (1999) Bluetongue Viruses In the Encyclopedia of Life Sciences. Macmillan)

Bluetongue is naturally transmitted by *Culicoides* species and consequently outbreaks depends on the presence of efficient midge vector and susceptible animals, conventionally believed to be transmitted only through the bite of infected vector and not by contact or through infected products. The following figure (Fig. 2) shows the vector of Bluetongue disease and an infected sheep with Bluetongue Virus.

Fig. 2: A. *Culicoides:* Vector of Bluetongue Disease, B. Infected Sheep

MORPHOLOGY OF BTV

Bluetongue virus is a non-enveloped linear and segmented double stranded ribonucleic acid (ds RNA) virus. The 10 segments of virus code for 10 proteins, seven structural proteins (VP1-VP7) and three non structural proteins (NS1, NS2 NS3/NS3a) proteins. Two structural proteins VP2 & VP5 make up the icosahedral capsid of the virus. Serotype is primarily determined by VP2, the most variable of the BTV proteins, which interacts with the neutralizing antibodies. The geographical origin of the serotypes is reflected in the variable sequence of the segments that make up a specific serotype's genome, allowing further classification of serotypes into topotypes.

CLINICAL SYMPTOMS

In severe cases there is an acute febrile response characterized by hyperaemia and

congestion, leading to oedema of the face, eyelids and ears and haemorrhages & erosion of the mucous membranes. The tongue may show intense hyperaemia and become oedematous, protrude from the mouth and, in severe cases become cyanotic. Hyperaemia may extend to other parts of the body particularly the coronary band of the hoof, the groin, axilla and perineum. There is often severe muscle degeneration. Breaks in the wool may occur associated with pathology in the follicles. A reluctance to move is common and torticollis may occur in severe cases. In fatal cases the lungs may show interalveolar hyperaemia, severe alveolar oedema and the bronchial tree may be filled with froth. The thoracic cavity and pericardial sac may contain varying quantities of plasma-like fluid. Most cases show a distinctive hemorrhage near the base of the pulmonary artery.

CONTROL

The control strategy of Bluetongue is mainly through vaccination of animals, management practices as well as the control of the vector. Due to a large number of susceptible hosts and BTV serotypes, control of BTV is very difficult. It can be intended with keeping susceptible animals away from *Culicoides* vector but all time this is not possible. Control of vector can be tried with pouring *Culicoides* insecticides, but it is expensive and does not attain complete freedom from the vector.

Live attenuated vaccines, as well as inactivated vaccines, have been successfully used in China, South Africa, Europe and other countries and a genetically engineered Virus-Like Particle (VLPs) has also been projected as a next generation vaccine. However, prevalence of multiple serotypes within a limited geographical area and incidence of genetic and phenotypic drift during natural infection in vectors and hosts, ensuring neutralization-resistant phenotypic variants within a serotype making the circumstances further difficult.

There is no current BTV vaccination in North India and the presence of large number of non-cross-protecting BTV serotypes circulating in the

Table 1: Distribution of Bluetongue Virus Serotypes reported from India

State	Host species	Virus Isolation
Andhra Pradesh	Sheep	**2, 3, 9, 10, 16, 21**
Tamil Nadu	Sheep	**1, 3, 16, 23**
Karnataka	Sheep	**1, 2, 12, 16, 17, 20**
Maharashtra	Sheep	**1, 2, 3, 4, 8, 9, 16, 18, 23**
Madhya Pradesh	Sheep	**18**
Gujarat	Cattle, Camel and Sheep	**6**
Uttar Pradesh	Sheep, Goat	**9, 18, 23**
Haryana	Sheep, Goat	**1, 4**
Himachal Pradesh	Sheep	**3, 9, 16, 17**
Jammu & Kashmir	Sheep	**18**
Uttarakhand	—	—
Rajasthan	—	—

area and hence control of disease is difficult to achieve[11].

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IN-FLOW OF RIVER MAHANADI ON BIODIVERSITY IN CHILIKA LAGOON

Sudhansu Sekhar Rath

Protection of proper and adequate water in any river system is the prerequisite to maintain biodiversity in any river system. But on the other hand, the utilization of the river waters in domestic, agriculture, industry and other essential purposes is also equally important and is being used by conserving the in-flow waters through the constructions of dams, barrages, weirs etc. Further, when the conservation of water in rivers becomes excessive, the inflow of water gets reduced and affects the biodiversity drastically. The present communication details how the biodiversity of river Mahanadi system has been affected after the construction of a number of dams, barrages, weirs etc at the upper stretches of the river.

INTRODUCTION

The lake Chilika is the largest brackish water lagoon of Asia and the second largest coastal lagoon of the world which spreads over the Puri, Khurda,and Ganjam district of Odisha state of India. It is the largest wintering ground for migratory birds in the Indian sub-continent. The lagoon hosts over 160 species of birds in the peak of December and January. In 1981, this lake was designated as the first Indian wet land for international importance under the Ramcsar convention. It is also the queen of natural scenery and largest Irrawaddy Dolphin habitat. It's total coverage area is over 1100 KM2, water volume 4 KM3, depth 4.2 mt and catchment area 3560 km2. The surface area of this lagoon varies from 900 km2 to 1165 km2. There are about 52 streams (primary inflow) into this lake, including Bhargavi, Daya, Makra, Malaguni and Luna , the tributaries of the river Mahanadi which is a major river in east central India.[2] This river flows a total coarse of 560 miles and has an estimated drainage area of 51000 square miles. During monsoon, the Mahanadi has a peak discharge rate of 2000000 ft 3 per second. However its farthest head waters lie 6 KM near Pharsiya village which is 442 mt. above sea level and south of Sibawa town in Dhamtari district of Chhattisgharh province. The hills here are an extension of the eastern ghats and are a source of many other streams which join the river Mahanadi. The first 80 km of its course, this river flows in a northerly direction and drains through the Raipur city of Chhattisgarh. It is rather a narrow river at this Stage and the total width of its valley does not exceed 500-600 meters.

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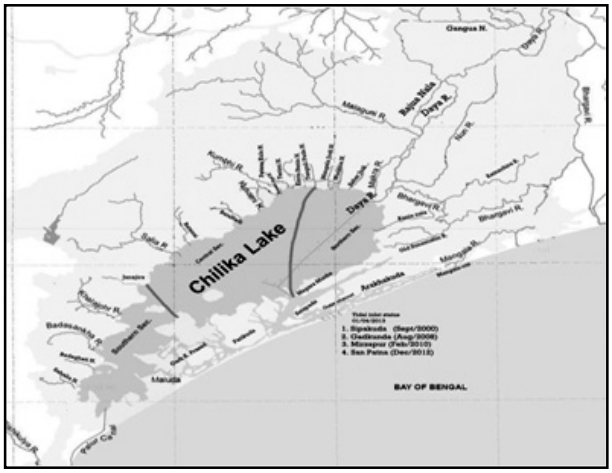

Figure 1: Catchment area of Mahanadi in to Chilika Lagoon.

The river Mahanadi flows down from Raipur district covering a distance of 858 km . In just upstream of the Hirakud Dam constructed over the river Mahanadi, other barriers such as Saradi Weir , Kalama weir and seven diversion- weirs across the river Arpa (a tributary of river Seonat) Which again is a tributary of the Mahanadi) besides khongasara , Salka and Bilaspur projects have already been constructed While construction of other projects such as Ambaguda divertion , Salka divertion ,Lachhanpur divertion and Arpa bhapsajhar barrage projects are under way. The catchment area of the river Mahanadi up to the Hirakud Dam is 82432 Sq km of which 71424sq km lies in Chhattisgarh which is 86% of the total catchment area. Average water inflow in the river is mcm of which 35308 mcm is contributed by Chhattisgarh. Present utilization of water by Chhattisgarh is rearly 9000 mcm which is computed to be 25% of the available water in river Mahanadi up to The Hirakud dam (PTI) . National Green Tribunal (NGT) stays operation of 31 projects taken up by Chhattisgarh on this river on the petition of Shri Sudarsan Das who indicated that during last five years Chhattisgarh State Environment Impact Assessment Authority (SEIAA) has granted environment clearance for the construction of 35 minor irrigation projects, 33 barrages and 12 Industrial units on the river Mahanadi. Further, one more barrage project has also been given environment Clearance by the Ministry of Environment and Forest Department, Government of India. Now the lagoon gets only 61% water inflow from Mahanadi river system mainly from Its distributaries Daya and Bhargabi.[3]

A study by the Indian National Centre for Ocean Information Service (INCOIS) an autonomous organization under the union Ministry of Earth Science opined that salinity, silicate and ammonia levels in Chilika lake varied significantly after the cyclone 'Philin' mainly due to the decrease in water flow into the lake through Daya and Bhargabi . The ammonia and silicate levels increased in lake water while the composition, concentration and distribution of microscopic brackish water plants (phytoplanton) differed.

FECI-FUNNA OF LAGOON

Various type of fish and shellfish of about 261 species are generally reported in the lake out of which 28 species are prawns and 34 species are crabs. Among total number of species available in the lake, only 65 species breed in the lake in which 27 species are fresh water.[5] The remaining species migrate to sea to breed. Due to reopening of lake mouth during 2002, six threatened species have been reappeared including Milkfish, indo-pacific tarpon, ten pounder, bream, hilsa and mullet. The total monthly collection of fish, prawns and crabs was recorded at 27 landing stations around the lake during 2016 and the total

anual fish landing was estimated to be 14067.50 mt, which worked out to 10.26% increase as compared to the annual catch value in 2014. The result of 2014 was surprising as some commonly found fish species such as gania, chauli, balikhai, seba, kundala, baligarada, kanti, kanta, kadisha, andsarabara were missing from the daily catch basket probably due to fluctuation in desired salinity and sand infestation into the lake. Use of motor boats in the lake also might have some adverse impact on the growth of some species. (The Hindu).

AVI-FAUNA

The lagoon hosted over 210 species which included rare or accidental 2 Species during peak migratory season under 10 orders and 42 families in 2004 census. Some of the endangered species like spoon-billed, Sandpiper, asian dowitcher, goliath heron, peregrine, falcon, white belled, sea eagle which are listed under threatened species of ten, were seen here as winter migrant birds from as far as (12000k.m) from the Caspian sea, lake Baikal, Aralsea and other remote part of Russia, Kirghiz Mongolia, Central And Southeast Asia, Ladakh and Himalayan. Nalabana island is the core area of the Ramsar designated wetlands of this lake. But there were about 50,000 decrease in migratory birds during 2017-2018 census compared to 2016-2017 mostly attributable to decrease in food and biodiversity of chilika lagoon.

IRRAWADDY DOLPHIN

Irrawaddy dolphin (*Orcaclla brevisostris*) are generally quite sky. All of such species can be mostly seen with their dorsal fin or a tail fluke and their life span is 30 years. It is not correct that the river Dolphin can live in estuaries and brackish water near coasts. Due to opening of Sea mouth in chilika in 2002, coupled with increase in water depth, Dolphins have reportedly recorded in more areas of the lake now. It is also interesting that one Dolphine was seen by some local fishermen during 2017 in Budha river near Adhanga ghat of jajpur district – a branch river of Baitarin . Dolphin are generally seen in single, or pairs or small groups of 4-6 individuals in the lake. Hence the presence of such species now indicates a rich piscine population in this lake. There are about 1561 dolphins scattered all over the lagoon but Satapada is now the main site. Therefore such natural habitat of enormous species in the lake is not only maintaing the ecosystem but also providing economic source to the local people through eco-tourism.

Figure 2: Showing Irrawaddy dolphin in Chilika lagoon.

ECONOMY SOURCE OF LOCAL PEOPLE THROUGH ECO-TOURISM.

Olive Ridley sea turtles - the mass nesting beach along the chilika coast is at Rushikulya of Ganjam district located at the southern Odisha coast. It spreads over 6 km of plain sandy area. There are about 20 lakh turtles nest in each season.

OBSERVATIONS

1. The inflow pattern of Chilika lagoon has been drastically disturbed by the project made by Chhattisgarh government.
2. Decrease of inflow in the river Mahanadi in to the lake has affected in shrinkage, depth, siltation and salinity regimes. It has also affected the abundance availability of fish, crab, prawns directly affecting the economic status of the local people besides increase in endangered species of feci-fauna and decrease in winter birds avi-fauna.
3. Increased infestation of weeds and wild grasses on the peripheral areas of the lake shank water area of Chilika. According to Patanaik (2000) the lake shrank by 393 sq.km between 1920-1993.
4. Opening of gates of different projects to discharge water for out flow in the river Mahanadi by Chhattisgarh government without the knowledge of Odisha govt. causes flood in catchment area of Odisha.

CONCLUSION

This eco-tourism lagoon has unique ecological status due to nutrient cycle but may be affected seriously by the construction projects of dams, barrages, weirs etc on the upstream of the river Mahanadi initiated by Chhattisgarh government. Hence conservation and management of this nature- gifted lagoon is the prime importance of Odisha government for its Research and Development program on aquaculture.

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Dr. B. C. Deb Memorial Award for Soil/Physical Chemistry – Chemical Sciences
Prof. R. C. Shah Memorial Lecture – Chemical Sciences
Dr. B. C. Deb Memorial Award for Popularisation of Science
Prof. K. P. Rode Memorial Lecture – Earth System Sciences
Dr. (Mrs.) Gouri Ganguly Memorial Award for Young Scientist – Animal, Veterinary and Fishery Sciences
Prof. G. K. Manna Memorial Award – Animal ,Veterinary and Fishery Sciences
Prof. Sushil Kumar Mukherjee Commemoration Lecture – Agriculture and Forestry Sciences
Pran Vohra Award – Agriculture and Forestry Sciences
Prof. S. S. Katiyar Endowment Lecture – New Biology/Chemical Sciences
Prof. William Dixon West Memorial Award – Earth System Sciences

* ISCA Fellows (FISC)
** Infosys Foundation – ISCA Travel Award
*** Asutosh Mookerjee Fellowship (2020-2021)

*****Last date 15th July, 2019, **Last date 15th November, 2019, *Last Date 10th Sept, 2019.**

Last date of Receiving of Nominations / Application for other ISCA Awards and Lectures of 2019-2020 is ***July 31, 2019. Contact:*** General Secretary (Membership Affairs), The Indian Science Congress Association, 14, Dr. Biresh Guha Street, Kolkata-700 017, E-mail : es.sciencecongress@nic.in. For details see: http://www.sciencecongress.nic.in/awards.php

THE INDIAN SCIENCE CONGRESS ASSOCIATION
14, Dr. Biresh Guha Street, Kolkata-700 017

ISCA Best Poster Awards Programme : 2019-2020

To encourage Scientists, The Indian Science Congress Association has instituted two Best Poster Awards in each Sections. These awards carry a sum of Rs.5,000 /- besides a Certificate of Merit.

1. Applications are invited from members **(Life, Annual & Student)** of the Association who have paid their subscription on or before **July 15, 2019**
2. Four copies of full length paper along with four copies of the abstract (not exceeding 100 words) must reach the office of the General Secretary (Membership Affairs) not later than **September 15, 2019**. At the top of each copy of the paper and its abstract, the name of the Section under which the paper is to be considered should be indicated. For details of Sections see http:// www.sciencecongress.nic.in/html/paper_presentations.php
3. Along with the Four copies of paper, Four copies of the Application Form (to be downloaded from ISCA website http://www.sciencecongress.nic.in/best_poster_awards.php) with brief bio-data of the candidate (not exceeding 2 pages), full length paper and abstract in the form of a CD must also be sent simultaneously along with the hard copies. **(In MS Word, not PDF) format.**
4. The number of authors of each poster submitted for the award shall be limited to two only. **The first author of the poster shall be the presenting author. Both the authors should be the members of the Association and have paid their subscription on or before 15th July, 2019**.
5. The research work should have been carried out in India and this has to be certified by the Head of the Institution from where the candidate is applying.
6. The candidate should give an undertaking that the paper being submitted has not been published in any journal or presented in any other Conference / Seminar / Symposium or submitted for consideration of any award.
7. A scientist shall submit only one poster in any one Section (and not a second poster on the same or any other topic in any other Section) for consideration for poster presentation award.
8. A person who has already received ISCA Best Poster Award in any section once will not be eligible to apply for the above Award in the same or any other section.
9. Incomplete Applications will not be considered.
10. Full length papers will be evaluated by experts and maximum twenty posters in each section will be selected for presentation during 107th Indian Science Congress.
11. The final selection for the Awards will be made by a duly constituted committee and the awards will be given during the Valedictory Session of 107th Indian Science Congress session on **January 7, 2020**.
12. Applications submitted for the above award will not be returned.
13. The last date for receiving applications for the above award at ISCA Headquarters is **September 15, 2019**.

All correspondences should be made to:

The General Secretary (Membership Affairs), The Indian Science Congress Association, 14, Dr. Biresh Guha St., Kolkata-700017. Tel. Nos. (033) 2287-4530/2281-5323, Fax No.91-33-2287-2551, E-mail: es.sciencecongress@nic.in/aes.sciencecongress@nic.in,Website: http: //www.sciencecongress.nic.in

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

Ashok Kumar Saxena

Date: 26/04/2019

(Ashok Kumar Saxena)
Publisher
Everyman's Science

KNOW THY INSTITUTIONS

CENTRAL RESEARCH INSTITUTE FOR JUTE AND ALLIED FIBRES (CRIJAF), BARRACKPORE

Jute Agricultural Research Laboratory (JARL) under Central Jute Commission was established in 1938 at Dhaka. After partition of the country, Jute Agricultural Research Laboratory shifted to Chinsura in West Bengal and then at the present location of Nilganj, Barrackpore in year of 1953 as Jute Agricultural Research Institute (JARI). JARI was taken over by Indian Council of Agricultural Research (ICAR) in 1966. In January 1990, the institute has been rechristened to its present name Central Research Institute for Jute and Allied Fibres (CRIJAF). To carry out research work on allied fibres and seed, the institute established four research stations viz., Ramie Research Station at Sorbhog, Assam in 1959; Sisal Research Station at Bamra, Odisha in 1962; Sunhemp Research Station at Pratapgarh, Uttar Pradesh in 1963 and Central Seed Research Station for Jute & Allied Fibres at Budbud, West Bengal in 1956.

Besides, the institute has nine (9) SAU based and six (6) ICAR institute based collaborating centres for multi-locational testing and revalidation of the technologies under All India Co-ordinated Research Projects on Jute & Allied Fibres (AICRP on JAF) now functioning as All India Network Projects on Jute and Allied Fibres (AINP on JAF). CRIJAF is the apex institute in the country to consider researches on JAF for developing production technologies to increase the productivity in a suitable manner. The research stations are in CSRSJAF BudBud, West Bengal, Sunnhemp Research Station, Pratapgarh, Uttar Pradesh , Sisal Research Station, Bamra, Odisha and Ramie Research Station, Sorbhog, Assam

MANDATE

- Basic and strategic research on improvement of jute and allied fibre crops,

biotic and abiotic stresses, yield and quality.

- Development of economically viable and sustainable production technology, cropping systems and post-harvest technology.
- Co-ordination and monitoring of applied research on national and regional issues to develop improved varieties and technologies.
- Dissemination of technologies and capacity building.

DIVISIONS/UNITS

CRIJAF operates from it's headquarter situated at Nilganj, Barrackpore, District North 24 Parganas of West Bengal. The Director is the Head of the Institute, administering its affairs assisted by the in-charge All India Network Project on Jute & Allied Fibres, Divisional and Sectional Heads for scientific matters. The Institute has three divisions viz., Crop Improvement Division, Crop Production Division and Crop Protection Division and Agricultural Extension section with well-defined sphere of research activities.

CENTRAL FACILITIES

Institute has the following central services to support with.

* Administration
* Finance & Accounts
* Library & Documentation
* PME cell
* AKMU
* Farms
* Hindi Cell
* Medical Unit
* Security and Estate

Under the administrative control of CRIJAF there are three Research Stations to deal with different allied fibre crops and one Research station to produce breeders' seed of the mandate crops.

ACHIEVEMENTS

Crop Improvement

The mandate of the division is to develop improved varieties of jute and allied fibre crops possessing with higher yield, better quality along with other traits like biotic and abiotic stress resistance, suitable for different jute and allied fibre growing areas of the country. Division of Crop Improvement covers research areas like plant genetic resources, genetics and plant breeding, biotechnology and statistics.

Crop Production

The mandate of the Division of Crop Production is to develop improved and economically viable production technologies suitable for various fibre based cropping system in different agro -eco regions for the farmers as well as to meet the industrial requirement for diversified uses. Division of Crop Production consists of four disciplines namely Agronomy, Soil science and Microbiology, Plant Physiology and Agricultural Engineering & Farm Machinery. These four disciplines work in tandem for the fulfillment of the above mentioned mandate of the Division.

- Crop Rotation
- Crop Husbandry
- Improved Post Harvest Technology
- Physiological Basis of Improving Jute Yield and Quality
- Farm Machinery and Mechanization

ACHIEVEMENTS OF AGRICULTURAL EXTENSION TRANSFER OF TECHNOLOGY

The Extension section of CRIJAF take measures to transfer the technology generated by the Institute by various means. This is done through :

- Research In the recent years studies on yield gap analysis in jute production, constraints in jute production, contribution of production factors in jute production, evaluation of jute-based cropping sequences, impact of newly developed jute varieties etc. have been conducted with special emphasis on farmer's perception

Demonstration

Technology generated at the Institute on improved production technologies on jute such as on HYV, mechanized sowing of seed, pest & disease management, fertilizer management etc. are transferred by conducting frontline demonstrations in different villages of North-24 Parganas, Hooghly, Malda, Murshidabad and Nadia districts of West Bengal. In the XIth five year plan so far we have demonstrated on 100 ha area under farmers' field. These demonstration sites serve the purpose of Technology assessment and dissemination to the participating and neighboring farmers pertaining to jute production technologies. Presently the demonstrations are being conducted in 50 ha area directly under farmers' field to motivate the farmers for quick adoption of jute production technologies

Human Resource Development/Training

This includes capacity enhancement of the extension personnel and the researchers through training . National/ state level trainings and seminars are conducted regularly for capacity enhancement of farmers, researchers and extension officials of the country with latest technical know -how. These programmes cover the entire gamut of production technologies pertaining to jute and allied fibre crops. Short duration (5 days) as well as long duration (21 days) training programmes on entrepreneurship development through diversification of jute products are also conducted on regular basis for farm women of weaker section to produce diversified products from jute fibre and marketing of the same through cooperative approach. The Institute has been successful in mobilizing financial support from the Directorate of Jute Development, Khadi Village Industries Commission and National Centre for Jute Diversification all under Govt. of India and Department of Science & Technology, Govt. of West Bengal for conducting most of the training programmes.

Other extension activities

Dissemination of information are also done by other extension activities such as conducting visits of farmers and extension agencies as exposure to improved production technologies of jute; by organising group meetings/awareness camps, farmers day, seed sale counter and visits of the farmers and the students from different Institutions and States to expose them on the latest technological innovations (at the Institute Headquarters). In addition, the Institute participated in melas/exhibitions organised by different Institutions in the country and also conducted T.V./Video programmes.

On–farm Testing

The Institute conducts programmes where the farmers and the extension personnel are exposed to the improved production technologies on jute under on-farm conditions in different villages in

North-24 Pargans, Hooghly, Malda, Murshidabad and Nadia districts of West Bengal. The package includes use of proven technologies on improved varieties, seed treatment, method of sowing, fertilization practices, weed control, pest and disease management and improved retting method.

Farmers Day/Awareness Camp/ Farmers Group Meeting

For increasing the awareness and interest of farmers towards jute and allied fibre production technologies the programmes viz. farmers day, awareness camp and group meeting s are conducted on regular basis which provides opportunity to have farmer scientists interface where the queries/problems of the farmers as the feedback a rediscussed at length.

Farmers get first hand knowledge of the technologies developed by the institute on such occasions. Farmers from various jute growing districts viz. North-24 Parganas, Hooghly Malda, Murshidabad and Nadia districts of West Bengal attend such programmes

Exposure Visits of farmers & students

The reputation of the Institute has attracted farmers, students and others interested in fibre production from various corners of the country, viz. Bihar, Orissa, Assam, Andhra Pradesh, Uttar Pradesh and Kerala, in addition from West Bengal to get themselves exposed to production technologies of jute and allied fibre crops. Such programmes are conducted by the Institute round the year.

Participation in Mela/ Exhibition

The Institute participates in melas/exhibitions, organised by different Institutions / Societies, in Bihar , Orissa, Andhra Pradesh & West Bengal depicting the technological innovations in production of jute & allied fibres. Based on the materials and quality of exhibits, and the methodology of focusing the technologies to the visiting farmers, the pavilions of the Institute has also received awards on several occasions.

Contact :

Director
ICAR-Central Research Institute for Jute and Allied Fibres
An autonomous organisation under the DARE, Ministry of Agriculture & Farmers Welfare, Government of India
Barrackpore, Kolkata 700120,
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crijaf-wb@nic.in
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CONFERENCES/MEETINGS/SYMPOSIA/SEMINARS

SECOND INTERNATIONAL CONFERENCE ON RADIATIONS AND APPLICATIONS (ICRA), SIDI-FREDJ, ALGIERS, 28-30 OCTOBER 2019.

Topics :

1. Radiation-Nucleus Interaction
- Nuclear reactions
- Nuclear structure
- Nuclear astrophysics
- NAtomic spectroscopy
- Ion surface interaction
- Cluster surface interaction

2. Nuclear Analysis Techniques
- NRA and NAA techniques
- XRF and PIXE techniques
- Irradiated materials
- Detection and instrumentation

3. Medical Physics
- Radiotherapy
- Nuclear medicine
- Radioprotection in medicine
- Diagnostic radiology with ionizing radiation

4. Nuclear Reactor Physics
- Radioisotope production
- Neutronic
- Nuclear reactor safety
- Neutron beam applications and associated techniques

5. Radiation in Industry, Life and Nature Sciences
- Industry
- Agriculture
- Environmental analysis
- Geology
- Archaeology and cultural heritage

Contact :

N. Adimi (USTHB), Scientific Secretary Email: icra2.dz@gmail.com

31ST INTERNATIONAL SYMPOSIUM ON BALLISTICS, 4TH-8TH NOVEMBER 2019, HICC HYDERABAD.

Topics :
- Interior ballistics
- Exterior ballistics
- Launch Dynamics
- Explosion Mechanics
- Terminal Ballistics
- Impact Physics
- Vulnerability & Survivability.

Contact :

MCI GeTS India Pvt. Ltd. HITEX, Second Floor, HITEX Trade Fair Office Building Izzath Nagar, Madhapur, Hyderabad 500084. Email : isb@mci-group.com

INTERNATIONAL CONFERENCE ON SOIL AND WATER RESOURCES MANAGEMENT FOR CLIMATE SMART AGRICULTURE, GLOBAL FOOD AND LIVELIHOOD SECURITY, 05-09 NOV 2019, NATIONAL AGRICULTURAL SCIENCE MUSEUM, NEW DELHI.

Topics :

1. Soil Degradation – Inventorization, Issues and Management
2. Water Resources Conservation and Management
3. Sustainable Farming System vis-à-vis Climate Change
4. Land Use Planning and Management under Changing Soil and Water Scenario
5. Biodiversity Conservation for Mitigating Climate change
6. Socio-economic and Gender issues in Natural Resource Management
7. Policy Interventions in Soil and Water Management for Global Food security
8. Bio-Industrial approaches to Watershed for Food and Livelihood Security

Contact :

Sh. Jagat Vir Singh, Secretary General, Soil Conservation Society of India, National Societies Block, G-4/A, National Agricultural Science. Centre (NASC) Complex, Dev Prakash Shastri Marg, Pusa, New Delhi-110012, INDIA. Mobile: +9-9868822627, Email: iagat53@yahoo.co.in

INTERNATIONAL CONFERENCE ON RECENT ADVANCES AND INNOVATIONS IN ENGINEERING, 27-29 NOV 2019, POORNIMA UNIVERSITY, JAIPUR.

Topics:

I Computer Science Engineering /Information Technology

II Electronics & Communication Engineering

III Electrical Engineering

Contact :

Shamsul Jamel Elias, Organizing Chair. Department of Computer Science,Universiti Teknologi MARA (UiTM) Kedah Branch,Kedah, Malaysia. Email: sjamel@gmail.com, Mobile: +60134550499

107 INDIAN SCIENCE CONGRESS, UNIVERSITY OF AGRICULTURAL SCIENCES, GKVK CAMPUS, BANGALORE, KARNATAKA, 3-7 JANUARY, 2020

Focal Theme - Science & Technology : Rural Development

Sections :

- Agriculture and Forestry Sciences
- Animal, Veterinary and Fishery Sciences
- Anthropological and Behavioural Sciences (including Archaeology and Psychology & Educational Sciences)
- Chemical Sciences
- Earth System Sciences
- Engineering Sciences
- Environmental Sciences
- Information and Communication Science & Technology (including Computer Sciences)
- Material Sciences
- Mathematical Sciences (including Statistics)
- Medical Sciences (including Physiology)
- New Biology (including Biochemistry, Biophysics & Molecular Biology and Biotechnology)
- Physical Sciences
- Plant Sciences

Contact :

General Secretary (Membership Affairs), Indian Science Congress Association, 14 Dr Biresh Guha Street, Kolkata-700017, Phone : 033 22874350, Fax 033 22872551. Email : es.sciencecongress@nic.in, aes.sciencecongress@nic.in, website sciencecongress.nic.in

S&T ACROSS THE WORLD

PHOTOACOUSTIC MICROSCOPY CAPTURES VARIATION WITHIN TUMOURS

A method to determine the metabolic activity of thousands of individual cells per hour *in vitro* has been demonstrated by researchers in the US. The team used photoacoustic spectroscopy, in which laser pulses generate an ultrasound signal upon absorption by specific molecules, to measure the degree of oxygen saturation in haemoglobin. Improving significantly on the throughput rate of existing measurement techniques, the new method could give clinicians a more complete picture of tumour heterogeneity, leading to more accurate diagnoses and personalized cancer therapies (*Nature Biomed. Eng.* 10.1038/s41551-019-0376-5).

One way in which cancer cells differ from healthy cells is in their rate of oxygen consumption. Fast-growing cancers are sustained by correspondingly fast metabolisms, prompting treatments that target cellular metabolic processes. There is a challenge in the fact that cancers, although originating from a single mutated cell, acquire further mutations as they proliferate and can differentiate into a variety of cell types. This means that a typical tumour comprises a diversity of genotypes and phenotypes, and it cannot be assumed that a given treatment will affect the whole tumour equally. Oncologists, then, need a way to determine in detail the range of metabolic characteristics present in a tumour.

Addressing this issue, two collaborating teams led by Jun Zou at Texas A&M University and Lihong Wang at California Institute of Technology have described a way to profile several thousand tumour cells at a time. First, the researchers created an array of microwells, each of which was large enough to hold a single cell and some blood to supply oxygen. The team populated some of these microwells with non-cancerous cells derived from a mouse, some with cells from a human lung-cancer culture, and others with cells from tumours excised from breast-cancer patients.

When the researchers illuminated the microwells with 532 and 559 nm lasers, the energy absorbed by the cells was converted into a pulse of ultrasound that was picked up by an ultrasonic transducer. Oxygenated and deoxygenated haemoglobin have distinct absorption profiles at the two frequencies used, so the team could translate the ultrasound signal into a measure of oxygen saturation. Making one measurement at the start of the experiment and another 15 minutes later, the researchers determined the rate of oxygen consumption for each individual cell.

As predicted, the healthy cells exhibited lower metabolic rates on the whole than the cancer cells. And while the healthy cells showed a near-normal distribution, the metabolic rates of the cancer cells were more chaotically distributed, indicating a high degree of heterogeneity.

The cells also differed in how they responded to hypoxia, which the researchers investigated by supplying healthy and lung-cancer cells with relatively deoxygenated blood. The metabolic rates of both cultures decreased when starved of oxygen, but the effect was more pronounced in the healthy cells. This might seem paradoxical given cancer cells' usual metabolic profligacy, but Zou has an explanation.

"Because cancer cells consume more oxygen, cells buried deep inside a tumour can sometimes face an insufficient supply, and tend to develop a better adaptation to hypoxia," says Zou. "This is just like weeds. When dry, they don't die. When wet, they grow like crazy."

Hypoxia within tumours is associated with resistance to chemotherapy and radiotherapy, so a better understanding of cancer cells' behaviour under such conditions is vital. Characterizing the metabolic rate of large numbers of individual cells could also yield information about treatment progress and likely success. Measuring tumour cells' activity after an initial round of therapy, for example, could indicate whether a tumour is resistant or sensitive to treatment, informing subsequent clinical decisions. Focusing on cancer cells circulating in blood, meanwhile, can help predict a tumour's metastatic potential, which is linked to cellular metabolic rate.

"We expect the work could have a huge impact on personalized cancer treatment and the development of new cancer drugs," says Zou. "Furthermore, the entry barrier entry for this technology is low, so it could be used widely."

(Source : https://physicsworld.com)

SINGLE-ATOM IMAGING COULD HELP SEARCH FOR NEUTRINOLESS DOUBLE BETA DECAY

A new technique to enable the detection of a hypothetical process called neutrinoless double beta decay has been developed by an international team of physicists. Their technique involves probing a large sample of xenon for nuclei created by the decay process. If neutrinoless double beta decay is indeed spotted, it could have profound consequences for our understanding of the universe.

One of the central questions in particle physics is whether neutrinos are their own antiparticles. If they are, neutrinoless double beta decay – which is forbidden by the Standard Model of particle physics – should be possible. Several experiments are therefore competing to detect or rule out this exotic decay, which is predicted to be extremely rare.

Beta decay covers a family of processes that involve the emission of neutrinos (or antineutrinos) by a nucleus. One common beta-decay process involves a neutron in a nucleus transforming to a proton by the emission of an electron and an electron antineutrino. If neutrinos are there own antiparticles, the emitted electron antineutrino can then be absorbed as a neutrino by another neutron in the nucleus – leading to a second beta-decay and emission of another electron. While there is no overall emission of neutrinos, the nucleus has undergone a double beta decay and is left with two additional protons.

Explaining neutrino mass

Neutrinos being their own antiparticles could help explain why neutrinos have mass – something that is not explained by the Standard Model of particle physics. "We have to find mechanisms to generate neutrino mass," explains theoretical particle physicist Werner Rodejohann of the Max Planck Institute for Nuclear Physics in Heidelberg: "The vast majority of these mechanisms predict neutrinos to be their own antiparticles."

Rodejohann continues, "In the Standard Model without neutrino mass, you would have the same amount of matter and antimatter produced in the early Universe. These would then have annihilated leaving a Universe with only radiation. But since we are here, we know that something must have allowed a small asymmetry between matter and antimatter. Seeing neutrinoless double beta decay would confirm a lot of our ideas about how something survived." Observing this, however, is extremely difficult.

The Enriched Xenon Observatory (EXO) in New Mexico looks for neutrinoless double beta decay in 200 kg of liquid xenon enriched in xenon-136, which is a neutron-rich nucleus that is considered a prime candidate for the process. The idea is that the two high-energy electrons emitted in the

decay process ionize other xenon atoms, producing an electron shower that can be detected.

Search for barium

One challenge facing EXO physicists is how to distinguish these exceedingly rare events from other types of radioactive decay that can also produce a shower of electrons. The solution, according to William Fairbank of Colorado State University and colleagues, is to look for the barium-136 nucleus that is produced by the double beta decay of xenon-136. "None of the other likely background decays would produce a barium-136 atom at the decay site," he explains.

Fairbank and colleagues have therefore developed a technique to retrieve single barium ions from a tank of liquid xenon using a cryogenic solid xenon probe with a small sapphire window on the end. They showed that barium ions can then be identified using laser spectroscopy. The researchers suggest that further development of the technique may provide a means to suppress the background signal in their next experiment – which will be called nEXO and will contain five tonnes of enriched xenon.

Another challenge facing the researchers is that xenon-136 in known to undergo conventional double beta decay. This is an extremely rare process that produces two electrons and two antineutrinos. Identification of a barium ion would prove only that double beta decay had taken place, not that it was neutrinoless. To further discriminate between the two processes, the energy of the emitted electrons must also be measured to work out if some energy has been taken away by the two neutrinos. The researchers calculate that, in the energy range of interest, there is about a 50% chance of detecting a two-neutrino double beta decay would be expected in the ten years that nEXO is expected to run.

Particle physicist Ben Jones of the University of Texas at Arlington — one of the leaders of the NEXT (Neutrino Experiment with Xenon TPC) collaboration – which searches for neutrinoless double beta decay using high pressure xenon gas, describes the nEXO team's ability to detect barium atoms as "a very substantial advance". He adds, "So far every experiment to detect this decay has been limited by backgrounds from other radioactivity. The detection of single barium ions could reduce backgrounds to a negligible level, which would be really paradigm shifting for the field." However, Jones cautions that there is still much more work to be done before the technique is viable.

The research is described in *Nature* **569**, 203–207, 2019.

GENE EDITING CREATES MICE WITH TWO BIOLOGICAL DADS FOR THE FIRST TIME

For the first time, researchers have created mice with two dads. No female contributed to the rodents' genetic makeup.

This unusual reproduction took place in a lab where researchers gathered fathers' stem cells, and used them to produce embryos that were implanted into surrogate mothers. The technique required scientists to edit the animals' genes in order for the mice to mature enough to be born. Even so, mouse pups with only fathers died a few days after birth, researchers report October 11 in *Cell Stem Cell*. By contrast, previous research and this study have shown that some gene-edited mice with only mothers can survive to adulthood and have offspring of their own.

The researchers did the experiments to learn why mammals can reproduce only sexually — requiring two parents of the opposite sex — while other vertebrates, including turkeys, snakes and

sharks, can sometimes reproduce with only one parent, says study coauthor Qi Zhou of the Chinese Academy of Sciences in Beijing. Females of those species can sometimes cause an unfertilized egg to produce offspring, a process called parthenogenesis.

Researchers have previously made zebrafish with only an individual father's DNA. But no one before now has reported achieving male-only reproduction, or androgenesis, with mammals.

In the new work, mouse pups with two mothers were smaller than usual and had other abnormalities, the researchers found. Those deficits happened because some genes that the pups inherited from their mothers were imprinted, or marked with molecules known as methyl groups that are attached to DNA in spots near the gene. Imprinting may cause some genes to be more active and others less active.

So the researchers used a molecular scissors known as CRISPR/Cas9 to snip out three imprinted regions near important genes in stem cells that were then used to produce embryos. Of 210 of these embryos implanted in surrogate mothers, about 14 percent were born. Those gene-edited pups grew normally and became adults with normal fertility.

To even get embryos made from two dads' stem cells to form, the researchers had to snip out six imprinted pieces of DNA. Still, only 1.2 percent of 1,023 embryos with the six edits produced pups. Those pups were twice the size of normal pups and died soon after birth. Cutting out a seventh imprinted region resulted in pups of normal size, but only two pups lived more than 48 hours and neither survived to adulthood.

Still, the work is an important first step in understanding what the imprinted regions do during normal development, says B. Duygu Özpolat, a developmental biologist at the Marine Biological Laboratory in Woods Hole, Mass., who was not involved in the work.

That knowledge might help correct birth defects caused by imprinting errors, she says.

Making mammals from single sex parents might also help endangered species that have animals of only one sex left, Özpolat says. For instance, the last male northern white rhinoceros died earlier this year, leaving only two females (*SN: 8/4/18, p. 8*). Gene editing might help researchers bring white rhinos back by making all-female populations from lab grown stem cells.

"It might be too expensive, and might not work for every species, but it's something," Özpolat says. As for human same sex couples hoping to have a biological baby together, she says, "that's the far future for the moment."

Zhou adds that it could be too dangerous to try the technique in people. There's no guarantee that the imprinted regions involved in mouse reproduction are the same ones involved in human reproduction. At any rate, he says, "to apply this technique into human is not one of our goals."

(Source : https://www.sciencenews.org)

DYING STARS CALLED COLLAPSARS MAY FORGE MUCH OF THE UNIVERSE'S GOLD

The gold in your favorite jewelry could be the messy leftovers from a newborn black hole's first meal.

Heavy elements such as gold, platinum and uranium might be formed in collapsars — rapidly spinning, massive stars that collapse into black holes as their outer layers explode in a rare type of supernova. A disk of material, swirling around the new black hole as it feeds, can create the conditions necessary for the astronomical

alchemy, scientists report online May 8 in *Nature*.

"Black holes in these extreme environments are fussy eaters," says astrophysicist Brian Metzger of Columbia University, a coauthor of the study. They can gulp down only so much matter at a time, and what they don't swallow blows off in a wind that is rich in neutrons — just the right conditions for the creation of heavy elements, computer simulations reveal.

Astronomers have long puzzled over the origins of the heaviest elements in the universe. Lighter elements like carbon, oxygen and iron form inside stars, before being spewed out in stellar explosions called supernovas. But to create elements further down the periodic table, an extreme environment densely packed with neutrons is required. That's where a chain of reactions known as the r-process can occur, in which atomic nuclei rapidly absorb neutrons and undergo radioactive decay to create new elements.

Scientists had suspected that when two dead stars known as neutron stars collide, the r-process could occur in material churned up by the merger. Astronomers recently clinched the case for that idea when they spotted a collision between two neutron stars that produced spacetime ripples known as gravitational waves and light. The fireworks show revealed signs of the formation of a medley of heavy elements including gold, silver and platinum (*SN: 11/11/17, p. 6*).

The neutron star explanation has shortcomings, though. These dense dead stars can take a long time to coalesce. But heavy elements have been found in ancient stars that formed early in the universe's history. It's not clear whether a neutron star merger could happen fast enough to explain the elements' presence in those early stars.

Collapsars, however, can occur shortly after stars begin to form. And the phenomenon could be a prolific producer of heavy elements. A single collapsar might generate 30 times as much r-process material as a neutron star merger, and could generate a few hundred times the Earth's mass in gold, Metzger says. The researchers report that collapsars might be responsible for 80 percent of the r-process elements in the universe, with neutron star mergers making up the rest.

The study sheds new light on the 2016 discovery that a dwarf galaxy called Reticulum II experienced a cataclysm early in the history of the universe that left r-process elements in its stars (*SN: 5/14/16, p. 9*). Scientists had proposed that an ancient neutron star merger seeded the galaxy with those elements. Now, a collapsar is another candidate.

"It's very exciting," says astrophysicist Anna Frebel of MIT, a coauthor of the 2016 study. Neutron star mergers are rare, so "it felt a little bit like we were proposing to win the lottery." But collapsars are about 10 times as rare, so if they are the explanation, "it feels like we've won the lottery twice."

But it's still not clear if collapsars happen frequently enough, or if they produce the right amount of material, to explain the abundances of heavy elements seen in the universe. "I think the jury's still out," says astrophysicist Alexander Ji of Carnegie Observatories in Pasadena, Calif., who coauthored the 2016 paper on Reticulum II.

"Now we're really excitedly thinking about how you might be able to tell the difference" — whether collapsars or neutron stars better explain galaxies like Reticulum II, Ji says. Future observations of the aftermath of the supernovas produced by collapsars could also help nail down their role.

(Source : https://www.sciencenews.org/article)

भारतीय विज्ञान कांग्रेस संस्था

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

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सदस्यता की शर्तें और सदस्यों की विशेषाधिकार :

संस्था की सदस्यता उन सभी लोगों के लिए खुली हैं, जो स्नातक या उसके समान स्तर पर शैक्षणिक योग्यता अर्जन कर चुके हैं, और जिन्हें भारत में विज्ञान की तरक्की में रूचि हैं।

1. **वार्षिक सदस्य :** जो व्यक्ति नये रूप से वार्षिक सदस्यता ग्रहण करना चाहता है उसे वार्षिक सदस्यता शुल्क ₹ 200/- के साथ भर्ती शुल्क ₹ 50/-* (विदेशियों के लिए** U.S. $ 70) मात्र देने पड़ेंगे। वार्षिक सदस्यता शुल्क प्रत्येक वर्ष के 01 अप्रैल को देय हो जाएगा। जो भी 15 जुलाई के भीतर अपनी सदस्यता शुल्क नहीं अदा कर पाएगा वह उस साल के लिए अपनी वोट देने की क्षमता से वंचित हो जाएगा और/या वह उस वर्ष के लिए संस्था के कार्यालय को भी नियंत्रण नहीं कर पाएगा। वार्षिक सदस्य अपनी सदस्यता दोबारा अगले साल 15 जुलाई के भीतर बिना शुल्क दिए पुन: अपनी सदस्यता प्राप्त कर सकता हैं।

   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।

2. **सत्र सदस्य :** यदि कुछ कारणों से वार्षिक सदस्य अपनी सदस्यता उस वर्ष के 15 जुलाई के अंदर दोहराना भूल जाएँ, तो उनकी सदस्यता, सत्र सदस्यता के रूप में बिना वोट डालने की क्षमता में सीमित कर दिया जाएगा। सत्र सदस्यको ₹ 200/- (विदेशियों के लिए $ 50) अदा करना पड़ेगा। एक सत्र सदस्य को लेख/पोस्टर प्रस्तुतीकरण का अधिकार प्राप्त होगा जिस कांग्रेस सत्र का वह सदस्य हैं। एक सत्र सदस्य वोट प्रक्रिया में भाग लेने के योग्य नहीं हैं। सत्र सदस्य को विभागों के व्यवसाय बैठकों और साधारण बैठकों में भाग लेने की योग्यता प्राप्त नहीं हैं।

3. **छात्र सदस्य :** जो व्यक्ति स्नातक स्तर से नीचे पढ़ाई कर रहा हैं, उसे वार्षिक सदस्यता शुल्क ₹ 100/- मात्र देने पड़ेंगे अपना नाम छात्र सदस्य के रूप में लिखवाने के लिए, बशर्ते उसके आवेदन पत्र पर उसके प्राचार्य/विभागाध्यक्ष/संस्थान के प्रधान के हस्ताक्षर हों। एक छात्र सदस्य को यह अधिकार दिया जाएगा, कि वह अपना पेपर कांग्रेस सत्र के समय पेश कर सकें, बशर्ते वह पेपर वह किसी वार्षिक सदस्य या संस्था के कोई अवैतनिक सदस्य के साथ पेश करें। उसे वोट करने का या कार्यालय को नियंत्रण करने का अधिकार प्राप्त नहीं होगा। छात्र सदस्य को विभागों के व्यवसाय बैठकों में भाग लेने की योग्यता प्राप्त नहीं हैं।

4. **आजीवन सदस्य :** एक सदस्य अपने भविष्य की सारी वार्षिक सदस्यता शुल्क एक बार में ₹ 2,000/- (विदेशियों के लिए U.S. $ 500) मात्र अदा करके पा सकता हैं। एक व्यक्ति जो 10 साल या उससे अधिक नियमित रूप से सदस्यता प्राप्त कर चुका है, उसे उसकी संयुक्त सदस्यता शुल्क के ऊपर प्रतिवर्ष ₹ 50/- की छूट दी जाएगी, बशर्ते कि उसकी संयुक्त शुल्क ₹ 1,200/- से नीचे न हों (विदेशियों के लिए U.S. $ 12.50 और U.S. $ 300 क्रमश:)। एक आजीवन सदस्य को उसके पूरे जीवन काल में सदस्यता की सारे विशेषाधिकार प्राप्त होंगे।

5. **संस्थान सदस्य :** एक संस्थान जो ₹ 5,000/- सदस्यता शुल्क के रूप में दे वही संस्था के संस्थान सदस्य उस वित्तीय वर्ष के लिए बन सकता है, (विदेशियों के लिए U.S. $ 2,500)। इसमें वह विज्ञान कांग्रेस के वार्षिक सत्र में अपने एक व्यक्ति का नाम नामांकित कर सकता हैं, जो उनका प्रतिनिधि हों। एक संस्थान सदस्य 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।

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।

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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।

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

(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।

(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।

(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।

(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।

(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।

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।

भारतीय विज्ञान कांग्रेस संस्था

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

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सदस्यता के लिए नया आवेदन पत्र

सेवा में

महासचिव (सदस्यता कार्य)
भारतीय विज्ञान कांग्रेस संस्था
14, डॉ० बिरेश गुहा स्ट्रीट,
कोलकाता-700 017

स्टैम्प आकार का फोटो

महोदय,

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।

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

मैं निम्नलिखित विभाग में रुचि रखता/रखती हूँ (कृपया किसी एक में निशान लगाएँ)।

विभाग

1. कृषि और वानिकी विज्ञान
2. पशु, पशुचिकित्सा और मत्स्य विज्ञान
3. मानवशास्त्रीय और व्यवहारपरक विज्ञान (जिसमें सम्मिलित, हैं, पुरातत्व-विज्ञान, मनोविज्ञान, शैक्षिक विज्ञान और सेना विज्ञान)
4. रसायन विज्ञान
5. भू-पद्धति विज्ञान
6. अभियन्ता विज्ञान
7. पर्यावरण विज्ञान
8. सूचना और संचारण विज्ञान और प्रौद्योगिकी (जिसमें कंप्यूटर विज्ञान भी सम्मिलित है)
9. भौतिक विज्ञान
10. गणित विज्ञान (जिसमें सांख्यिकीय सम्मिलित है)
11. चिकित्सा शास्त्र (जिसमें शरीर विज्ञान भी सम्मिलित है)
12. नया जीवविज्ञान (जिसमें जीव रसायन, जीव भौतिकी और आणविक जीवविज्ञान और जीव-प्रौद्योगिकी भी सम्मिलित है)

13. भौतिकीय विज्ञान
14. वनस्पति विज्ञान

(कृपया टंकित करें या ब्लॉक अक्षरों में भरें)

नाम (ब्लॉक अक्षरों में) :

श्री/सुश्री/श्री/श्रीमती/डॉ०/प्रो० (कृपया टिक करें)

कुलनाम प्रथम नाम मध्य नाम

शैक्षणिक योग्यता :

(अंतिम शैक्षणिक योग्यता प्रमाण-पत्र अंक-सूची का स्वत:सत्यापित जिराक्स प्रति संलग्न करना है)

पदनाम

सम्पर्क का पता :

(राज्य, शहर/नगर और पिन कोड सहित)

दूरभाष संख्या/मोबाईल संख्या और ई-मेल :

किसी भी सरकारी अनुमोदित पहचान पत्र (अनिवार्य) :

वर्तमान वर्ष विश्वविद्यालय प्रवेश-पत्र :

स्थायी पता :

दिनांक : भवदीव

हस्ताक्षर

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।

(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।

(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।

(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।

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

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

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

THE INDIAN SCIENCE CONGRESS ASSOCIATION

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

Telephone : (033) 2287-4530, 2281-5323
Fax : 91-33-2287-2551
Website : http://sciencecongress.nic.in
E-mail : es.sciencecongress@nic.in

Terms of Membership and Privileges of Members :

Membership of the Association is open to person with Graduate or equivalent Academic Qualifications and interested in the advancement of Science in India.

1. **Annual Member :** A person willing to be enrolled as new Annual Member has to pay an annual subscription of ₹ 200/- along with an admission fee of ₹ 50/-* (for foreign** U.S.$ 70) only. The annual subscription of a Member shall become due on the 1st April of each year. Anyone who fails to pay the subscription on or before the 15th July in any year shall lose the right of voting and/or holding any office of the Association for that year. A member failing to pay the annual subscription by the end of March of the following year shall cease to be a Member. Annual members can renew their Membership without paying the admission fee in the next year by remitting subscriptions in time i.e. within 15th July. Members may contribute papers for presentation at the Science Congress. They will receive, free of cost, reprints of the Proceedings of the Session of any one section of their interest and also the bi-monthly journal of the Association Everymans Science for that year only. For Renewal of Membership please download the form from ISCA website.
2. **Sessional Member :** If for some reasons, Annual Members fail to renew their Membership by remitting subscription prior to 15th July each year, their Membership for the year would be restricted to Sessional Membership without voting right. Sessional Member has to pay ₹ 200/- (for foreign $50). A Sessional Member shall have the right to present paper/poster at the session of the congress of which he/she is a member. A Sessional Member shall not be eligible to participate in the voting process. A Sessional member shall not be eligible to participate in the Business meetings of the Sections and the General Body.
3. **Student Member :** A person studying at the under-graduate level may be enrolled as a Student Member by paying an annual subscription of ₹ 100/- **only provided his/her application is duly certified by the Principal/Head of the Institution/Department.** A student member shall have the right to submit papers for presentation at the Session of the Congress of which he/she is a member, provided such papers be communicated through a Member, or an Honorary Member of the Association. He/She shall not have the right to vote or to hold any office. A student member shall not be eligible to participate in the Business Meetings of the Sections and the General Body.
4. **Life Member :** A Member may compound all future annual subscriptions by paying a single sum of ₹ 2,000/- (for foreign** U.S. $ 500) only. Any person who has been continuously a member for 10 years or more, shall be allowed a reduction in the compounding fee of ₹ 50/- for every year of such membership, provided that the compounding fee shall not be less than ₹ 1,200/- (for foreign** U.S. $ 12.50 and U.S. $ 300 respectively). A life Member shall have all the privileges of a member during his/her lifetime.

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. **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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* *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.*

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

(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.

(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.

(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.

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

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

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.

THE INDIAN SCIENCE CONGRESS ASSOCIATION

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Application Form For New Membership

To

The General Secretary (Membership Affairs)
The Indian Science Congress Association
14, Dr. Biresh Guha Street,
Kolkata-700 017

Stamp Size Photograph

Dear Sir,

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)

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_____.

I am interested in the following section (Please tick any one).

Sections

1. Agriculture and Forestry Sciences
2. Animal, Veterinary and Fishery Sciences
3. Anthropological and Behavioural Sciences (including Archaeology, Psychology, Education and Military Sciences)
4. Chemical Sciences
5. Earth System Sciences
6. Engineering Sciences
7. Environmental Sciences
8. Information and Communication Science & Technology (including Computer Sciences)
9. Materials Science
10. Mathematical Sciences (including Statistics)
11. Medical Sciences (including Physiology)
12. New Biology (including Bio-Chemistry, Biophysics & Molecular Biology and Biotechnology)

13. Physical Sciences

14. Plant Sciences

(Please type or fill up in Block Letters)

Name (in Block Letters) :

Mr./Ms./Shri/Shrimati/Dr./Prof (Please tick)

Surname First Name Middle Name

Academic Qualifications :

Self attested xerox copy of last educational certificate/marksheet must be attached)

Designation

Address of communication :

(including state, city/town and pin code)

Phone No./Mobile Number & E-mail :

Any Govt. approved ID Card (Mandatory) :

Current Year University Admit Card :

Permanent Address :

Date : Yours Faithfully

Signature

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

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

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REMINDER

TO
ALL ANNUAL MEMBERS (2018-19)

RENEWAL OF ANNUAL MEMBERSHIP SUBSCRIPTION FOR 2019-2020

Dear Sir/Madam,

1. Kindly fill up the renewal form given on the opposite page and remit R 200/- by Bank Draft on a Kolkata Bank in favour of "The Indian Science Congress Association" to renew your membership for 2019-2020. No Cheque, Postal order or Money order will be accepted by ISCA.
2. For exercising **Voting Right** the enrolment of Annual Membership is required to be made by **July 15, 2019**. Subscription received after July 15, 2019 will be treated as Sessional Member.
3. Last date of receiving **full papers along with 3 copies of Abstracts** for presentation at the **107th Session of Indian Science Congress** to be held from 3-7 January, 2020 is **September 15, 2019.**
4. As per the resolution of the **Executive Committee** in its meeting held on **October 15, 2011,** 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'.
5. While sending your subscription, **Please quote your last year (i.e. 2018-2019 only) Annual membership number.**

If your subscription is already remitted, please ignore this letter.

Yours faithfully

Prof. Gangadhar
General Secretary
(Membership Affairs)

N.B. : Sending of membership subscription without the duly filled in renewal form will not be accepted.

The Indian Science Congress Association

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E-mail : es.sciencecongress@nic.in

Dated :———————

APPLICATION FOR RENEWAL OF ANNUAL MEMBERSHIP SUBSCRIPTION FOR 2019-2020

Annual Membership Number :
(Last Year i.e. 2018-2019 only)

Name : Middle Name : Surname :

Affiliation :

Present Address (only for persons changing the address)

*If there is any change in the address as given earlier in your application, please state the original address mentioned previously.

Original Address :

+Enclosed Bank draft No. ..... dt. ..... of ₹ 200 (two hundred only)

Signature of the Applicant

Date : _____ Contact No : _____

+in favour of *"The Indian Science Congress Association"* payable at any branch of Bank in Kolkata.

The Indian Science Congress Association
14, Dr. Biresh Guha Street,
Kolkata- 700 017

TO
ALL MEMBERS (with Voting Right)
for 2019-2020

Re : *Election of Members to the Executive Committee and the Council for 2020-2021*

Dear Sir/Madam,

I would invite your attention to Regulations 9. (A) & (B) and 13. (A) (iv) & (B) of The Indian Science Congress Association which provide that the General Body (consisting of all Members with voting right and Honorary Members of the Association) shall elect ten members to the Executive Committee and seven members to the Council from amongst its Members (with voting rights). You are entitled to propose the name of one Member (with voting right for 2019-2020) for election to each body for the year 2020-2021. Such a proposal, **along with consent of the nominee,** must reach the undersigned on or before the **10th September, 2019**.

The nominee shall have the right to withdraw his/her nomination by writing to the General Secretary (Membership Affairs) by 25th September, 2019.

A list of persons who are ex-officio members of Executive/Council is given on the reverse. These names need not be proposed for the Council.

You will appreciate that owing to various reasons, it is not possible to send at present any printed copy of the *List of Members* enrolled till July 15, 2019, the last date for enrolment of members with rights of voting or holding any office of the Association. You would no doubt satisfy yourself about the membership of your nominee(s), if necessary, by reference either to the nominee(s) or to the office of the Association.

Your faithfully

(Dr. S. Ramakrishna)
General Secretary (Membership Affairs)

July 2, 2019.

OFFICE-BEARERS FOR 2019-2020

Prof. K. S. Rangappa	—	Ph.D., D.Sc., F.N.A.Sc., F.R.S.C.	—	General President
Dr. S. Ramakrishna	—	M.Sc., M.Phil., Ph.D.	—	General Secretary (Membership Affairs)
Dr. Anoop Kr. Jain	—	B.Ed., LL.B., M.Sc., Ph.D.	—	General Secretary (Scientific Activities)
Dr. Sheo Satya Prakash	—	M.Sc., Ph.D.	—	Treasurer

EX-OFFICIO MEMBERS OF THE EXECUTIVE COMMITTEE / COUNCIL FOR 2020-2021

Dr.(Mrs.) Vijay Laxmi Saxena	—	M.Sc., Ph.D.	—	General President (2020-2021)
Prof. K. S. Rangappa	—	Ph.D., D.Sc., F.N.A.Sc., F.R.S.C.	—	General President (2019-2020)
Dr. S. Ramakrishna	—	M.Sc., M.Phil., Ph.D.	—	General Secretary (Membership Affairs) (2019-2022)
Dr. Anoop Kr. Jain	—	B.Ed., LL.B., M.Sc., Ph.D.	—	General Secretary (Scientific Activities) (2019-2022)
Dr. Sheo Satya Prakash	—	M.Sc., Ph.D.	—	Treasurer (2019-2022)

Past General Presidents of the Association

Dr. M. S. Swaminathan, Ph.D., F.N.A., F.R.S.

Prof. R. P. Bambah, Ph.D.(Cantab), Sc.D. (Cantab), F.N.A.Sc., F.A.Sc., F.N.A.

Prof. C. N. R. Rao, D.Sc., Ph.D., F.N.A., F.N.A.Sc., F.A.Sc., F.R.S.

Prof. D. K. Sinha, Ph.D., F.N.A.Sc., F.I.M.A. (UK)

Dr. S. K. Joshi, Ph.D., F.A.Sc., F.N.A.

Prof. P. Rama Rao, Ph.D., F.A.Sc., F.N.A.

Dr. (Mrs.) Manju Sharma, Ph.D., F.N.A.Sc.

Dr. R. A. Mashelkar, Ph.D., F.A.Sc., F.N.A.

Dr. R. S. Paroda, Ph.D., D.Sc.(h.c.), F.N.A.

Dr. K. Kasturirangan, Ph.D., D.Sc.(h.c.), F.N.A., F.A.Sc., F.N.A.Sc., F.N.A.E.

Prof. Asis Datta, Ph.D., D.Sc., F.N.A., F.A.Sc., F.N.A.Sc., F.T.W.A.S.

Prof. N. K. Ganguly, M.D., D.Sc.(h.c.), F.R.C.Path (London), F.A.M.S., F.N.A., F.A.Sc., F.N.A.Sc., F.T.W.A.S.(Trieste, Italy), F.I.A.C.S. (Canada)

Prof. Harsh Gupta, Ph.D., F.N.A., F.N.A.Sc., F.T.W.A.S.

Prof. R. Ramamurthi, Ph.D., D.Sc., F.N.A., F.N.A.Sc., F.N.A.A.S., F.A.P.A.S.

Dr. T. Ramasami, M.Tech., Ph.D., F.N.A., F.A.Sc., F.T.W.A.S.

Dr. G. Madhavan Nair, D.Sc., F.N.A.E., F.N.A.S.

Prof. K. C. Pandey, Ph.D., D.Sc.

Prof. Geetha Bali, M.Sc., Ph.D., F.N.A.Sc.

Dr. Manmohan Singh, Ph.D.

Prof. Dr. Ranbir Chander Sobti, Ph.D., D.Sc., F.N.A., F.N.A.Sc,. F.N.A.A.S., F.A.M.S., F.Z.S., F.P.A.S., F.S.C.G.

Dr. Ashok Kumar Saxena, M.Sc., Ph.D.

Prof. D. Narayana Rao – Ph.D., F.N.A.Sc., F.I.E.T.E., F.A.P.A.S.

Dr. Achyuta Samanta – M.Sc., Ph.D.

Dr. Manoj Kumar Chakrabarti — M.Sc., Ph.D., F.A.Sc.T., F.N.A.Sc.

Past General Secretaries of the Association

Prof. D. K. Sinha, Ph.D., F.N.A.Sc., F.I.M.A. (UK)

Dr. (Miss) Shashi Prabha Arya, Ph.D., D.Sc., F.N.A.Sc., F.I.M.A. (UK)

Prof. H. P. Tiwari, Ph.D.

Prof. S. P. Mukherjee, Ph.D., F.N.A.Sc.

Dr. (Mrs.) Yogini Pathak, Ph.D.

Prof. Uma Kant, Ph.D., F.B.S.

Prof. B. Satyanarayana, Ph.D., F.M.S., F.A.P.A.Sc.

Prof. B. P. Chatterjee, Ph.D., F.A.Sc.T., F.N.A.Sc.

Prof. S. P. Singh, Ph.D.

Prof. Avijit Banerji, Ph.D., F.A.Sc.T.

Dr. Ashok Kumar Saxena, M.Sc., Ph.D.

Dr. (Mrs.) Vijay Laxmi Saxena, Ph.D.

Dr. Manoj Kumar Chakrabarti, M.Sc., Ph.D., F.A.Sc.T., F.N.A.Sc.

Dr. Nilangshu Bhusan Basu, B.E., M.C.E., Ph.D., F.I.E., F.I.P.H.E., F.I.V., F.I.S.

Prof. Arun Kumar, Ph.D.

Prof. Gangadhar – M.Sc., Ph.D., F.Z.S.I.., F.S.E.Sc.

Prof. Premendu P.Mathur – M.Sc., Ph.D., F.A.M.S.

Past Treasurers of the Association

Prof. D. K. Sinha, Ph.D., F.N.A.Sc., F.I.M.A. (UK)

Prof. S. P. Mukherjee, Ph.D., F.N.A.Sc.

Dr. S. B. Mahato, Ph.D., F.I.C., F.R.Sc., F.A.Sc.T.

Prof. B. P. Chatterjee, Ph.D., F.A.Sc.T., F.N.A.Sc.

Prof. Avijit Banerji, Ph.D., F.A.Sc.T.

Dr. Nilangshu Bhusan Basu, B.E., M.C.E., Ph.D., F.I.E., F.I.P.H.E., F.I.V., F.I.S.

Prof. Dhyanendra Kumar, M.Sc., Ph.D.

Prof. Ranjit K. Verma – M.Sc., Ph.D., F.I.C.(I), M.I.C.T.A., F.I.C.S., F.I.C.C., M.C.R.S.I., M.I.T.A.S.

Regulations 9. (D) – Ten elected Members as in 9. (A) who have served on the Executive Committee for three successive years, shall not be eligible for election as Members of the Executive Committee for a period of two years thereafter.

Prof. M. Bhupathi Naidu, Tirupati would be completing his three-years period of membership in March, 2020 in the Executive Committee and are not, therefore eligible for re-election in the Executive Committee for 2020-2021 & 2021-2022.

Mrs. Kumkum Swarup, Kanpur completed her three-years period of membership in March, 2019 in Executive Committee and are not, therefore eligible for re-election in the Executive Committee for 2020-2021.

Regulations 13. (D) – Seven elected Members as in 13. (A)(iv) who have served on the Council for three successive years, shall not be eligible for election as Members of the Council for a period of two years thereafter.

Prof. Sunil Prakash Trivedi, Lucknow & Dr. M. G. Ragunathan, Chennai would be completing their three-years period of membership in March, 2020 in the Council and is not, therefore eligible for re-election in the Council for 2020-2021 & 2021-2022.

Mr. Gauravendra Swarup, Kanpur completed his three-years period of membership in March, 2019 in the Council and are not, therefore eligible for re-election in the Council for 2020-2021.

GUIDELINES FOR SUBMISSION OF MANUSCRIPTS

1. Everymans's Science intends to Propagate the *latest message of science* in all its varied branches to its readers and through them, to every one interested in Science or Engineering or Technology. *Research articles* usually meant for publication in periodicals devoated to particular branches of Science & Technology and addressed to specialised sections of the readers, are not appropriate for Everyman's Science. Instead, popular or easily intellegible expositions of new or recent developments in different branches of Science & Technology are welcome.

2. Manuscripts should be typewritten on one side of the paper with double spacing. Articles should be written generally in non-technical language and should not ordinarily *exceed 2000 words*. Articles must be understandable by the average enthusiastic readers with some modest scientific background but outside the field. It should not be a review article in a specialised area. Without being too technical, it must also reflect state of the art situation in the field. *A summary* in 50 words should be submitted along with the paper highlighting the importance of the work. *Two copies* of the manuscript complete in all respects should be submitted. The title should be written in capital letters and name(s) of the author(s) should be given along with the Department, Institution, City and Country of each author.

3. Illustration & Tables : the size of illustrations should be such as to permit reduction to about one-third. Legends and captions should be typed on a separate sheet of paper. Photographs should be on glossy paper with strong contrast in black and white. Typed tables should be separate pages and provided with titles and their serial numbers. The exact position for the placement of the tables should be marked in the script. Authors are specially requested to reduce the number of tables, illustrations and diagrams to a minimum (maximum of 3).

4. References : References to be given on a selective basis, (maximum of 10) and the order of placement should be numerically with (a) name(s) of the author(s) (surname last), (b) name of the journal in abbreviated form according to the 'World list of Scientific Periodicals' and in italics, (c) volume number (in bold) (d) page number and (e) year of publication.

   For citations of books the author's name should be followed by the (a) title of the book, (b) year of publication or edition or both, (c) page number, (d) name of publishers, and (e) place of publication.

5. The Indian Science Congress Assocaition and the Editors of Everyman's Science assume no responsibility for statements and opinions advanced by the contributors to the journal.

   Reprints : The communicating author with receive 1 copy of the journal and 10 reprints free of cost.

   All manuscripts and correspondences should be addressed to the *Hony, Editor, Everyman's Science. The Indian Science Congress Association 14, Dr. Biresh Guha Street, Kolkata-700 017.* Email : iscacal@vsnl.net. iscacal_2004@yahoo.com, Fax : 91-33-2287-2551

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THE INDIAN SCIENCE CONGRESS ASSOCIATION

14, Dr. Biresh Guha Street, Kolkata-700017

ISCA YOUNG SCIENTIST'S AWARDS PROGRAMME : 2019-2020

To encourage Scientists, The Indian Science Congress Association has instituted a number of awards in different disciplines. These awards carry a sum of Rs.25,000 /- besides a Certificate of Merit.

1. Applications are invited from members (Life & Annual) of the Association who have paid their subscription on or before **July 15, 2019.** The upper age limit of the candidates for the award is 32 years as reckoned on **December 31, 2019 (born on and after January 01, 1988)**
2. Four copies of the abstract (not exceeding 100 words) along with four copies of full length paper must reach the office of the General Secretary (Membership Affairs) not later than **August 16, 2019**. At the top of each copy of the paper and its abstract, the name of the Section under which the paper is to be considered should be indicated. For details of Sections see http://www.sciencecongress.nic.in/html/paper/presentations.php
3. Along with the Four copies of paper, Four copies of the Application Form (to be downloaded from ISCA website http://www.sciencecongress.nic.in/html/youn_scproramme.php) with brief bio-data of the candidate (not exceeding 2 pages), list of publications, with copies of reprints of already published papers if any and a soft copy of the duly filled application from with scanned copies of enclosures (excluding reprints), full length paper and abstract in **MS Word (not PDF)** along with biodata in the form of a CD must also be sent simultaneously along with the hard copies.
4. The Paper submitted must be a **single author paper** and the research work should have been carried out in India and this has to be certified by the Head of the Institution from where the candidate is applying.
5. The candidate should give an undertaking that the paper being submitted has not been published in any journal or presented in any other Conference / Seminar / Symposium or submitted for consideration of any award.
6. A Young Scientist can present only one paper in any one Section (and not a second paper on the same or any other topic in any other Section).
7. A person who has already received Young Scientist Award in any section once will not be eligible to apply for the above Award in the same or any other section.
8. Incomplete Applications will not be considered.
9. The papers submitted will be subjected to verification for authenticity.
10. Full length paper will be evaluated by experts and the selected Young Scientists **(maximum of six)** in each section will be invited to make oral presentation of their paper during 107th Indian Science Congress. The selected candidates will be provided admissible travelling allowances by ISCA.
11. The final selection for the Awards will be made by a duly constituted committee and the awards will be given during the Valedictory Session of 107th Indian Science Congress session on January 7, 2020.
12. Applications submitted for the above award will not be returned.
13. The last date for receiving papers at ISCA Headquarters is **August 16, 2019**.

All correspondences should be made to:

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