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ASSESSMENT OF LEAN BODY TISSUE COMPOSITION IN YOUNG ELITE MALE PLAYERS OF DIFFERENT SPORTS

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Abstract:
Purpose: The present study was aimed to investigate the characteristics of lean body tissue composition in a group of young (mean age 16.7 ± 2.31 yrs) male athletes of different sports and the effect of sports specific physical activity on body tissue composition. **Methods:** Three hundred forty two (n= 342) male players of different sports viz., football, hockey, table tennis and badminton along with seventy two (n=72) sedentary school boys were also evaluated for various anthropometric and body composition parameters. Body composition including, body fat % (BF %), fat free mass (FFM), body cell mass (BCM) and extra cellular mass (ECM) was determined by whole body bio impedance measurements using a multi-frequency analyzer (Maltron Bioscan 920-2, Maltron International, Rayleigh, Essex, UK). Relative BCM, BCM Index (BCMI) and the ECM /BCM ratio were also calculated. **Results:** One-way ANOVA reveals significant differences ($p<0.01$) in BF%, FFM, BCM and ECM when compared among the group. BCM% related to body weight was also differed significantly ($p<0.01$) and found highest value in hockey players and lowest value in control group followed by the table tennis players. However, only significant difference was observed in case of BCMI when table tennis players were compared to their badminton counterparts. Scatter plot of BMI and BCMI predicted that both soccer and hockey players had greater

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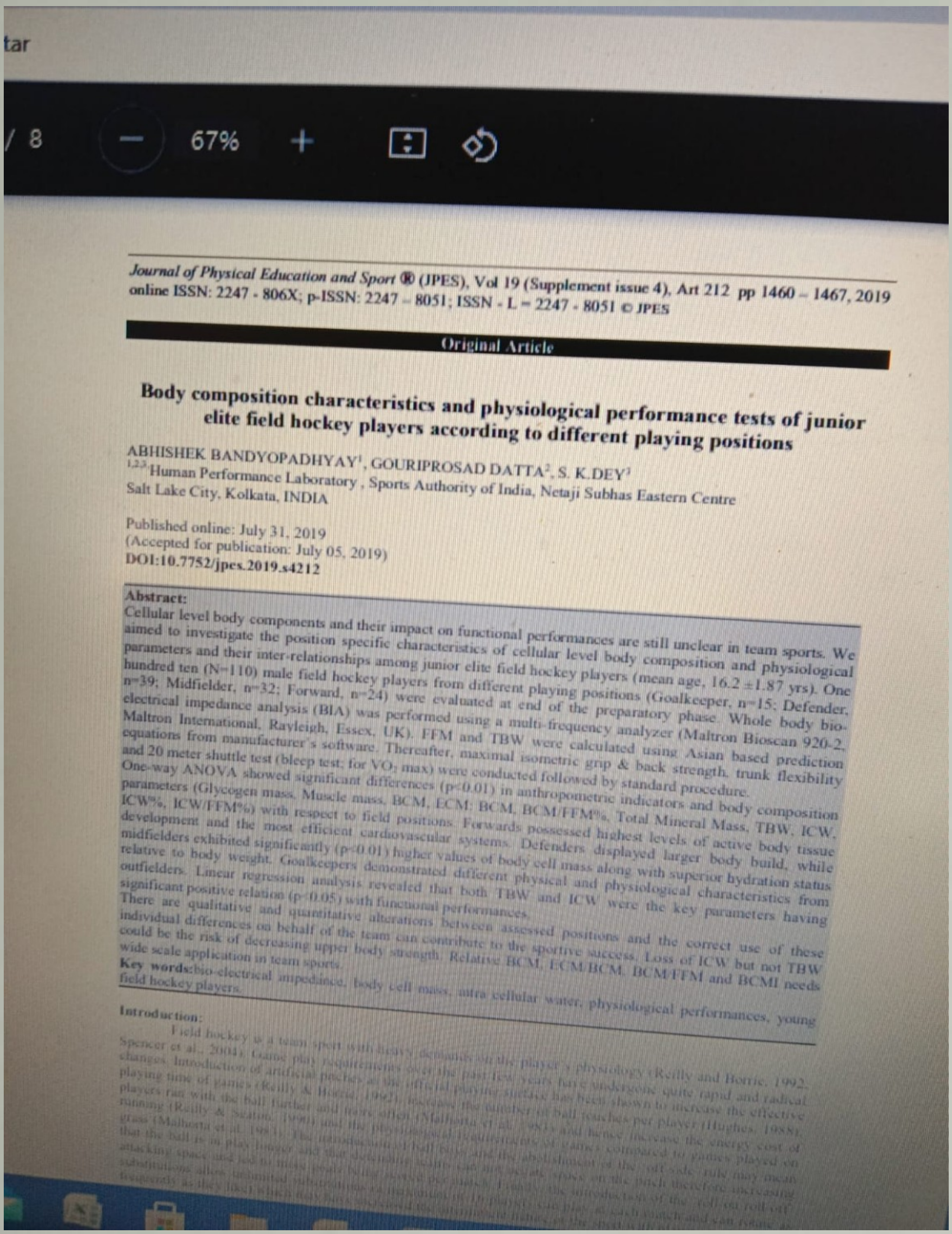
Title of paper: Body Composition Characteristics and Physiological Performance Tests of Junior Elite Field Hockey Players according to Different Playing Positions



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Original Article

Body composition characteristics and physiological performance tests of junior elite field hockey players according to different playing positions

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Abstract:
Cellular level body components and their impact on functional performances are still unclear in team sports. We aimed to investigate the position specific characteristics of cellular level body composition and physiological parameters and their inter-relationships among junior elite field hockey players (mean age, 16.2 ±1.87 yrs). One hundred ten (N=110) male field hockey players from different playing positions (Goalkeeper, n=15; Defender, n=39; Midfielder, n=32; Forward, n=24) were evaluated at end of the preparatory phase. Whole body bio-electrical impedance analysis (BIA) was performed using a multi-frequency analyzer (Maltron Bioscan 920-2, Maltron International, Rayleigh, Essex, UK). FFM and TBW were calculated using Asian based prediction equations from manufacturer's software. Thereafter, maximal isometric grip & back strength, trunk flexibility and 20 meter shuttle test (bleep test; for VO_2 max) were conducted followed by standard procedure. One-way ANOVA showed significant differences ($p<0.01$) in anthropometric indicators and body composition parameters (Glycogen mass, Muscle mass, BCM, ECM: BCM, BCM/FFM%, Total Mineral Mass, TBW, ICW, ICW%, ICW/FFM%) with respect to field positions. Forwards possessed highest levels of active body tissue development and the most efficient cardiovascular systems. Defenders displayed larger body build, while midfielders exhibited significantly ($p<0.01$) higher values of body cell mass along with superior hydration status relative to body weight. Goalkeepers demonstrated different physical and physiological characteristics from outfielders. Linear regression analysis revealed that both TBW and ICW were the key parameters having significant positive relation ($p<0.05$) with functional performances. There are qualitative and quantitative alterations between assessed positions and the correct use of these individual differences on behalf of the team can contribute to the sportive success. Loss of ICW but not TBW could be the risk of decreasing upper body strength. Relative BCM, ECM/BCM, BCM/FFM and BCMI needs wide scale application in team sports.
Key words: bio-electrical impedance, body cell mass, intra cellular water, physiological performances, young field hockey players.

Introduction:

Field hockey is a team sport with heavy demands on the player's physiology (Reilly and Borrie, 1992; Spencer et al., 2004). Game play requirements over the past few years have undergone quite rapid and radical changes. Introduction of artificial pitches as the official playing surface has been shown to increase the effective playing time of games (Reilly & Borrie, 1992) ...

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ORIGINAL SCIENTIFIC PAPER

Prediction of Athletic Performance through Nutrition Knowledge and Practice: A Cross-Sectional Study among Young Team Athletes

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Abstract

The present study was conducted to assess the nutrition knowledge, practice, and status and to identify the nutritional and body composition factors predicting athletes' performance. Young team athletes including 40 footballers and 50 hockey players were recruited in this study (age 16.48±1.5) to assess the nutrition knowledge (NK), nutrition practice (NP), and 24-hour dietary recall using a semi-structured questionnaire. Physical characteristics, including height, weight and body mass index (BMI), along with static strength- handgrip and relative back strength, were recorded. Fat mass (FM), fat-free mass (FFM), muscle mass (MM), basal metabolic rate (BMR) and glycogen store was determined using a bioelectrical impedance analyser. Aerobic capacity (VO_2max) was measured with a beep test. The majority of the athletes with good NK scores were found to have good NP scores as well and vice versa ($\chi 2$=23.861, p=0.000). Their mean recorded scores for NK and NP were found to be 11.13±3.6 and 7.30±2.0 out of a total of 20 and 12, respectively. Daily consumption of protein (β=0.336; p value=0.004), sodium (β=0.273; p value=0.006) and dietary fibre (β=0.220; p value=0.002) were found to be the best predictors for nutritional practice. Nutrition knowledge and practice had significant positive correlation with BMR (0.314***; 0.419***), calcium intake (0.248*; 0.482***), iron intake (0.303***; 0.221*) and VO_2max (0.331***; 0.428***), respectively. Daily calorie consumption (β=0.144, p=0.029), BMR (β=0.304, p<0.001***), MM (β=0.213, p=0.020), calcium (β=0.275, p=0.001) and iron intake (β=0.240, p=.001) were the significant predictors of athletic performance. Therefore, good nutrition knowledge may improve the nutritional habits and dietary pattern of athletes. Body composition and nutrient intake can predict athletic performance. Intervention studies should emphasize nutrition education aiming for improved athletic performance.

Key words: *basal metabolic rate, bioelectrical impedance analysis, body composition, dietary pattern, aerobic capacity*

Introduction

Optimal fuelling is an essential requisite for athletes to excel to their best ability (Maughan & Burke, 2011; Kerksick et al., 2008). Apart from nutrition playing an influential role in enhancing on-field performance; it also promotes muscle growth, prevents injury, accelerates recovery, and supports rehabilitation (Mahan & Stump, 1998). Undoubtedly, athletes' daily diet and fluid intake affect their health, body composition, and substrate availability during exercise as well as recovery time (American Dietetic Association, 2009). Adequate nutrition, which can be reached through sufficient nutrition knowledge (NK), is an integral part of a training programme

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Research Article Open Access

Protective Role of Green Synthesized Gold Nanoparticles Using *Terminalia arjuna* against Acetaminophen Induced Hematological Alterations in Male Wistar Rats

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Abstract

Background: The present study aim to investigate on the characterization of green synthesized gold nanoparticles (AuNPs) and to evaluate whether this herbal nanoparticle can increase the efficiency of herb for alteration of hematological indices against acetaminophen induced toxicity in male Wistar rats.

Methods: Bark extract of *Terminalia arjuna* was used for the green synthesis of AuNPs and then characterization of the nanoparticles were done. Then experiment was conducted on 24 healthy male Wistar rats. The animals were divided into four groups, each group having six rats. Group-1: Control; Group- 2: acetaminophen treated (500 mg / kg) for 14 days; Group-3: Co-administration of acetaminophen (500 mg/kg/day) along with *Terminalia arjuna* bark extract (175 µg/kg/day) for 14 days; Group-4: Co-administration acetaminophen (500 mg/kg/day) along with of green synthesised AuNPs (175 µg/kg/day) for 14 days. Hematological indices were measured using standard hematological techniques.

Results: The green synthesized AuNPs were characterized by UV-visible spectroscopy, FESEM, HRTEM, EDX, FTIR, XRD, DLS analysis. UV-visible spectroscopy showed SPR band at 524 nm. FESEM, HRTEM and XRD analyses revealed that green synthesized AuNPs were spherical shaped, crystalline in nature with size ranging between 20 and 40 nm. Hematological analysis revealed that there was significant decrease in Red Blood Cells (RBCs), Hemoglobin (HB), Hematocrit (HCT)%, Lymphocyte percentage and Platelet Distribution Width (PDW)%, with acetaminophen treatment but White Blood Cells(WBCs), Red blood cell Distribution Width (RDW)% and Platelets (PLTs) significantly increases with acetaminophen administration. Then after co-administration with green synthesized AuNPs along with acetaminophen showed effective significant recovery in the hematological alterations.

Conclusions: Overall the results highlighted the promising effect of green synthesized AuNPs against acetaminophen induced hematological alterations in male Wistar rats.

Keywords: *Terminalia arjuna*; Gold nanoparticles; FESEM; HRTEM; Hematological indices

Introduction

Development in the field of nanotechnology has embossed the necessity of utilizing therapeutic nanoparticles for the detection and treatment of diseases. Among the metallic nanoparticles gold nanoparticles (AuNPs) has great importance because of its wider applications in drug delivery [1], biomedical [2], biosensor [3], anticancer [4], antioxidant [5] due to its biocompatibility well defined size, shape, stability and can be easily synthesized [6]. Chemical synthesis method of AuNPs is hazardous to the environment toxic to the biological system. Green synthesis of nanoparticles by using plants and its extract have received much interest due to its eco-friendliness [7,8], less biohazardous, non-toxicity, cost effectiveness and easily scalable [9]. From different studies it has been reported that flavones, polyols, terpenoids, polysaccharides and proteins are involved in the bioreduction and stabilization of the metal ions during nanoparticles synthesis using plant [10]. In last few years, for the development of nanotechnology based drugs many pharmaceutical companies have got approval from the US Food and Drug Administration(FDA) as there is a great urge for large investment in developing new nanotechnology based medical tools for therapeutics [11].

Investigations in the area of green synthesis of gold nanoparticles using living plants [12] were first reported by Gardea–Torresdey and his co-workers. Scientific research reports demonstrated that several plants were used for biosynthesis of nanoparticles, which includes *Sida acuta* leaf extract [13], *Beta vulgaris* [14], crude extract of *Syzygium aromaticum* [15], *Piper nigrum* [16]. Synthesis of AuNPs using several plants have been reported which includes *Terminalia arjuna* [17], *Morinda citrifolia L.* [18], *Murraya koenigii* [19], *Terminalia chebula* [20], *R. tuberosa*& *P. acidus* [21], and *Gnidia glauca* [22]. From environmental issues it is clear that the green synthesis meets the significant potential in using of safe, harmless, renewable materials for nanoparticle synthesis. In this current study bark extract of *Terminalia arjuna* is used for the green synthesis of gold nanoparticles. Different bioactive constituents such as triterpenoid, saponin, tannin, ellagic acid, gallic acid and proanthocyanidines are present in *Terminalia arjuna* bark extract had been reported [23]. In ayurveda *Terminalia arjuna* is considered as miracle herb used for the treatment of cardiovascular and

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Name of the teacher:Dr. Kaustav Dutta Chowdhury

Title of paper: Cathepsin B mediated scramblase activation triggers cytotoxicity and cell cycle arrest by andrographolide to overcome cellular resistance in cisplatin resistant human hepatocellular carcinoma HepG2 cells.

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Cathepsin B mediated scramblase activation triggers cytotoxicity and cell cycle arrest by andrographolide to overcome cellular resistance in cisplatin resistant human hepatocellular carcinoma HepG2 cells

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ABSTRACT

Andrographolide regimen in single or in combination with anticancer drugs is a promising new strategy to reverse chemoresistance in heaptocellular carcinoma. Apoptosis inducing factor (AIF) may regulate a complementary, cooperative or redundant pathway, along with caspase cascades. Despite these findings, mechanisms underlying caspase-dependent and-independent signaling pathways in andrographolide -induced apoptosis in cisplatin-resistant human hepatocellular carcinoma cell line (HepG2CR) remain unclear. Andrographolide treatment effectively reduced NF-κβ nuclear localization by modulating protein kinase A- protein phosphatase 2 A- Iκβ kinase (PKA/PP2 A/IKK) axis that in turn maintains initiator caspase8 activity. Lysosomal distribution of tBid stimulates cytosolic cathepsin B resulting accumulation of truncated-AIF with induction in scramblase mediated phosphatidylserine exposure in HepG2CR cells. Andrographolide treatment thereby switch on subG1 phase arrest by modulating cellular check points (cyclin A, B, cyclin dependent kinase-1) cueing to the apoptosis event. Collectively, this study suggested antineoplastic potential of andrographolide through PKA/PP2 A/IKK pathway in HepG2CR cells.

1. Introduction

Resistance is an evolutionary attributable cellular self-defense to protect cells from environmental stress and toxic effects (Pfeffer and Singh, 2018). Hepatocellular carcinoma (HCC) with its diversity in origin in biological and clinical characteristics thwarted the efficacy of chemotherapy (Samonakis and Kouroumalis, 2017) in part caused by multidrug resistance (MDR). Several mechanisms including vital roles of drug efflux pump, epithelial mesenchymal transition (EMT), hypoxia-inducible factor1-α (HIF1-α) signaling and DNA damage repair govern MDR induction, in chemo-resistance of HCC (Wen et al., 2016). Combined chemotherapy based on cisplatin, recommended by international cancer organizations has become a potential line of chemotherapy against liver cancer in recent times (Buendia and Neuveut, 2015) and continued to be a mainstay to treat HCC (Kim et al., 2017). Widespread use of platinum drugs led to a gradual design of escape route for tumor cell to build up resistance that reduces the effect of chemotherapy to a significant extent developing intense modications at both molecular and cellular levels about cell survival/death, endocytosis, gene activation/silencing by regulating methylation and acetylation as well as mutations mediated by transcription factors/miRNAs (Shindo et al., 2018). Hence, the concept of using phytomedicines warrants immediate attention to overcome drug resistance.

Protein phosphatase 2 A (PP2 A) play dual role in keeping both pro-survival as well as pro-apoptotic signaling networks in check, maintaining a crosstalk with protein kinase A (via mitogen activated protein

Abbreviations: Andro, andrographolide; Cisp, cisplatin; cAMP, cyclic adenosine monophosphate; PKA, protein kinase A; PP2A, protein phosphatase2A; IKK, Iκβ Kinase; cFLIP, cellular FLICE inhibitory protein; HCC, hepatocellular carcinoma; HepG2CR, cisplatin resistant HepG2 cell; FBS, fetal bovine serum; PEN-STREP, penicillin-streptomycin; AIF, apoptosis inducing factor; Iκβ, inhibitory κβ

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RESEARCH ARTICLE

ENVIRONMENTAL TOXICOLOGY WILEY

Association of p38MAPK-p53-Fas aggregation in S-allyl cysteine mediated regulation of hepatocarcinoma

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Abstract

Bioactive components of dietary phytochemicals have been reported to possess anti-tumor activities. Evidences suggested key role of stress responsive p38MAPK in the induction of nutraceuticals mediated apoptosis in hepatocellular carcinoma (HCC). Current study demonstrated detailed molecular bagatelle associated with p38 MAPK mediated effective suppression of cell growth both in HepG2 and chemically induced liver carcinoma after S-allyl cysteine (SAC) treatment. SAC promoted p38MAPK activity responsible for p53 phosphorylation, its stabilization followed by nuclear translocation leading to induction in expression and oligomerization of Fas protein. Distinctive p38MAPK-p53 axis dependent Fas-FasL-FADD mediated caspase activities along with perturbed cell cycling became normalized with continuation of SAC treatment for another month to diethylnitrosamine induced liver carcinoma. Co-treatment with SB203580, the p38MAPK inhibitor, prevented pro-apoptotic effect of SAC by altering p53 phosphorylation and death inducing signaling complex conformation in HepG2 and induced HCC. Collectively study suggested significant contribution of p38MAPK-p53-DISC-Caspase pathway in the regulation of anti-neoplastic activity of SAC against HCC.

KEYWORDS
DEN, Fas, HepG2, p53, pp38MAPK, SAC

1 | INTRODUCTION

Hepatocellular carcinoma (HCC) is the most common form of primary liver cancer and constitutes 90% of the occurrence worldwide.[1] Reports on new cases of cancer per year globally make HCC as the sixth most familiar malignant disease affecting human.[2] It is estimated to be second leading cause of death considering high annual mortality rate in HCC.[3] IARC-WHO data indicate that Africa and East Asia account for ~80% of reported HCC.[1] Survival rate in HCC is generally less as therapeutic strategy with desirable effects is greatly limited for patients.[4] Liver transplantation, hepatectomy, and ablation therapy are potentially curative therapies in early stages of HCC,[5] but the majorities are usually diagnosed at an advanced stage of the disease.[6] Due to presence of large size tumors and potential characteristic metastasis, surgery is sometimes impossible as well as there is no effective systemic chemotherapy till today to ameliorate advanced

Abbreviations: AIF, apoptosis-inducing factor; DISC, death-inducing signaling complex; ELISA, enzyme linked immune-sorbent assay; FACS, fluorescence-activated cell sorting; FADD, Fas associated death domain; Fas, Fas receptor; FasL, Fas ligand; SAC, S-allyl cysteine; WST-1, water soluble tetrazolium salts-1.

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Title of paper: Transmission and conductance for a driven vector barrier in phosphorene

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Transmission and conductance for a driven vector barrier in phosphorene

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ABSTRACT

Charge transport through a rectangular vector potential barrier modulated by a continuum laser in monolayer phosphorene is studied theoretically in the ballistic regime along the line of Floquet formalism. Laser free transmission profile displays strong directional behavior exhibiting collimation depending on the incident energy and width of the barrier. However, the application of laser, polarized along the zig-zag direction, creates a sharp anti-resonance in the transmission spectrum and reveals a strong light matter interaction due to broken symmetry in presence of the magnetic vector potential. Transmission properties through a vector barrier are found to be sensitive particularly for lower frequency and higher intensity of the laser. For a thin barrier, the laser assisted conductance is suppressed remarkably in contrast to its oscillatory nature for a thicker one.

1. Introduction

After the major breakthrough of the experimental realization of graphene in 2004 [1,2], some other 2D materials that have created sensation in the world of nano technology are silicene, MoS_2, germanene etc. and then one of the most technologically potential candidate black phosphorus. Of late, the layered black phosphorus (BP) has created tremendous attention to the researchers particularly owing to its unique anisotropic electronic properties [3–5] and layer dependent direct band gaps [6], in contrast to the widely studied graphene. In fact, the zero band gap of graphene, due to its low energy linear dispersion imposes severe limitations in the field of digital electronics. The low ON/OFF ratio of graphene based switches leads to a decline of graphene application. In order to circumvent this problem Scientists were in search of some other 2D materials having finite band gap resulting in the discovery of the aforesaid materials (Silicene, Germanene, Phosphorene, etc.) which possess intrinsic thickness dependent band gap (in contrast to graphene) originating due to relatively large spin orbit interaction. Such band gap can be tuned by external electric field. The band gap of BP increases when the thickness of the material decreases from bulk to few layers and eventually monolayer [7,8].

Of late, layered BP has gained tremendous potentiality in multidisciplinary fields of nano and opto-electronics due to its unique electronic and opto-electronic properties. In the bulk form BP is a weak Vander Waals – bonded layered material where each layer form a puckard surface due to sp^3 hybridization of the 3s and 3p atomic orbitals unlike the graphene where layers are perfectly flat and hence possesses isotropic band honeycomb structure [9]. In particular, the field effect transistor (FET) based on a few layer BP is found to have an ON/OFF ratio of 10^5 [10] and carrier mobility at room temperature as high as 10^3 $cm^2/V.s$ that make BP a favourable

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Name of the teacher: Dr. Shrabani Sen

Title of paper: Entner-Doudoroff glycolysis pathway as quadratic-cubic mixed autocatalytic Network: A kinetic assay

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Entner-Doudoroff glycolysis pathway as quadratic-cubic mixed autocatalytic network: A kinetic assay

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ABSTRACT

Concentration oscillations are ubiquitous phenomenon in biochemical systems.

The present paper considers the simple nonlinear chemical feedback model for standard glycolytic route with prototype autocatalytic steps.

Quadratic $S + P \rightleftarrows 2P$.

Cubic $S + 2P \rightleftarrows 3P$.

We couple these steps to get the mixed quadratic-cubic model but remarkable array of complex behavior and oscillatory patterns as expected on coupling is surprisingly missing. The observation is in conformity with natural glycolytic alternatives like the Entner-Doudoroff (ED), and phosphoketolase pathways found in Archaea – *Thermoproteustenax* and other prokaryotes. The fundamental and the practical implications of our findings are thoroughly discussed with pilot calculations and numerical simulations supported via non-linear dynamic analysis. A basic kinetic scheme is suggested for natural glycolytic alternative, ED pathway with its comparison and contrast to other standard routes for glucose metabolism. A key outcome of the study is the phenomenon of oscillator death for the coupled network. A discussion on the thermodynamic aspect of entropy production rate for the model networks are also presented for a comparison.

1. Introduction

Glycolysis is the most important cellular process yielding ATP, the universal energy carrier molecule in all living organisms. The characteristic oscillations of the intermediates of glycolysis exhibiting all sustained, damping and growing undulation and its regulation have been the subject of extensive experimental and theoretical research over the last four decades. Modeling the central carbon metabolism, and particularly the glycolysis pathway [1–3] is one of the essential bioengineering/bioinformatics topics. However, discussing glycolytic oscillation automatically hints at the Embden–Meyerhof–Parnas (EMP) and oxidative pentose phosphate (OPP) pathway to be the biochemical standards for glucose catabolism [4–8]. However, studies found that there is a third, previously overlooked pathway of glucose breakdown: the Entner-Doudoroff (ED) [9–14] pathway. Initially ED pathway was considered to be restricted to gram-negative bacteria, but current studies indicate that it is widely distributed from *Archaea* to *Eukarya*. Damping oscillations [4,5,7–9] in prokaryotes, particularly during photosynthesis has been reported as early as 1949 [15], suggesting that such oscillations are initiated and supported by imbalances between photosynthetic light reaction and Calvin cycle [16–18]. In bacteria, oscillations also control gene expression, cell division, cell-cycle progression etc. Again C^{13}-labelling studies with growing cell and cell suspensions demonstrated an operation of ED pathway in addition to EMP in *T. tenax*. Recent studies have suggested the activation and importance of ED pathway in the physiology of *E. coli* bacteria, *V. cholera* [19,20]. The widespread utility of the pathway suggests, ED metabolism is of far greater importance in nature than has been previously recognized. Thus EMP pathway (often simply "glycolysis") although is nearly the ubiquitous glycolytic route among eukaryotes, it is not the only game in town. Biochemical studies thus have indicated that prokaryotes display impressive diversity in glucose metabolism [20–24] and uses three different pathways, a variant of the reversible EMP pathway and two different modifications of the ED pathway, a non-phosphorylative and a semi-phosphorylative version for metaboli purposes. The overall scheme of EMP and ED pathways are howeve quite similar. In fact it is now argued that the ED pathway predates th EMP pathway in the evolution of microbes. Equal in importance to th energy yield is the ability of both glycolytic pathways to provide ne cessary metabolic precursors for biosynthesis. In their landmark pape

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Title of paper: Evaluation of genotoxic and carcinogenic potentiality in betel nut extract treated Sarcoma – 180 tumour bearing mouse

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Research Article

EVALUATION OF GENOTOXIC AND CARCINOGENIC POTENTIALITY IN BETEL NUT EXTRACT TREATED SARCOMA-180 TUMOR BEARING MICE

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ABSTRACT
The present study has been oriented to assess the genotoxic as well as carcinogenic potential of different concentrations of ethanolic betel nut extract (BNE) on in vivo Sarcoma-180 tumor bearing mouse considering survival rate, tumor growth, mitotic index and chromosomal aberrations as parameters. Different concentrations of BNE induce the rate of cell proliferation in tumor cells with steady increase of mitotic index and chromosomal abnormalities. The cell proliferation rates and chromosomal abnormalities in 300mg/kg body weight BNE treated series were significantly increased when compared to the control and other treated groups. Interestingly, hemoglobin percentage and RBC count along with lymphocyte count gradually decreased and total WBC count increased in treated series when the data were compared to control series. The significant increase of tumor growth rate, mitotic index and chromosomal aberrations with reduction of mouse survival rate as well as decrease in the percentage of hemoglobin and RBC count in treated series may be attributed to the presence of different types of toxic alkaloids in BNE that has a genotoxic as well as carcinogenic effect.

Keywords: Betel nut extracts, Sarcoma-180, Chromosome abnormality, Tumor volume, Viable cell

1. INTRODUCTION

The reports of the genotoxic and carcinogenic potentiality of different plant species have been described by many researchers [1-3]. Betel nut is a well-known plant product consumed mostly by people of India and some other Asian countries. It is used to treat leucoderma, leprosy, cough, worms, anaemia and digestive diseases [4]. Carcinogenic activity of betel nut extract and its arecoline content has been reported by earlier researchers [1]. Betel nut is also reported to increase the frequency of chromosomal aberrations on in vivo system in mice [1, 2, 5]. Betel nut treated experimental male mice showed low percentage of sperm motility and viability [6]. Our earlier studies [7] have indicated that different concentrations of ethanoic extract of betel nut significantly enhanced the sperm head abnormality, total WBC count and differential count of neutrophils in normal male mice in a dose dependent manner with steady decrease of sperm motility, sperm viability, hemoglobin percentage and RBC count. Therefore, the present study aimed to analyze the different dose dependent responsiveness of betel nut extract on S-180 tumor bearing mice on the basis of tumor volume, cell proliferation rate, metaphase index, bone marrow chromosomal abnormality, hematological parameters like differential count of neutrophil and lymphocytes, gram percentage of Hb, total count of RBC, WBC. Percentage of mice life span was also determined by % ILS method in comparison to control and vehicle.

Moreover, total phenolic and flavonoid contents of BNE were evaluated as phenol sometimes acts as potential deleterious toxic, carcinogenic compound and its interaction with hematological and cytogenetical parameters have not been thoroughly evaluated.

2. MATERIAL AND METHODS

2.1. Collection, Identification and Extraction of betel nut

Ethanolic betel nut extract was prepared by slight modifications of the original technique as described by earlier workers [3, 7, 8]. Fresh betel nut was collected from local market in Kolkata, India and authenticated by the Botanical survey of India, Botanical garden, Howrah, West Bengal, India. Betel nuts were dried under shade and cut into small pieces. Then 100 gm of pulverized betel nuts were kept overnight in 100 ml of 90% ethanol. The betel nut solution was placed in the thimble of soxhlet and the sample was extracted. After 48 hrs of

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Name of the teacher: Dr. Samarendra Nath Banerjee

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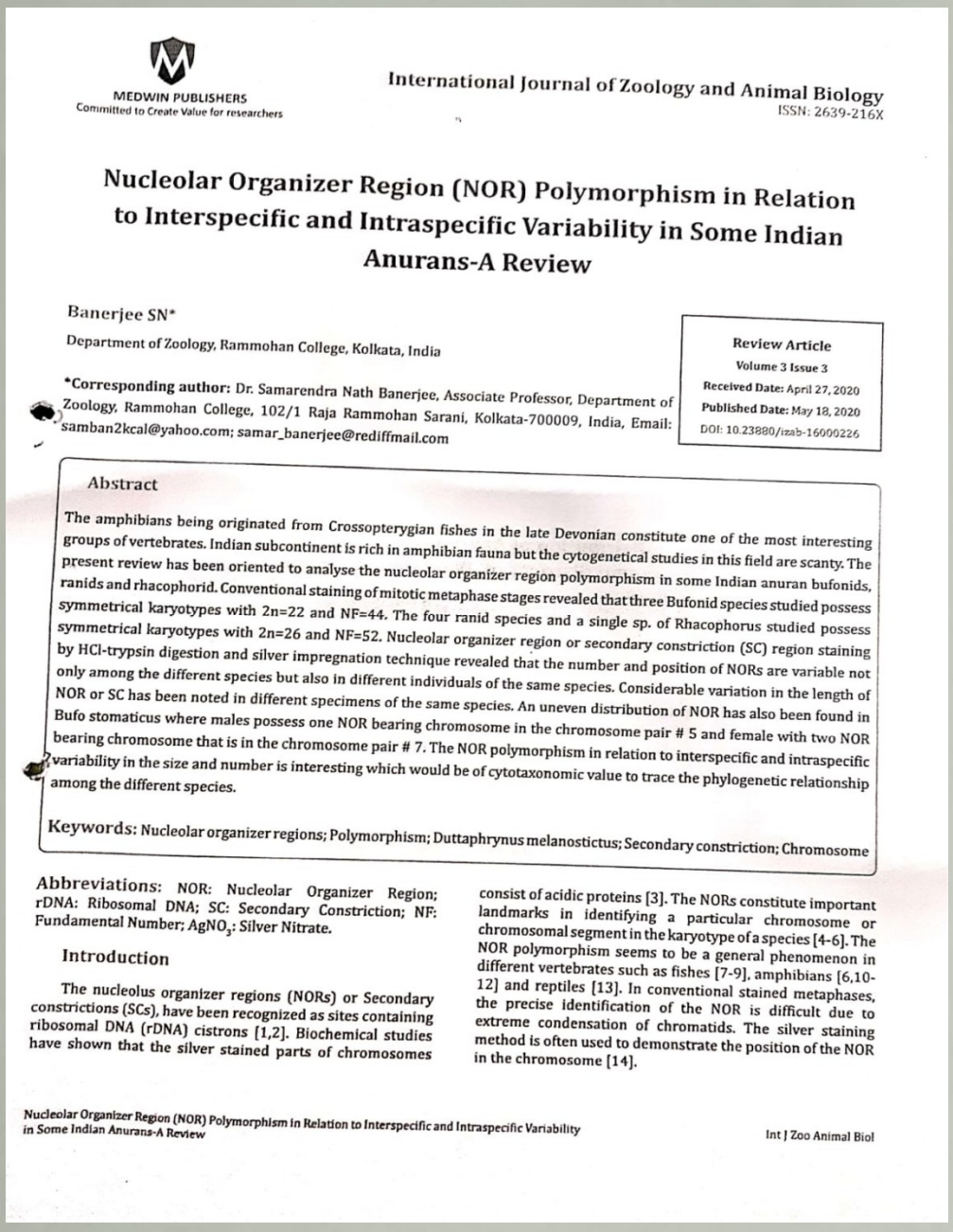

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Nucleolar Organizer Region (NOR) Polymorphism in Relation to Interspecific and Intraspecific Variability in Some Indian Anurans-A Review

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Review Article
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Abstract

The amphibians being originated from Crossopterygian fishes in the late Devonian constitute one of the most interesting groups of vertebrates. Indian subcontinent is rich in amphibian fauna but the cytogenetical studies in this field are scanty. The present review has been oriented to analyse the nucleolar organizer region polymorphism in some Indian anuran bufonids, ranids and rhacophorid. Conventional staining of mitotic metaphase stages revealed that three Bufonid species studied possess symmetrical karyotypes with 2n=22 and NF=44. The four ranid species and a single sp. of Rhacophorus studied possess symmetrical karyotypes with 2n=26 and NF=52. Nucleolar organizer region or secondary constriction (SC) region staining by HCl-trypsin digestion and silver impregnation technique revealed that the number and position of NORs are variable not only among the different species but also in different individuals of the same species. Considerable variation in the length of NOR or SC has been noted in different specimens of the same species. An uneven distribution of NOR has also been found in Bufo stomaticus where males possess one NOR bearing chromosome in the chromosome pair # 5 and female with two NOR bearing chromosome that is in the chromosome pair # 7. The NOR polymorphism in relation to interspecific and intraspecific variability in the size and number is interesting which would be of cytotaxonomic value to trace the phylogenetic relationship among the different species.

Keywords: Nucleolar organizer regions; Polymorphism; Duttaphrynus melanostictus; Secondary constriction; Chromosome

Abbreviations: NOR: Nucleolar Organizer Region; rDNA: Ribosomal DNA; SC: Secondary Constriction; NF: Fundamental Number; $AgNO_3$: Silver Nitrate.

Introduction

The nucleolus organizer regions (NORs) or Secondary constrictions (SCs), have been recognized as sites containing ribosomal DNA (rDNA) cistrons [1,2]. Biochemical studies have shown that the silver stained parts of chromosomes consist of acidic proteins [3]. The NORs constitute important landmarks in identifying a particular chromosome or chromosomal segment in the karyotype of a species [4-6]. The NOR polymorphism seems to be a general phenomenon in different vertebrates such as fishes [7-9], amphibians [6,10-12] and reptiles [13]. In conventional stained metaphases, the precise identification of the NOR is difficult due to extreme condensation of chromatids. The silver staining method is often used to demonstrate the position of the NOR in the chromosome [14].

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Title of paper: Unified relation-theoretic fixed point results via F{R}-Suzuki-contractions with an application

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UNIFIED RELATION-THEORETIC FIXED POINT RESULTS VIA $F_{\mathcal{R}}$-SUZUKI-CONTRACTIONS WITH AN APPLICATION

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Abstract. In this paper, we introduce the notion of *$F_{\mathcal{R}}$-Suzuki-contraction* where $\mathcal{R}$ stands for an arbitrary binary relation and utilize the same to establish some existence and uniqueness fixed point results on metric spaces (not necessarily complete) equipped with arbitrary relation. Our results generalize, extend and unify several results of the existing literature. We also provide some examples to demonstrate the generality of our results. As an application of our main results, the existence and uniqueness of solution of a family of nonlinear matrix equations is discussed.
Key Words and Phrases: Complete metric spaces, binary relations, Suzuki-contraction mappings, fixed point.
2010 Mathematics Subject Classification: 47H10, 54H25.

1. Introduction

Throughout this paper, respectively, $\mathbb{R}$, $\mathbb{R}^+$, $\mathbb{N}$ and $\mathbb{N}_0$ stand for the set of all real numbers, the set of all positive real numbers, the set of all positive integers and the set of whole numbers.

The Banach contraction principle was originated in the Ph.D. thesis of Banach in 1920. This work was later published in the form of a research article [8] in 1922 which has already earned around 2000 Google citations. This work has been extended and generalized in the different directions. Historically speaking, in 1986 the idea of order-theoretic fixed points was initiated by Turinici [23]. In 2004, Ran and Reurings [16] formulated a relatively more natural order-theoretic version of classical Banach contraction principle. Recently, Samet and Turinici [20] established fixed point theorem for nonlinear contraction under symmetric closure of an arbitrary relation. Most recently, Alam and Imdad [6, 7] employed an amorphous relation to prove a relation-theoretic analogue of Banach contraction principle which in turn unify a host of well known relevant order-theoretic fixed point theorems. For the work of this kind one can be referred [1, 2, 3, 4, 5, 6, 7, 12, 16, 17, 18, 19, 20, 21, 23] and references cited therein.

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Title of paper: Using (JCLR)-property to prove hybrid fixed point theorems via quasi F-contractions

TWMS J. Pure Appl. Math. V.11, N.1, 2020, pp.43-56

USING (JCLR)-PROPERTY TO PROVE HYBRID FIXED POINT THEOREMS VIA QUASI F-CONTRACTIONS

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Abstract. The purpose of this paper is to prove some coincidence and common fixed point results for two hybrid pairs of coincidentally idempotent and quasi-coincidentally commuting mappings satisfying multi-valued F-contraction condition using joint common limit range property. We also prove some results for hybrid pairs of mappings which satisfy an F-contractive condition of Hardy-Rogers type. Consequently, a host of existing results are generalized and improved. Furthermore, we adopt some examples to demonstrate the realized improvements in our results proved herein.

Keywords: metric space, multi-valued mappings, quasi-coincidentally commuting mappings, common limit range property, common fixed point.

AMS Subject Classification: 47H09, 47H10, 54H25.

1. Introduction

The important Banach contraction principle is one of the cornerstones in the development of Nonlinear Analysis. Metric fixed point theory continues to be an active area of research under the ambit of non-linear analysis. The Banach contraction principle remains a source of inspiration for the researchers of this domain which was established by Banach [7] in 1922. Therefore, generalizations of the Banach contraction principle have been explored heavily by many authors.

Von Neumann originally initiated the fixed point theory for multivalued mappings in the study of game theory. Fixed point results for multivalued mappings are quite useful in control theory and have been frequently used in solving many problems of economics and game theory.

The development of the geometric fixed point theory for multivalued mappings was initiated with the work of Nadler [29] in 1969. He used the concept of Hausdorff metric to establish the multivalued contraction principle containing the Banach contraction principle as a particular case, as follows.

Theorem 1.1. *Let (X, d) be a complete metric space and a mapping T from X into $CB(X)$ such that for all $x, y \in X$,*

$$\mathcal{H}(Tx, Ty) \leq \lambda d(x, y),$$

where $\lambda \in [0, 1)$. Then T has a fixed point, that is, there exists a point $x \in X$ such that $x \in Tx$.

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Title of paper: T11TS immunotherapy potentiates the repressed calcineurin-NFAT signalling pathway of T cells in Cryptococcus neoformans infected rats: a cue towards T-cell activation for antifungal immunity.

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ORIGINAL ARTICLE

T11TS immunotherapy potentiates the repressed calcineurin-NFAT signalling pathway of T cells in *Cryptococcus neoformans* infected rats: a cue towards T-cell activation for antifungal immunity

Omar Faruk Sk Md[1,2], I. Hazra[1], S. Mondal[1], A. Datta[1], S. Moitra[1], P.K. Das[1], R. Mishra[2] and S. Chaudhuri[1]

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Keywords
Cryptococcus neoformans, immunotherapy, IL-2, NFAT, signalling, T cell, T11 target structure.

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Abstract

Aims: To examine the modulation of the interacting partners of the calcineurin (CaN)-NFAT pathway in T cells during *Cryptococcus neoformans* fungal infection and post-T11TS immunotherapy.

Methods and Results: Wistar rats were infected with *C. neoformans* and followed by immunotherapy with immune-potentiator T11TS. T cells were analysed by flow cytometry, immunoblotting and nuclear translocation study. The signalling proteins LCK, FYN, LAT, PLCγ1 and CaN in T cells were regulated by *C. neoformans* infection resulting in reduced nuclear translocation of NFAT and IL-2 expression. Following T11TS immunotherapy, the expressions of the above-mentioned proteins were boosted and thus resulting in the clearance of *C. neoformans* from lung and spleen.

Conclusions: The precise mechanism of suppression of the T-cell function by *C. neoformans* is still unknown. Previously, we have shown that T11TS positively regulates the function of T cells to abrogate glioma and other immunosuppressive conditions. T11TS immunotherapy increased the expression of the above signalling partners of the CaN-NFAT pathway in T cells and improved nuclear retention of NFAT. As a result, an increased IL-2 expression leads to activation and proliferation of T cells.

Significance and Impact of the Study: Our results demonstrate the role of T11TS in restoring the CaN-NFAT signalling pathway in T cells. It identifies T11TS as an immunotherapeutic agent with potential clinical outcomes to counteract *C. neoformans* infection.

Introduction

Cryptococcus neoformans is a ubiquitous pathogenic fungus in phylum Basidiomycota (Srikanta *et al.* 2014) and the main causal organism in fungal-related death in HIV patients. Furthermore, non-HIV patients are also vulnerable to this fungal infection, such as patients with hematopoietic malignancies, genetic defects, autoimmune diseases and patients on immunosuppressive therapies (Rohatgi and Pirofski 2015; Elsegeiny *et al.* 2018). Recent studies have estimated that the worldwide *C. neoformans*-related mortality is between 200 000 and 600 000 annually (Park *et al.* 2009; Pappas 2013; Rajasingham *et al.* 2017). *Cryptococcus* recognition and phagocytosis through the innate immune system are critical steps to stimulate an effective immune response (Rohatgi and Pirofski 2015; Elsegeiny *et al.* 2018). However, if innate immunity is compromised, an adaptive T-cell-mediated response is crucial in preventing the disease (Rohatgi and Pirofski 2015). Although deficiency of the CD4+ T cells

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Regulation of key molecules of immunological synapse by T11TS immunotherapy abrogates *Cryptococcus neoformans* infection in rats

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ABSTRACT

Cryptococcus neoformans infects and disseminates in hosts with diminished T cell responses. The immunomodulator T11TS (T11 target structure) had profound potential in glioma as well as *C. neoformans* infected model for disease amelioration. It is been established by our group that T11TS potentiates Calcineurin-NFAT pathway in T cells of *C. neoformans* infected rats. We investigated the upstream Immunological Synapse (IS) molecules that are vital for the foundation of initial signals for downstream signaling, differentiation and proliferation in T cells. Improved RANTES level in the T11TS treated groups suggests potential recruitment of T cells. Down-regulation of TCRαβ, CD3ζ, CD2, CD45 and CD28 molecules by cryptococcus were boosted after T11TS therapy. Heightened expression of inhibitory molecule CTLA-4 in cryptococcosis was dampened by T11TS. The decline of MHC I, MHC II and CD80 expression on macrophages by *C. neoformans* were enhanced by T11TS. The dampening of positive regulators and upsurge of negative regulators of the IS during cryptococcosis was reversed with T11TS therapy resulting in enhanced clearance of fungus from the lungs as envisaged by our histological studies. This preclinical study with T11TS opens a new prospect for potential immunotherapeutic intervention against the devastating *C. neoformans* infection with positive aspect for the long-term solution and a safer immunotherapeutic regimen.

1. Introduction

The encapsulated basidiomycete *Cryptococcus neoformans* is an opportunistic fungus that causes life-threatening cryptococcosis in individuals with diminished cell-mediated immunity (Wozniak et al., 2011). It usually infects through inhalation of spores or desiccated yeast from environmental sources (Coelho et al., 2014). After an initial asymptomatic pulmonary infection, the organism is carried in the bloodstream and subsequently disseminated to other target organs (Yang et al., 2017). Intracellular survival of *C. neoformans* primarily in macrophages provides advantages by allowing escape from the immune response (Yang et al., 2017). Although lungs are considered to be a common site of infection, *C. neoformans* predominantly targets the brain causing meningoencephalitis, and the brain involvement may result in severe illness and mortality, even with adequate antifungal drug treatment (Coelho et al., 2014; Yang et al., 2017). *C. neoformans* mainly affects in an immunocompromised state, such as in immunosuppressive therapies, diabetes mellitus, systemic lupus erythematosus, and more frequently in AIDS (Li et al., 2017; Wozniak et al., 2011).

CD4 + and CD8 + T cells are important in controlling *C. neoformans* by limiting their survival within macrophages (Lindell et al., 2005) indicating that T cells play a pivotal role in modulating the outcome of the disease. RANTES is a pro-inflammatory chemokine present at the sites of multiple inflammatory conditions and could trigger T-cell signaling pathway to activate T-cells (Appay et al., 2000).

It is imperative to understand the operative mechanisms of the Immunological Synapse (IS) to comprehend the early steps in the

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Title of paper: Unfolding the Role of a Flavone-Based Fluorescent Antioxidant towards the Misfolding of Amyloid Proteins: An Endeavour to Probe Amyloid Aggregation

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Unfolding the Role of a Flavone-Based Fluorescent Antioxidant towards the Misfolding of Amyloid Proteins: An Endeavour to Probe Amyloid Aggregation

Abhijit Karmakar, Tamanna Mallick, Chandrani Fouzder, Alpana Mukhuty, Samiran Mondal, Anup Pramanik, Rakesh Kundu, Debabrata Mandal, and Naznin Ara Begum*

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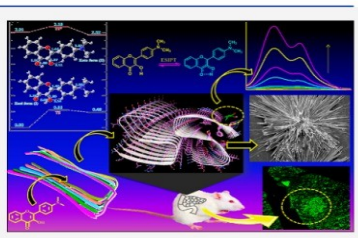
ABSTRACT: 4′-*N*,*N*-Dimethylamino-3-hydroxyflavone (DMAHF), a synthetic fluorescent flavone analogue with potent antioxidant activity, was explored as a molecular rotor-like fluoroprobe for amyloid aggregations, a causative factor in Alzheimer's disease, Parkinson's disease, type-2 diabetes, etc. During its interactions with (human) insulin amyloid aggregation (IAA), its microenvironment was changed. This instigated a drastic change in its excited-state intramolecular proton transfer-based dual emission behavior, which was tracked to monitor its amyloid probing activity. Thus, the amyloid probing potential of DMAHF was originated from its interactions with IAA, which were studied by various spectroscopic techniques and molecular docking and quantum-mechanical calculations. Morphological changes of the IAA in the presence of DMAHF were studied by scanning electron microscopy. DMAHF also probed efficiently the islet amyloid polypeptide deposition in the pancreatic β-cells of diabetic mice. DMAHF showed significant sensitivity and specificity towards amyloid aggregation without having any complexity in its photophysical behavior. This indicates its potential as an ideal bio-friendly and cost-effective fluoroprobe for amyloid proteins.



INTRODUCTION

Amyloid aggregation has long been suspected as a major key factor in various incurable neuro-degenerative and metabolic diseases, for example, Alzheimer's disease, Parkinson's disease, Type-2 diabetes, etc. Amyloids represent a broad class of proteins having minimal primary sequence similarity that can self-assemble into β-sheet-rich un-branched fibrillar structures, which are termed as amyloid plaques/fibrils.[1,2] Such misfolded amyloidic proteins are the pathological traits for these fatal diseases, like amyloid-β (Aβ) peptide and tau protein are related to Alzheimer's disease, whereas islet amyloid polypeptide (IAPP or amylin) and α-synuclein (α-s) are associated with type-2 diabetes and Parkinson's disease, respectively.[1−6]

Nowadays, researchers are struggling to shed light on the etiology of the amyloid aggregation related diseases. However, until now, we do not have drugs or therapeutic agents that can delay and/or prevent the progression of Alzheimer's or other amyloidosis-induced diseases.[1−8] The reasons behind this lacuna may be the complexity in the amyloid structure and difficulty in understanding its mechanism of formation. Increased knowledge in this direction can immensely help to us develop the diagnostic and therapeutic tools for combating these incurable diseases. Scientists have taken various strategies to achieve such knowledge. One such strategy is based on the inhibition or reversal of the amyloid aggregation. But to achieve this goal, early detection/diagnosis of amyloid aggregation is necessary. It is noteworthy that the studies on the interactions of various small molecules with amyloid fibrils are extremely relevant and necessary in developing the efficient amyloid diagnostic probes as well therapeutic agents. In this context, several small molecules having characteristic chromophoric/fluorophoric behavior, for example, dyes based on azobenzene, benzothiazole, and benzimidazole moieties, are put into trial for detecting amyloid oligomers, for example, Aβ and corresponding aggregates.[3,6,9−14] Over half a century, the most widely used amyloid fluorescence probe or fluoroprobe is Thioflavin-T (ThT), which is a small-molecule-based fluorescent molecular rotor having a benzothiazole framework (Figure 1).

The fluorescence responses of ThT in the presence of amyloid aggregations are monitored to probe the amyloid, and

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Name of the teacher: Dr. Samiran Mondal

Title of paper: Curry leaf and its antioxidant potential: A systematic study to enhance its activity in aqueous medium

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Current Nutrition & Food Science, 2019, *15*, 1-10 1

RESEARCH ARTICLE

Curry Leaf and its Antioxidant Potential: A Systematic Study to Enhance its Activity in Aqueous Medium

Deepa Kumari[a,b], Tamanna Mallick[a], Abhijit Karmakar[a], Samiran Mondal[c], Sreeparna Das[a,*] and Naznin Ara Begum[a,*]

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Abstract: ***Background*:** We have done a systematic study on the antioxidant activity of the methanol and petroleum ether (60-80oC) extracts (MEC and PEC respectively) of Curry leaves (Murraya koenigii Spreng. Family: Rutaceae) using various in-vitro chemical methods.

***Method*:** Both of these two extracts were found to be highly efficient in the formation of Ag and Au nanoparticles. So we have explored their ability to form the nanoparticles to study their antioxidant activity. In all the assay systems, MEC showed higher activity over PEC in aqueous medium. This may be due the higher solubility of MEC and its active components, like polyphenols and flavonoids in the aqueous medium. PEC contains lesser amount of these water soluble active components but PEC was rich in carbazole types of alkaloids which are hydrophobic in nature. So, to enhance the antioxidant activity of PEC and its carbazole costituent, like 2-hydroxy carbazole and mahanimbine, we have encapsulated these in the biopolymeric matrix of the mucilage isolated from an edible vegetable, Abelmoschus esculentus L. (commonly known as Lady's finger, family: Malvaceae).

***Result*:** It was interesting to note that, PEC and its carbazole compounds showed better antioxidant activity (ferrous ion chelation and ferric reducing antioxidant activity) in aqueous medium after this encapsulation process.

***Conclusion*:** The protocols used in the present study were very simple and can be implemented in any lab set-up. In future, this work can be extended to evaluate antioxidant potentials of other plant based materials.

Keywords: *Abelmoschus esculentus* L., antioxidant activity, curry leaves, encapsulation, lady's finger, *Murraya koenigii* Spreng.

1. INTRODUCTION

Edible leaves of various medicinal plants have a long history of use in the traditional medicine of various countries, including India [1]. Locally available and edible plant-based sources, like fruits and leafy vegetables are thus note-worthy as these are low-cost, effective and have minimal side effects [2-4].

Curry leaves are widely used in Indian cuisine as spice and condiment. Moreover, there is a long history of the use of these leaves in the Indian traditional medicine [5]. These leaves show various pharmacological activities, such as, anti-tumours, anti-viral, anti-inflammatory, anti-convulsant, diuretic and antioxidant activities [5]. Curry leaves are collected from the Indian medicinal plant and Indian curry leaf plant (scientific name: *Murraya koenigii* Spreng., family: Rutaceae). It is a small tropical tree, widely cultivated in India and is famous for its aromatic leaves (commonly known as Curry leaves).

Curry leaves have been identified as rich sources of polyphenolics (*e.g.* myrecetin-3-galactoside, quercetin-3-rutinoside, quercetin-3-glucoside, kaempferol-3-O-caffeoylate, 5-caffeoyl-quinic acid, tannic acid, gallic acid, caffeic acid, cinnamic acid, chlorogenic acid, feluric acid and vanilic acid *etc.*), free amino acids, carbazole alkaloids, flavonoids and terpenoids [5]. Leaves of these plants are the richest sources of carbazole alkaloids (*e.g.* mahanimbine, koenigine *etc.*) [5].

Aqueous extract of Curry leaves and the carbazole alkaloids isolated from these leaves show hepatoprotective activity, hypoglycemic activity along with antioxidant activity

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Drug Addiction and abuses in Mizoram

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ABSTRACT

The problem of addiction or drug abuse is on the rise in the state of Mizoram. This state is most vulnerable because of its wide international boundaries and its closeness to the in-famous Golden – Triangle which is noted for production and supply of heroin to the states of North East India. Pander to addictive substances or drug abuse is one of the most rigorous challenges in the present-day societies. It is a problematical trend with combined effects of social, ancestral psychosomatic and social factors. There are many causes which are responsible for the drug abuse such as the psychological causes followed by cultural and social reasons. Curiosity, pleasure seeking, negative motivation towards life, frustration, anxiety and insurgence against parents are identified as psychological causes. Addicted respondents mentioned fashion style, peer pressure, lack of parental affection and care, broken family and media influence as the major social and cultural causes. Indulging in addiction as a fashion is another aspect contributed by addicts in Mizoram. This was conducted with a goal of understanding how the addictive substance influences on youth of the city. This research study identified some important structural and background factors which are responsible for the observable fact. The findings suggest that the addiction of drug mostly among the teenage is increasing at a rapid rate in Mizoram. Besides that, the availability and easy access of drugs and other addictive materials also persuade the young generation to experiment with it.

KEY WORDS: Addiction, drug abuse, psychosomatic, social factors.

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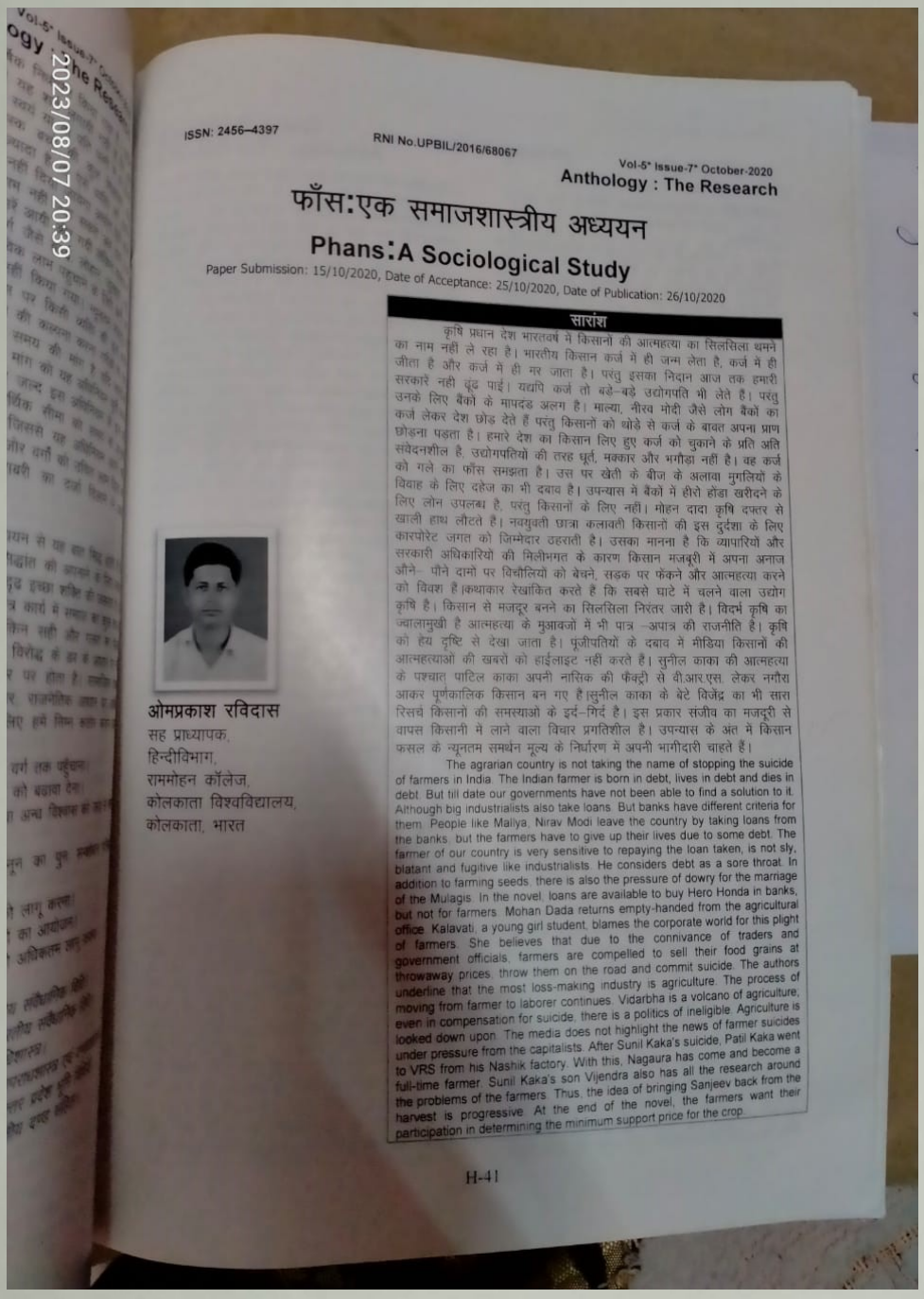

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Phans:A Sociological Study

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ओमप्रकाश रविदास
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कोलकाता विश्वविद्यालय,
कोलकाता, भारत

सारांश

कृषि प्रधान देश भारतवर्ष में किसानों की आत्महत्या का सिलसिला थमने का नाम नहीं ले रहा है। भारतीय किसान कर्ज में ही जन्म लेता है, कर्ज में ही जीता है और कर्ज में ही मर जाता है। परंतु इसका निदान आज तक हमारी सरकारें नहीं ढूंढ पाई। यद्यपि कर्ज तो बड़े-बड़े उद्योगपति भी लेते हैं। परंतु उनके लिए बैंकों के मापदंड अलग है। माल्या, नीरव मोदी जैसे लोग बैंकों का कर्ज लेकर देश छोड़ देते हैं परंतु किसानों को थोड़े से कर्ज के बावत अपना प्राण छोड़ना पड़ता है। हमारे देश का किसान लिए हुए कर्ज को चुकाने के प्रति अति संवेदनशील है, उद्योगपतियों की तरह धूर्त, मक्कार और भगौड़ा नहीं है। वह कर्ज को गले का फाँस समझता है। उस पर खेती के बीज के अलावा मुगलियों के विवाह के लिए दहेज का भी दबाव है। उपन्यास में बैंकों में हीरो होंडा खरीदने के लिए लोन उपलब्ध है, परंतु किसानों के लिए नहीं। मोहन दादा कृषि दफ्तर से खाली हाथ लौटते हैं। नवयुवती छात्रा कलावती किसानों की इस दुर्दशा के लिए कारपोरेट जगत को जिम्मेदार ठहराती है। उसका मानना है कि व्यापारियों और सरकारी अधिकारियों की मिलीभगत के कारण किसान मजबूरी में अपना अनाज औने- पौने दामों पर बिचौलियों को बेचने, सड़क पर फेंकने और आत्महत्या करने को विवश हैं।कथाकार रेखांकित करते हैं कि सबसे घाटे में चलने वाला उद्योग कृषि है। किसान से मजदूर बनने का सिलसिला निरंतर जारी है। विदर्भ कृषि का ज्वालामुखी है आत्महत्या के मुआवजों में भी पात्र –अपात्र की राजनीति है। कृषि को हेय दृष्टि से देखा जाता है। पूंजीपतियों के दबाव में मीडिया किसानों की आत्महत्याओं की खबरों को हाईलाइट नहीं करते हैं। सुनील काका की आत्महत्या के पश्चात पाटिल काका अपनी नासिक की फैक्ट्री से वी.आर.एस. लेकर नगौरा आकर पूर्णकालिक किसान बन गए हैं।सुनील काका के बेटे विजेंद्र का भी सारा रिसर्च किसानों की समस्याओं के इर्द–गिर्द है। इस प्रकार सजीव का मजदूरी से वापस किसानी में लाने वाला विचार प्रगतिशील है। उपन्यास के अंत में किसान फसल के न्यूनतम समर्थन मूल्य के निर्धारण में अपनी भागीदारी चाहते हैं।

The agrarian country is not taking the name of stopping the suicide of farmers in India. The Indian farmer is born in debt, lives in debt and dies in debt. But till date our governments have not been able to find a solution to it. Although big industrialists also take loans. But banks have different criteria for them. People like Mallya, Nirav Modi leave the country by taking loans from the banks. but the farmers have to give up their lives due to some debt. The farmer of our country is very sensitive to repaying the loan taken, is not sly, blatant and fugitive like industrialists. He considers debt as a sore throat. In addition to farming seeds, there is also the pressure of dowry for the marriage of the Mulagis. In the novel, loans are available to buy Hero Honda in banks, but not for farmers. Mohan Dada returns empty-handed from the agricultural office. Kalavati, a young girl student, blames the corporate world for this plight of farmers. She believes that due to the connivance of traders and government officials, farmers are compelled to sell their food grains at throwaway prices, throw them on the road and commit suicide. The authors underline that the most loss-making industry is agriculture. The process of moving from farmer to laborer continues. Vidarbha is a volcano of agriculture, even in compensation for suicide, there is a politics of ineligible. Agriculture is looked down upon. The media does not highlight the news of farmer suicides under pressure from the capitalists. After Sunil Kaka's suicide, Patil Kaka went to VRS from his Nashik factory. With this, Nagaura has come and become a full-time farmer. Sunil Kaka's son Vijendra also has all the research around the problems of the farmers. Thus, the idea of bringing Sanjeev back from the harvest is progressive. At the end of the novel, the farmers want their participation in determining the minimum support price for the crop.

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Name of the teacher: Dr. Saurav Dutta

Title of paper: Tailoring phonon modes of few- layered MoS2 by in plane electric field .

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ARTICLE OPEN

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Tailoring phonon modes of few-layered MoS_2 by in-plane electric field

Sreemanta Mitra[1,2✉], Divya Srivastava[3,4,6], Shib Shankar Singha[1,5,6], Saurav Dutta[6], Biswarup Satpati[7], Maarit Karppinen[3], Arindam Ghosh[2] and Achintya Singha[1✉]

We discuss the effect of the in-plane electric field on the Raman spectroscopy for few-layered MoS_2. The characteristic Raman modes of MoS_2 show gradual red shift, while the intensity increases by 45–50% as the electric field is increased, showing a large electro-optical effect. Structural analysis suggests that our few-layered MoS_2 belongs to P6/m2 space group with broken inversion symmetry. We attribute this gradual red shift to this broken symmetry-driven piezoelectricity in MoS_2, which generates tensile strain along the perpendicular direction when the electric field is applied. The enhancement of the effect upon reversing the electric field direction adds credence to our interpretation. Our first principal density-functional theory calculation further substantiates the claim. This optical probing of the electromechanical coupling may lead to applications as a nonextensive technique for electric field/strain sensors in the nanoelectronics devices.

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INTRODUCTION

Tunability of two-dimensional quantum materials (2DQM) through an external perturbation has strongly excited condensed matter research in recent years due to its possibility of applications, if not by the rich physics they offer[1]. Graphene and other 2DQMs[2–6] exhibit a wealth of unusual and fascinating properties, such as Dirac[2] or Weyl semimetal, topological insulator[7,8], charge-density wave[9], and superconductivity[7,10]. Among the vast library of 2DQM[6], atomically thin semiconducting transition metal dichalcogenides (TMDCs) (having formula MX_2, M = Mo and W and X = S, Se, and Te) have attracted particular interest in optoelectronic application due to their strong light–matter interaction owing to the presence of van-Hove singularity in their electronic structure[11,12]. The bulk 3D TMDCs are formed by the stacking of individual layers through a weak van der Waal's (vdW) force, making them easy to cleave and get a monolayer, whereas the atoms within each 2D plane are bound through a strong covalent bonding[12]. Thus, the huge difference between in-plane and out-of-plane interatomic interaction strengths often results in highly anisotropic electronic and mechanical properties in these layered systems. Coupling of these anisotropic properties may lead to interesting phenomena.

Quasi-2D molybdenum disulfide (MoS_2)[13] is a prototype material to study the light–matter interaction, since it has shown promising optoelectronic applications[14]. MoS_2 crystallizes in hexagonal structure and belongs to the space group/point group $P3m1/D_{6h}$ (with inversion symmetry). Similar to other vdW crystals, e.g., graphene, an atomically thin version of this naturally occurring MoS_2 has been successfully obtained by mechanical exfoliation[13–15] or liquid-phase exfoliation[16]. The anisotropic crystal structure, strong in-plane Coulomb interaction, and weak out-of-plane van der Waal's interaction of MoS_2 leads to several interesting anisotropic optical and electronic behavior[17–22]. Both monolayer and few-layered MoS_2 exhibit a number of intriguing physical properties, including a direct optical bandgap of about 1.8 eV[13,14], strong photoluminescence (PL), electroluminescence[13,14,23,24], and reasonably high mobility of the order of 0.2 m^2/Vs[25,26]. Numerous studies indicate that monolayer MoS_2 exhibits large exciton- and trion-binding energies[27], inversion symmetry breaking together with strong spin–orbit coupling[28], and valley Hall effect[29]. These indicate the promising possibility of MoS_2 in next-generation nanoelectronics[15,30] and photonics[31] applications.

Raman spectroscopy, a powerful tool to probe the phonons in solids, has been used extensively as a nondestructive method to characterize electronic and vibrational properties of 2DQMs[32,33]. It has also been used for identification of a number of layers[33–35], and the twist angle between the layers in 2DMs[36]. MoS_2 shows two distinct and well-defined types of Raman modes, one due to the stretching of S atoms along the c axis (A mode) and the other is from the in-plane breathing motion (E^1_{2g} mode)[12,20,33,37]. The resonance excitation (~1.8–2.0 eV) gives rise to a rich spectrum of second-order peaks and multiphonon bands[26,33] due to strong electron–phonon coupling, and is widely used as the fingerprint characterization of MoS_2[33]. However, the effect of external perturbation on the Raman spectrum of MoS_2 is not extensively reported. Although recently, a giant increase in the phonon modes' intensity has been observed in monolayer to bulk MoS_2 under a magnetic field[37] and electron irradiation[38], the effect of the electric field (E) is still unknown. Recently, the gate voltage dependence on the optical properties in general, has been discussed for MoS_2, along with its possibility as optical modulators[39]. The effect of the gate voltage on the Raman spectroscopy has also been discussed[39].

In this paper, we describe the effect of moderate in-plane electric field on the phonon modes of few-layered MoS_2, probed by Raman spectroscopy at room temperature. We have been able

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REVIEW ARTICLE | www.ijcmr.com | Section: Physiology

An Early Year History of Biological Preparation of Silver Nanoparticles in West Bengal and their Antibacterial Activity: A Review

Kartik Shaw[1], Sahana Mazumder[2]

ABSTRACT

Biologically prepared silver nanoparticles are in trend to be used as antibacterial agents throughout the globe. Silver nanoparticles prepared from different biological sources have been tested against Staphylococcus aureus, Escherichia coli, and other clinical bacteria in West-Bengal also. The size, shape and activity of the biogenic silver nanoparticles will vary depending upon the biological sources and its concentration used for nanoparticle preparation. UV-Vis spectrophometry, Dynamic light scattering, FESEM, HRTEM are the techniques which can be used for characterizing silver nanoparticles of different size and shape. From the history of last decade of research upon silver nanoparticles' green synthesis and its antibacterial, antifungal, antilarval as well as anticancer agents, researchers used plant parts, fungus and bacteria as biological sources for the reduction of silver ions to silver nanoparticles. Which showed promising activity against different bacterial strains, either procured from ATCC (American type culture committee) or from any clinical sources. When it comes to analyse the activity of the prepared silver nanoparticles against multidrug-resistant (MDR) clinical bacterial strains, there are lesser evidences from West-Bengal. This review will work as a reservoir for biologically prepared silver nanoparticles in West-Bengal in the last decade and will also help researchers to characterize biogenic silver nanoparticles.

Keywords: Biogenic Silver Nanoparticles, Characterizing Silver Nanoparticles, Staphylococcus Aureus, West-Bengal.

INTRODUCTION

From ancient time silver and its components had been used as bactericidal agents against gram positive and gram negative bacteria.[1,2,3,4] The first concept of nanoparticles and nanoparticle based drug targeting was born from one of the eminent scientist Paul Ehrlich from an opera; he had visited.[5,6] Nanoparticles can be defined as any particulate matter of size less than 100nm at any dimension.[7] Multiple reports confirm the highly toxic nature of silver ions and silver based products against various microorganisms, including 16 species of bacteria.[4,8,9,10] AgNPs (silver nanoparticles) along with other noble metal nanoparticles are widely applied in cosmetics, shampoo, toothpastes and other biomedical products which directly come in contact with human body.[11] Chemically reduced AgNPs have severe side effects on human health. So, biologically synthesized nanoparticles are widely suggested as possible ecofriendly alternatives to chemically or physically synthesized nanoparticles.[12] There are evidences of photosynthesis of silver and gold nanoparticles from coriander leaves.[13] Sundried *Cinnemomum camphora* leaves[14], phylanthin extract[15], henna leaves[16], tulsi leaves[17], papaya fruit extract[18], are also able to be used for biogenic synthesis of silver nanoparticles. Other than the above mentioned extracts, a lot more plants are available to be used to produce silver nanoparticles efficiently, such as *Azadirachta indica*[19], *Catharanthus roseus*[20], *Datura metel*[21], *Nelumbo nucifera* (lotus)[22], *Medicago sativa*[23], *Alternanthera denate*[24], *Cymbopogon citrates*[25], *Argyreia nervosa*[26], *phlomis*[27], *Aloe vera*[28], *Moringa oleifera*[29], *Ziziphora tenuior*[30], *Centells asiatica*[31], *Vitex negundo*[32], *Swietenia mahagoni*[33], *Boerhavia diffusa*[34], *Cocos nucifera*[35], *Brassica rapa*[36], *Melia dubia*[37], *Pogostemon benghalensis*[38], *Garcinia mangostana*[39], *Psoralea corylifolia*[40], etc.

With the increasing trend of using silver nanoparticles (AgNPs) as antibacterial agents, we are trying to see the scenario of biogenic preparation of AgNPs at a glance in West Bengal, India. This review includes the biological methods used by researchers to prepare AgNPs, their characterization and their antibacterial effect upon clinical isolates taken from different bacterial infection sites of patients of various hospitals and pathological laboratories of West Bengal or procured from ATCC.

Article availability

Google search with keyword "silver nanoparticles synthesis west Bengal" gave a lot of search results. From them only 31 relevant articles were selected, among which 22 papers were published from west Bengal between 2010-2019, upon green synthesis of silver nanoparticles. Articles selected for the study were published in nature, springer, wiley and other renowned and well established journals.

How far West Bengal is preparing silver nanoparticles from biological sources in recent decade (table 1)

Characterization methods: From table[41-59], we can say that a lot of ways and techniques are available to characterize silver nanoparticles. The first charactererization will be done by observing change in colour after reduction of silver ions to AgNP, due to SPR (surface Plasmon resonance) property

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Recent Prevalence of Clinical Multidrug Resistant *Staphylococcus aureus* in West Bengal

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Abstract:
Introduction: *Antibiotic resistance is increasing day by day like a tsunami. About 100,000 tons' antibiotics are being prepared annually throughout the world. Staphylococcus aureus is one of the pathogenic bacteria which are rapidly evaluating themselves to become resistant for several antibiotics.*
Materials & Method: *137 clinical bacterial isolates have been collected for study. 21 S. aureus isolates were identified by positive catalase, coagulase and mannitol fermentation tests from 54 gram-positive bacteria. Antibiotics susceptibility test were performed using DAD (Disc agar diffusion) method. Azithromycin, Clarithromycin, Levofloxacin, Rifampicin and Amikacin were the antibiotics which were used in experiments. ATCC25923 was reference strain of S. aureus.*
Results & Discussion: *Out of 21 S. aureus isolated from 54 gram-positive bacterial strain. 15 were resistant for at least one antibiotic agent among 5 agents used in the experiment. That means 15 MDR S. aureus identified among which one XDR was also found which was resistant for all the agents studied in the present work.*
Conclusion and future aim: *Throughout the study, it has been seen that clinical isolates of bacteria have capability to grow resistance for antibiotics, which is the reason we got non-susceptibility against vancomycin too. Therefore, speed of developing new antibiotics is lesser than bacteria are growing resistance. We need to combat this serious issue with some another possible way.*
Keywords: *VRSA, Staphylococcus, amikacin, azithromycin, MDR*

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I. Introduction:

"Antibiotics are manufactured at an estimated scale of about 100,000 tons annually worldwide, and their use had a profound impact on the life of bacteria on earth"(1). With the increase in production and use, the resistance against antibiotic is also increasing every day.While WHO has already declared "combat drug resistance: no action today, no cure tomorrow" in 2011(1). According to a research conducted at Jawaharlal Nehru Medical college, India in 2015 says that the antibiotic susceptibility profile of 1060 bacterial strains give 393 (37.1%) MDR (Multidrug resistant) bacterial strains, 146 (13.8%) XDR (Extensively Drug resistant) strains, and no PDR (Pan drug resistant) bacteria. All (100%) Gram negative bacterial strains were sensitive to colistin whereas all (100%) Gram positive bacterial strains were sensitive to vancomycin(2). On the other hand, resistance for vancomycin was first observed in the form of VRSA (Vancomycin resistant *Staphylococcus aureus*) in 2002 from USA(3)(4). Only four VRSA was obtained from USA till 2007(5). On the same time there were no VRSA isolates from Asia, except for Vancomycin Intermediate *Staphylococcus aureus* (VISA) in Japan and Korea(6) in 1997 and 2000 respectively. In the year 2006 a *van* gene negative VRSA isolate was also observed(5). The present scenario is that 14 VRSA infections have been found in US till 2017(4). It has been seen that 90% *Staphylococcus* strains contains resistance against penicillin(7)(5), and they are getting resistant vigorously against methicillin, aminoglycosides, macrolides and lincosamides(8)(9)(10)(11). This increase in AMR (Antimicrobial resistance) is leading to increased morbidity as well as a huge economic loss for the patients and for the nation(2)(3).*S. aureus* has a fundamental biological property of being able to asymptomatically colonize normal people and approximately 30% humans are carriers for *S. aureus*(4)(5).The recent epidemiology of *S. aureus* reveals that, the bacterium has evolved resistance against penicillin (first antibiotic) to vancomycin (last resort)(6). Apart from all the above incidents, if we see the community acquired antimicrobial resistance in *staphylococcus aureus*. In the early 1980s, the first emergence of CA MRSA (community acquired methicillin resistant *Staphylococcus aureus*) was reported in adults and then later in the same year it was also reported in children(7)(8)(9). They were not truly CA (community acquired), because the patients had a history of being in frequent contact with healthcare workers, so it must be HCA (healthcare associated) instead of CA(10). Now a days, CA-MRSA have been reported from every corner of the world, from US (United States) to Norway(6) and the same is increasingly reported from India as well(11)(12). The MRSA

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