ChemPubSoc Europe

DOI: 10.1002/slct.201802696

Chemistry SELECT Communications

Catalysis

NaN_3/NH_4Cl-Promoted Aza-Cyclization: A Convenient Route for Bio-Active Diverse Isoindolinone Derivatives

Sk Asraf Ali,[a] Sanjay Bhaumik,[a] Akash Jana,[b] Susanta Kumar Manna,[a] Mohammed Ikbal,[c] Arabinda Mandal,[a] Anirban Bera,[a] Avijit Jana,*[d] and Shubhankar Samanta*[a]

An efficient substrate dependent NaN_3/NH_4Cl promoted aza-cyclization was developed *via* metal free cascade transformation. A wide variety of bicyclic/tricyclic isoindolinone derivative was achieved with excellent diastereoselectivity from achiral reagent system. This protocol also provided synthetic route of dopamine D_4 receptor in short way. The bio-imaging study towards CHO cell line with our isoindolinone embedded new fluorophore was also demonstrated.

Introduction

Since the last few decades synthetic pharmaceutical building blocks have enriched the chemistry of heterocyclic molecules and medicinal chemistry to a great extent.[1] Among them, isoindolinone scaffold possesses a wide range of biological activities including antimicrobial, antiviral, HIV-1 inhibition, sedative and hypnotic.[2] It has been extensively used for the treatment of diabetes, obesity and hyperlipidemia, cancer and CNS diseases.[3] The 3-hydroxyisoindolin-1-ones are a unique part of naturally occurring substances, such as the alkaloid fumadensine isolated from *Fumaria densiflora* and chilenine obtained from *Berberis empetrifolia,* have significant biological activity (Figure 1).[4] More precisely, fumadensine and fumaridine are important privileged structures similar to our target molecule, have local anesthetic activity superior to that of procaine. Another of our analogous compound related to nonbenzodiazepine drug molecule pazinaclone (Figure 1),[5] have activity as a sedative and muscle relaxant. Concurrently, dopamine D_4 receptor is a well target for drug treatment of schizoprenia in which isoindolinone as key scaffold.[5c] Additionally, Raf kinase, MEK protein kinase and HIV integrase inhibitor are also observed in 3-hydroxy isoindolinone derivatives.[6]

Although, researchers have given their utmost to prepare such molecule[7] but only a few methods are related to 3-hydroxyisoindolin-1-ones moieties.[8] Construction of isoindolinone derivatives *via* inter- and intramolecular Diels–Alder reactions, Palladium(0)-catalyzed three-component carbonylation–amination–Michael addition, Copper-mediated oxidative coupling of benzamides followed by an intramolecular aza-Michael-type addition, Chiral phase transfer catalysed intramolecular asymmetric aza-Michael reactions are representative examples of most recent literature.[7] The hydroxy substituted isoindolinone derivatives are rare. They were usually prepared from the phthalimide which was derived as starting materials through nucleophilic attack by organometallic reagents for which specific nucleophilic reagents were needed for their conversion.[8a–d] Recently H. Liu *et al.* described regioselective intermolecular coupling transformation between (substituted ethynyl)benzoic acids, and alkyl amines under microwave-assisted conditions, which afforded the *N*-alkyl substituted 3-hydroxyisoindolin-1ones.[8e] Further, transition metal or organocatalyst reactions were developed to synthesize 3-methyleneisoindolin-1-ones.[9] However, all these protocol were limited to only bicyclic derivatives and not apply to bio-imaging study.

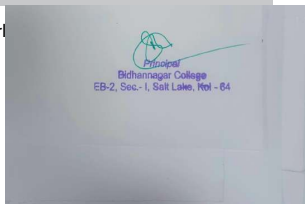
Results and Discussion

In continuation to our synthetic effort on intra/intermolecular aza-cyclization reaction for development of a new method for the preparation of heterocycles,[10] we wish to communicate a NaN_3/NH_4Cl promoted substrate dependent general method for bio-active isoinodolinones/3-hydroxyisoindolinone/ benzylideneisoindolinones. Recently, we have described a NaN_3/NH_4Cl mediated *aza-exo-trig/aza-endo-dig* cyclization reaction[10c] of a formyl group with suitable alkene and alkyne substituent. The modification of the substrate with carboxyl group instead of formyl group under identical reaction conditions in a different cyclization strategy afforded three types of isoindolinones depending on the alkene/alkyne functionalities (Scheme 1).

Current assignment commences with the conversion of 2-alkenyl/2-alkynyl aldehydes into their corresponding acids through Pinnick oxidation[11] with sodium chlorite (1.4 equiv.) in the presence of sodium dihydrogen phosphate buffer (1.0 equiv.) and hydrogen peroxide (1 mol%) in aqueous acetonitrile solvent for 1–2 h. Initially, we concentrate our studies on aza-cyclization on acrylic ester derivatives with

[a] *S. A. Ali, S. Bhaumik, S. K. Manna, Dr. A. Mandal, A. Bera, Dr. S. Samanta*
Department of Chemistry, Bidhannagar College, Kolkata 700064, India
E-mail: chemshubha@gmail.com
[b] *A. Jana*
Indian Institute of Science Education and Research Kolkata, Nadia 741246, India
[c] *Dr. M. Ikbal*
Berhampore Girls' College, Berhampore 742101, India
[d] *Dr. A. Jana*
Centre for Chemical Biology, CSIR-Indian Institute of Chemical Technology, Hyderabad 500007, India
E-mail: janaavijit2@gmail.com

Supporting information for this article is available on the WWW under https://doi.org/10.1002/slct.201802696



An Integrated Likelihood Method for Estimating Population Size in Dependent Dual-record System

Kiranmoy Chatterjee*
Diganta Mukherjee †

Abstract

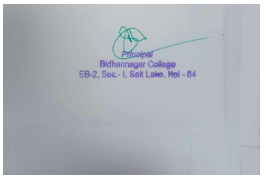
Motivated by various potential applications, we consider the problem of estimating human population size from dependent dual-record system (DRS) (equivalently, two-sample capture-recapture experiment). Owing to the non-identifiability of the present model under DRS, available methods are developed in Bayesian paradigm. Our first contribution is in developing a non-Bayesian estimation strategy through an integrated likelihood method with the help of a novel idea by Severini (Biometrika, 2007). Informative priors are chosen depending upon the availability of the directional behavioral knowledge so that nice frequentist properties hold. By such construction, proposed integrated likelihood also possess several desirable properties including negligible prior sensitiveness. Our second contribution lies in the construction of a strategy to classify the nature of underlying behavioral dependency of the given population (i.e. whether population is *recapture prone* or *averse*). Simulation studies are carried out to explore the performance of this classification strategy as well as the proposed method along with available Bayesian methods. Finally, illustration based on two real life data sets (epidemiological and economic census) are presented.

Key words: Classification of behavioral dependence; Human population; Information-unbiasedness; Orthogonal parameters; Score-unbiasedness; Unrelated parameters.

1 Introduction

Dual-record System (DRS) is a special type of data-structure obtained from a capture-recapture type experiment, especially designed for estimating a specified population size, say N, from two sampling occasions. Federal agencies are generally interested to know the actual size of a specified population. Often census operations fail to extract the true knowledge for various reasons. Therefore, either any other contemporary census data is used or another survey is conducted independently after the census operation in order to estimate the true size N. Application of this technique is common in various interdisciplinary platforms, such as epidemiological study, socio-economic census, study of episodic events, etc. In studies involving human population, more than two sources of information (or sampling occasions) is seldom used. To estimate population size from these two lists of information

*Department of Statistics, Bidhannagar College, Kolkata-700064, India; E-mail: *kiranmoy07@gmail.com*
†Sampling and Official Statistics Unit, Indian Statistical Institute, Kolkata-700108, India.



Eur. Phys. J. Plus (2018) **133**: 480
DOI 10.1140/epjp/i2018-12277-5

THE EUROPEAN PHYSICAL JOURNAL PLUS

Regular Article

Entropic uncertainty relation and revival structure of quantum wave packets

Benoy Talukdar[1,a], Aparna Saha[1], Supriya Chatterjee[2], and Golam Ali Sekh[3]

[1] Department of Physics, Visva-Bharati University, Santiniketan 731235, India
[2] Department of Physics, Bidhannagar College, EB-2, Salt Lake, Sector-1, Kolkata 700064, India
[3] Department of Physics, Kazi Nazrul University, Asansol - 713340, India

Received: 18 May 2018 / Revised: 23 September 2018
Published online: 27 November 2018

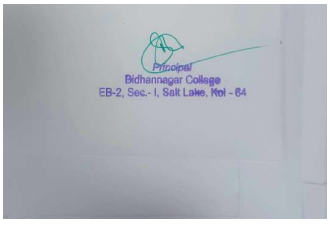
Abstract. We consider a wave packet in the one-dimensional infinite square well formed by a combination of ground state and the first few excited states, and identify three different methods to study its time development. The first method proceeds by monitoring the temporal evolution of the so-called autocorrelation function while the second one relies on the behavior of standard deviation based Heisenberg's position-momentum uncertainty relation as a function of time. The third method of our interest makes use of the time variation of the Shannon entropy sum or the so-called entropic uncertainty relation. The chosen form of the wave packet allowed us to study its revivals, super-revivals and fractional revivals by using analytic methods, the inevitable numerical routine being invoked at the last stage of the game. We found that, in general, the uncertainty-based approaches furnish more detailed information on the revival structure of wave packets than those provided by the autocorrelation function. The results of the entropic uncertainty relation, however, appear to be more accurate than the corresponding predictions of the standard deviation based uncertainty relation.

1 Introduction

The time evolution of the wave packets formed by linear superposition of bound-state eigenfunctions of boundary-value problems provides a typical example of quantum interference. For example, wave packets evolving in time initially move as localized entities and follow the corresponding classical motion. In particular, a localized wave packet oscillates with a classical period $t_{\rm cl}$ as predicted by classical mechanics, but subsequently deviates from classical trajectory so as to spread out and collapse. At later times, however, the collapsed wave packet may almost recover its initial shape such that the classical motion revives temporarily [1]. The time taken by a delocalized wave packet to regain its initial shape is called the revival time, often denoted by $t_{\rm rev}$. At intermediate times $p\,t_{\rm rev}/q$, fractional revivals may occur when the wave packet split into mini packets which are scaled copies of the initial entity [2,3]. Here p and q are prime numbers. On the other hand, for times beyond the revival time $t_{\rm rev}$, a new sequence of full and fractional revivals commences. These are characterized by a longer time scale called the super-revival time $t_{\rm sr}$. Interestingly, the revival cycle may repeat for times greater than $t_{\rm rev}$ but smaller than $t_{\rm sr}$. Studies in the transition between quantum and classical behavior of physical systems or the so-called classical quantum correspondence were regarded as a very intriguing problem from the early days of quantum mechanics and still attract considerable attention [4]. In recent years many attempts were made to characterize the intrinsic evolution of quantum wave packets created in Rydberg atoms [5] and in Bose-Einstein condensates [6–8].

The revival dynamics of wave packets is usually analyzed in terms of autocorrelation function, *i.e.* by monitoring the overlapping between the initial wave packet and the time-evolved one [1,9]. When a revival takes place, the autocorrelation function reaches its initial value, whereas the fractional revivals show up as relative maxima at times intermediate between 0 and $t_{\rm rev}$. The collapse and revival of wave packets can also be studied by analyzing the time behavior of their position-momentum uncertainty products. The standard deviation based uncertainty product computed by using wave packets will exhibit maxima and minima as a function of time. The maximum value of

[a] e-mail: binoyt123@rediffmail.com



J Parasit Dis (July-Sept 2018) 42(3):433–441
https://doi.org/10.1007/s12639-018-1021-z

ORIGINAL ARTICLE

Ethanolic leaf extract of *Coccinia grandis* is effective against both drug resistant and drug sensitive clinical isolates of Indian Kala-azar

Sangita Lahiry[1] · Anjan K. Das[2] · Sachindra N. Das[3] · Madhumita Manna[1]

Received: 14 May 2018 / Accepted: 4 July 2018 / Published online: 18 July 2018

Abstract The emergence of resistance to the current available drugs used for treatment against Indian Kala-azar (KA) or Visceral Leishmaniasis makes the control strategy inadequate for the disease. This grave epidemiological situation directed researches towards alternative treatments including herbal therapy. In this background, the aim of the present study was to evaluate the antileishmanial activity of the leaves of *Coccinia grandis* (a tropical vine) against both the Sodium Stibo Gluconate (SSG) sensitive and resistant as well as Miltefosine (MIL) sensitive and resistant field isolates of *Leishmania donovani*. The cytotoxicity effect of ethanolic extract of leaves of *C. grandis* (Cg-LE) against the clinical isolates of *L. donovani* was checked both in promastigotes and intracellular amastigotes stages. In both sensitive and resistant promastigotes, Cg-LE stimulated reactive oxygen species generation and apoptosis. Parasites infected macrophages showing enhanced nitric oxide production after Cg-LE treatment suggested the leishmanicidal activity of the leaf extract. Furthermore, Cg-LE treatment led to mitochondrial membrane damage and DNA fragmentation in promastigotes. The present study is very encouraging for the fact that Cg-LE showed promising antileishmanial activity against both SSG and MIL drug resistant clinical isolates of Indian KA.

Keywords *Leishmania donovani* · Drug resistant field isolates · *Coccinia grandis* · Antileishmanial activity · Apoptosis · DNA fragmentation

Introduction

Leishmaniasis is one of the neglected tropical diseases caused by the protozoan parasites belonging to the genus *Leishmania*. Among three different clinical forms, Visceral Leishmaniasis (VL) or Kala-azar (KA) is the most severe form, if left untreated (Sundar and Rai 2002). It is a systemic infection and most affected vital organs are spleen, liver, lymph nodes etc.

Around the World, 90% of VL cases occur in Indian subcontinent, Sudan, Ethiopia and Brazil (Desjeux 2004). Currently available drugs for the treatment of VL are not working efficaciously due to the emergence of resistance (Croft et al. 2006) and there is no potent vaccine (Kedzierski 2010). In this bleak scenario, alternative therapeutics is gaining impetus for obtaining antileishmanial compounds. Thus control measures have now focused mainly on alternative therapeutics using medicinal plants (De Carvalho and Ferreira 2001; Croft and Yardley 2002). World Health Organisation reported that almost 80% of the total population of developing countries depends on traditional medicines for their health care needs (WHO 2000). *C. grandis* is one of such medicinal plants with enormous medicinal values. Aqueous extract of leaves of *C. grandis* showed promising antibacterial activity against both gram

✉ Madhumita Manna
madhumita.manna09@gmail.com

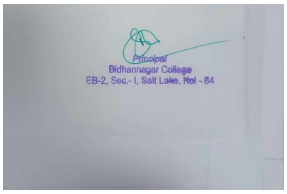
Anjan K. Das
dranjan_nrspath@yahoo.co.in

Sachindra N. Das
sdas@isc.jdvu.ac.in

[1] Department of Zoology, Bidhannagar College, EB 2, Sector I, Salt Lake, Kolkata, West Bengal 700064, India

[2] Department of Pathology, Calcutta National Medical College, 32 Gorachand Road, Kolkata, West Bengal 700014, India

[3] Department of Instrumental Science, Jadavpur University, 188, Raja S.C. Mallick Road, Kolkata, West Bengal 700032, India



Article

Exchange Rate Dynamics, Endogenous Risk Premium and the Balance Sheet Effect: An Effective Demand Model

South Asian Journal of Macroeconomics and Public Finance
7(2) 1–28

SAGE Publications
sagepub.in/home.nav
DOI: 10.1177/2277978718795775
http://journals.sagepub.com/home/smp

Moumita Basu[1]
Jonaki Sengupta[2]
Ranjanendra Narayan Nag[3]

Abstract

This article describes a macroeconomic framework for analysing the interaction between output, domestic interest rate and exchange rate in the presence of the endogenous risk premium and balance sheet effect of exchange rate depreciation on investment demand. Output is demand determined. There are three assets: money, domestic bonds and foreign bonds. Domestic bonds and foreign bonds are not perfect substitutes due to the presence of risk premium. The endogenous risk premium depends on certain macroeconomic fundamentals, namely budget deficit and current account balance. Using this framework, we will examine implications of monetary policy, fiscal policy, tariff liberalization and global interest rate hike for exchange rate dynamics and output. The balance sheet effect and the risk premium together explain how an expansionary fiscal policy may generate recession, while

[1] Assistant Professor, Department of Economics, Bidhannagar College, Kolkata, West Bengal, India.
[2] Assistant Professor, Department of Economics, Charu Chandra College, Kolkata, West Bengal, India.
[3] Associate Professor, St. Xavier's College (Autonomous), Kolkata, West Bengal, India.

Corresponding author:
Jonaki Sengupta, 12, Dakshinpally, P.O. Rahara, Kolkata 700118, India.
E-mail: jonaki12@yahoo.co.in

Organic & Biomolecular Chemistry

PAPER

View Article Online
View Journal

Cite this: DOI: 10.1039/c9ob00448c

One-pot tandem cyclisation to pyrrolo[1,2-*a*][1,4]-benzodiazepines: a modified approach to the Pictet–Spengler reaction†

Sk Asraf Ali, ‡[a,d] Suresh Kumar Mondal,‡[a] Tapas Das,[b] Susanta Kumar Manna,[a] Anirban Bera,[a] Debabrata Dafadar,[a] Sourenjit Naskar,[c] Mijanur Rahaman Molla *[d] and Shubhankar Samanta *[a]

Received 22nd February 2019,
Accepted 11th April 2019

DOI: 10.1039/c9ob00448c

rsc.li/obc

We have reported a one-pot two-step methodology for the synthesis of highly condensed heterocycles, pyrrolo[1,2-*a*][1,4]benzodiazepines, by a modified Pictet–Spengler reaction under mild conditions in a short time. Our approach has a few advantages over the conventional two components synthesis as it is step and atom economic, environmentally benign and a convergent synthetic method. We have discussed here the broad substrate scope of this novel methodology.

Introduction

In current research development, environmentally benign methodologies are central issues in modern synthetic organic chemistry. The one-pot reaction belongs to this class, as multiple bonds are formed in a single vessel circumventing several purification procedures at the same time.[1] Among all the one-pot reactions in the literature,[2] Pictet–Spengler reactions have been of great interest to the synthetic organic chemists because of its potential to synthesise *N*-fused heterocyclic compounds.[3] To the best of our knowledge, to date only two-component Pictet–Spengler reactions in one-pot have been reported in the literature. This reaction was mostly documented as *via* acid catalysed condensation of a reactive aldehyde with an amine partner and was utilized for the synthesis of tetrahydroisoquinolines (THIQs) and tetrahydro-β-carbolines by using aliphatic amines (Scheme 1).[4] However, substitution of the aliphatic amine by an arylamine linked to an activated heterocyclic nucleus, such as pyrrole, pyrazole, imidazole, produced highly condensed 6/7 membered N-rich heterocycles (Scheme 1) which are the core structure of many biologically active and pharmaceutically important molecules.[5]

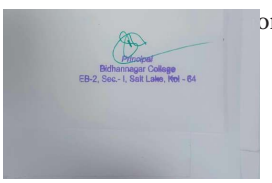
The seven-membered *N*-heterocycles [1,4]benzodiazepines are psychoactive drugs showing anxiolytic, hypnotic, sedative, muscle relaxant, amnesic, and other kinds of physiological activities.[6] In contrast, the pyrrole unit is an important privileged structure in various medicines, such as atorvastatin, pyrvinium, ketorolac, dividol, sunitinib, tolmetin, *etc.*[7] The physiological effects might be increased by the combination of [1,4]benzodiazepine and pyrrole fragments in a single molecule. Pyrrolo[1,2-*a*][1,4]benzodiazepines are being used as CNS (central nervous system) active agents and also have anticancer activity against leukemia cell lines. On the other hand, imidazo[1,5-*a*][1,4]benzodiazepine compounds are found to be used as a neurological drug. Also some pharmacologically active agents like asterrelenin, raspalin, and anthramycins are observed to carry pyrrolo[1,2-*a*][1,4]benzodiazepines moiety in their core structure.[8]

Therefore, research related to the synthesis of efficient, economical, environment-friendly Pictet–Spengler precursors with reactive N-heterocycles which involve aza-cyclisation with aldehydes has been of great interest in the recent era. All approaches towards Pictet–Spengler cyclisations consist of aryl or heteroaryl rings with appropriate amine functionality. These scaffolds were prepared either by multistep reactions or taking the heterocyclic ring as an initial step (Scheme 1). Our designed substrate provided a tandem pathway towards the Pictet–Spengler reaction, where the desired scaffolds preparation and aldehyde/ketone coupling reaction occur in one-pot in a very short time. In the course of our study, we have developed a tandem Pictet–Spengler reaction in which **1** and **2** first produce an arylamine linked activated pyrrole nucleus **3** at room temperature. Successive addition of aldehyde/ketone ...orded multi-fused highly condensed pyrrolo[1,2-*a*][1,4]benzo-

[a]*Department of Chemistry, Bidhannagar College, Kolkata 700064, India. E-mail: chemshubha@gmail.com; Fax: +(9133)2337 4782; Tel: +919775550193*
[b]*National Institute of Technology, Jamshedpur, Jharkhand 831014, India*
[c]*Indian Association for the Cultivation of Science, Jadavpur, Kolkata 700032, India*
[d]*Department of Chemistry, University of Calcutta, Acharya Prafulla Chandra Road, Kolkata 700009, India*

†Electronic supplementary information (ESI) available. CCDC 1897846. For ESI and crystallographic data in CIF or other electronic format see DOI: 10.1039/c9ob00448c

‡These authors contributed equally.



JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY

Article

Cite This: J. Agric. Food Chem. 2019, 67, 7660−7673

pubs.acs.org/JAFC

Characterization and Inception of a Triterpenoid Astrakurkurol, as a Cytotoxic Molecule on Human Hepatocellular Carcinoma Cells, Hep3B

Sudeshna Nandi,[†] Swarnendu Chandra,[†] Rimpa Sikder,[†] Saurav Bhattacharya,[‡] Manisha Ahir,[‡] Debanjana Biswal,[§] Arghya Adhikary,[‡] Nikhil Ranjan Pramanik,[∥] Tapan Kumar Lai,[⊥] Michael G. B. Drew,[#] and Krishnendu Acharya*[,†]

[†]Molecular and Applied Mycology and Plant Pathology Laboratory, Department of Botany, University of Calcutta, 35, Ballygunge Circular Road, Kolkata, WB 700019, India

[‡]Centre for Research in Nanoscience and Nanotechnology, University of Calcutta, JD-2, Sector III, Salt Lake, Kolkata, WB 700098, India

[§]Department of Chemistry, University College of Science, 92, Acharya Prafulla Chandra Road, Kolkata, WB 700009, India

[∥]Department of Chemistry, Bidhannagar College, EB-2, Salt lake, Kolkata 700064, India

[⊥]Department of Chemistry, Vidyasagar Evening College, 39, Sankar Ghosh Lane, Kolkata 700006, India

[#]Department of Chemistry, University of Reading, Whiteknights, Reading RG6 6AD, United Kingdom

ABSTRACT: Mushrooms are customary influential sources of pharmaceutically active metabolites. Usually lanostane-type triterpenoids from mushrooms had prospective for cancer disease treatments. Recently, a triterpenoid, astrakurkurol obtained from the fresh basidiocarps of the edible mushroom *Astraeus hygrometricus*, drew attention as a new cytotoxic therapeutic. The structural stability of this triterpenoid had been established with the amalgamation of density functional theory (DFT) calculations and study of single-crystal X-ray diffraction. To successfully manifest astrakurkurol as a potent cytotoxic therapeutics, a wide apprehension on the molecular and cellular mechanisms underlying their action is prerequisite. On this account, our study was directed to scrutinize the influence of this triterpenoid on human hepatocellular cancer cell model Hep3B. Encapsulating all experimental facts revealed that astrakurkurol had significantly decreased cell viability in a concentration-dependent manner. This effect was unveiled to be apoptosis, documented by DNA fragmentation, chromatin condensation, nuclear shrinkage, membrane blebing, and imbalance of cell cycle distribution. Astrakurkurol persuaded the expression of death receptor associated proteins (Fas), which triggered caspase-8 activation following tBid cleavage. Moreover, tBid mediated ROS generation, which triggered mitochondrial dysfunction and activated the mitochondrial apoptotic events. Astrakurkurol cytotoxicity was based on caspase-8-mediated intrinsic apoptotic pathway and was associated with inhibition at Akt and NF-κB pathway. Astrakurkurol had also inhibited the migration of Hep3B cells, indicating its antimigratory potential. These findings led us to introduce astrakurkurol as a feasible and natural source for a safer cytotoxic drug against hepatocellular carcinoma.

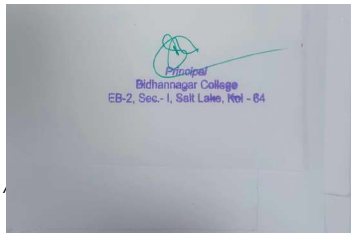
KEYWORDS: *astrakurkurol, triterpenoid, edible mushroom, liver cancer, apoptosis, migration*

INTRODUCTION

Cancer as a disease has become a huge concern worldwide, usually emerging from aberrant cells with unconstrained division and incursion through blood and lymph systems to other tissues. In the 21st century, overpowering cancer was one of the utmost challenges faced by mankind.[1] Among all cancers, hepatocellular carcinoma (HCC) is the biggest recurring malignancy on the globe, which accounts for almost 1 million deaths annually worldwide, and the numbers appear to be increasing substantially in America as well as in other developed western countries.[2] Despite major revolutions in modern medicine, the successful diagnosis and effective treatment of cancer still remains a significant challenge.[1] Modern cancer treatment involved chemotherapy, surgery, hormone therapy, radiation therapy, and immune therapy based on the stage of cancer progression,[3] and most of them pose significant toxic effects to unaffected tissue and the body as a whole.[4] Hence, considerable efforts were being given to identify therapeutic approaches appreciably from natural sources as they are more active as well as selective, less toxic with limited side effects, and capable of inhibiting growth and invasion of cancerous cells by simultaneously inducing apoptosis in early stage tumors.

Mushrooms have been consumed and valued for their inimitable taste, nutraceutical properties, and pharmacon utility. Various medicinal mushrooms known from ancient folklore had reports of use in conventional remedy, and fungal metabolites were popularly used to treat a broad range of diseases.[5] The latest studies revealed that there had been an

Received: February 20, 2019
Revised: June 19, 2019
Accepted: June 20, 2019
Published: June 20, 2019



Journal of Inorganic Biochemistry 199 (2019) 110755

Contents lists available at ScienceDirect

Journal of Inorganic Biochemistry

journal homepage: www.elsevier.com/locate/jinorgbio

New mononuclear and binuclear oxomolybdenum(V) complexes containing N—N chelator: Syntheses, DFT calculations, interaction with BSA protein and in vitro cytotoxic activity

Malini Roy[a], Debanjana Biswal[a], Oiendrilla Sarkar[b], Nikhil Ranjan Pramanik[c,*], Michael G.B. Drew[d], Pritam Sadhukhan[e], Mousumi Kundu[e], Parames C. Sil[e], Syamal Chakrabarti[a,*]

[a] Department of Chemistry, University College of Science, 92, Acharya Prafulla Chandra Road, Kolkata 700009, West Bengal, India
[b] Hooghly Jyotish Chandra Vidyapith, Chinsurah, Hooghly 712101, West Bengal, India
[c] Department of Chemistry, Bidhannagar College, EB-2, Sector-1, Salt Lake, Kolkata 700064, India
[d] Department of Chemistry, The University of Reading, Whiteknights, Reading RG6 6AD, UK
[e] Division of Molecular Medicine, Bose Institute, P-1/12, CIT Scheme VII M, Kolkata 700054, India

ARTICLE INFO

Keywords:
Oxomolybdenum(V)
N-N donor ligand
DFT calculations
Protein interaction
Anticancer

ABSTRACT

A neutral bidentate ligand 2-(3-methyl-5-phenyl pyrazol-1-yl) benzthiazole (L) has been synthesized by refluxing equimolar proportions of 2-hydrazino benzthiazole and benzoyl acetone in ethanol. The ligand acts in a N—N donor fashion and forms stable mononuclear, $MoOX_3L$ [L = Ligand, X = Cl (**1**), Br (**2**)] and binuclear $Mo_2O_4X_2L_2$ [L = Ligand, X = Cl (**3**), Br (**4**)] complexes with molybdenum(V). The ligand and complexes are thoroughly characterized by elemental analyses, IR, UV–Vis spectroscopy, EPR study, magnetic susceptibility, thermogravimetry and cyclic voltammetry. Magnetic moment measurements reveal that the mononuclear complexes are paramagnetic while the binuclear complexes are diamagnetic in nature. EPR studies also confirm the presence of a mononuclear Mo(V) moiety in the complexes. Relevant Density Functional Theory (DFT) calculations have been carried out to determine the structures of the synthesized compounds. The binding mode and mechanism of interaction of the synthesized compounds with bovine serum albumin (BSA) were studied by concentration dependent absorption and fluorescence titration experiments. The ligand and complexes **1–4** are screened for their potential in vitro anticancer activities against three different human cancer cell lines, namely, cervix adenocarcinoma epithelial cells (HeLa), renal carcinoma cells (SK-RC-45) and breast adenocarcinoma cells (MCF-7). The oxomolybdenum(V) complexes are found to exhibit higher anticancer potency towards the cancer cells than the free ligand. Also, structure activity relationship (SAR) studies of this new series of oxomolybdenum(V) complexes indicate that the anticancer activity is to some extent dependent on the electronic effects of the halogen atom coordinated to the molybdenum centre.

1. Introduction

Molybdenum belongs to the second transition metal series in the chromium family. The chemistry of molybdenum has received considerable interest because of its large number of accessible oxidation states ranging from −2 to +6, the presence of molybdenum in metalloenzymes and its significant role in hydroxylase and oxotransferase enzymes [1–7]. Molybdenum can form stable complexes with a large variety of ligands in its higher oxidation states +IV, +V and +VI. Over the decades, Mo(VI) complexes have been extensively studied due to their stable electronic arrangement. Comparatively, Mo(V) complexes have been less discussed due to their instability. The chemistry of Mo (V) is dominated by the paramagnetic mononuclear molybdenyl cation MoO^{3+} and diamagnetic binuclear oxo-bridged $Mo_2O_3^{4+}$ or $Mo_2O_4^{2+}$ cores [8–14].

The treatment and eradication of cancer involves chemotherapy as one of the important techniques [15]. Due to the several drawbacks of current anticancer drugs [16], the identification of new therapies is a domain of relevance in biomedical research. Molybdenum plays an important role in biology [17] and hence it's utility in the field of pharmaceutical chemistry demands exploration.

The donor set and the ligand environment surrounding

* Corresponding authors.
E-mail addresses: nr_pramanik@yahoo.co.in (N.R. Pramanik), schakrabarti2014@gmail.com (S. Chakrabarti).

https://doi.org/10.1016/j.jinorgbio.2019.110755
Received 14 February 2019; Received in revised form 21 June 2019; Accepted 24 June 2019
Available online 25 June 2019

Supramolecular Interactions through Lone pair (lp)–π and Anion-π in Triple-Stranded Dihelicates of Copper (II) Involving Multiring Nitrogen-Heterocyclic Ligand: A Structural Study

[1]Tirtha Pada Majhi, [2]Nabanita Kundu

[1]Assistant professor, [2]Assistant Professor
[1]Department of Chemistry,
[1]Bidhannagar College, EB-2, Sector-I, Salt Lake, Kolkata-700064, West Bengal, India

Abstract: Copper (II) complexes of redox-active bis-bidentate nitrogenous heterocyclic ligand, viz., 3,3′-dipyridin-2-yl[1,1]bi[imidazo[1,5-a]pyridinyl] (L), $[Cu_2(L)_3](ClO_4)_4.3.3CH_2Cl_2$ (**2**), $[Cu_2(L)_3](ClO_4)_4.2H_2O$ (**3**) have been synthesized and characterized by single-crystal X-ray diffraction analysis. In the solid state, the compounds along with compound **1** $[[Cu_2(L)_3](ClO_4)_4.3CH_3CN]$ have triple stranded helical structures. Being π-electron deficient, the heteroaromatic ligand display moderate to strong interactions with perchlorate anions of the complexes as well as with lone pairs of electron rich molecules (solvent of crystallizations, namely, acetonitrile, dichloromethane, water). The structures also involve C_{arene}-H---anion nonclassical hydrogen bonds. Interplay among such non covalent interactions help to shape the extended structures of the molecules in the solid state. Compounds **1** and **2** represents experimental proof for unprecedented type of lone-pair-π-π-anion interactions.

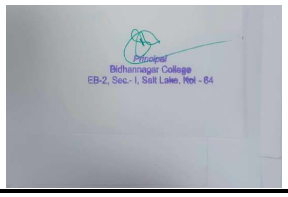
IndexTerms **- Copper (II) triple helicate, Multiring nitrogen heterocyclic ligand, Non-covalent interactions**

I. INTRODUCTION

Non-covalent interactions involving π-systems have been extensively studied in recent years.[1] Such interactions play a crucial role in many frontline areas of contemporary science, from molecular biology to crystal engineering.[2,3] For example, face to face π-stacking interactions involving aryl rings of nucleobase pairs are important for the stability of DNA double helix.[1,4] The interactions between neutral molecule (e.g. Lewis base) and electron deficient aromatic nucleus have been demonstrated to play important roles in a number of chemical and biological systems.[5] For example, interactions between water and the aryl rings of nucleobase pairs help to stabilize RNA pseudoknots.[5] Such interactions are also important for the frame shifting activity of the pseudoknot.[5b] An electrostatic interaction between anionic species and π-system[6] has been overlooked until recently due to counterintuitive nature (anion-π interaction is expected to be repulsive) of such interaction and has only emerged in the field of supramolecular chemistry since 2004 as a result of several favorable theoretical investigations.[6,7] Scientists have realized the importance of this type of interaction in the preparation of highly selective synthetic receptors for the recognition of anions with important biological and medicinal applications,[6,8] since more than 70% of enzyme substrate and cofactors are anions.[9]

Finally, the influence of different types of non-covalent forces are often difficult to measure in solution because only the time average of such interactions are normally observed in solution. The solid state structural analysis not only offers an opportunity to estimate the intermolecular forces of host-guest interactions in a static environment but also provide information about the size, shape, chirality and geometric deformations in such systems. These informations are important for the design of effective systems capable of recognizing cation, anion and neutral entities.

We have recently synthesized[10,11] a π-electron-deficient *N*-heterocyclic compound, viz., 3,3′-dipyridin-2-yl[1,1′]bi[imidazo[1,5-a] pyridinyl] (L) containing a pair of biologically relevant[12] imidazo[1,5-a]pyridine moieties. The ligand L is redox-active and capable of acting as a bis-bidentate ligand, and its copper(II) compound (**1**) offers a unique example of valence tautomerism in solution.[11] Herein, we report the synthesis of two new triple stranded helicates of copper(II) with this ligand (**2, 3**) in two different solvent systems, also different from **1** to investigate the phenomena of lone-pair-π interactions. This unique heteroaromatic ligand with its flexible backbone as well as electron deficient aromatic rings is capable of influencing the supramolecular structures of these helicates (**1-3**) through a variety of non-covalent interactions of *viz.* π-π, anion-π and solvent-π types.



View Article Online
DOI: 10.1039/C8NJ06511J

Fluorescence sensing and intracellular imaging of Pd^{2+} ion by a novel coumarinyl-rhodamine Schiff base†

Arup Kumar Adak,[a,b] Rakesh Purkait[b], Saikat Manna,[c] Bankim Chandra Ghosh,[d] Sudipta Pathak[c] and Chittaranjan Sinha[b]*

[a] Department of Chemistry, Bidhannagar College, EB-2, Sector –1, Salt Lake, Kolkata–700064, West Bengal, India.

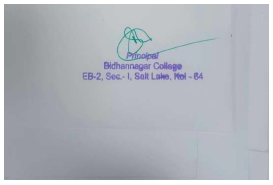
[b] Department of Chemistry, Jadavpur University, Kolkata–700032, West Bengal, India.

[c]Department of Chemistry, Haldia Govt. College, Debhog, Haldia, Purba Medinipur–721657, West Bengal, India.

[d]Department of Chemistry, Durgapur Govt. College, J. N. Avenue, Durgapur, Paschim Barddhaman –713214, West Bengal, India.

Abstract

Coumarinyl-rhodamine, **HCR**, serves as extremely selective sensor to Pd^{2+} ion in ethanol/H_2O (8:2, v/v, HEPES buffer, pH 7.2) solution and the limit of detection (LOD) is 18.8 nM (3σ method). The free sensor, **HCR**, is weakly emissive and in presence of Pd^{2+}, the colour changes from straw to pink with very strong emission at 598 nm in presence of eighteen other cations. The plausible mechanism includes opening of the spirolactam ring of rhodamine upon interaction with Pd^{2+}. This is justified by a structure optimization and transition energy calculation by DFT technique. **HCR** undergoes 1:1 complexation with Pd^{2+} that has been confirmed via Job's plot, mass spectra and Bensei-Hildebrand plot (association constant K_a, $9.1\times10^4\ M^{-1}$). A separate *in*



ROYAL STATISTICAL SOCIETY
DATA | EVIDENCE | DECISIONS

Journal of the Royal Statistical Society
Statistics in Society
Series A

J. R. Statist. Soc. A (2020)

On the estimation of population size from a dependent triple-record system

Kiranmoy Chatterjee

Indian Statistical Institute, and Bidhannagar College, Kolkata, India

and Prajamitra Bhuyan

Imperial College London, UK

[Received April 2018. Final revision April 2019]

Summary. Population size estimation based on a capture–recapture experiment under a triple-record system is an interesting problem in various fields including epidemiology and population studies. In many real life scenarios, there is inherent dependence between capture and recapture attempts. We propose a novel model that successfully incorporates the possible dependence and the associated parameters have nice interpretations. We provide estimation methodology for the population size and the associated model parameters based on the maximum likelihood method. The model proposed is applied to analyse real data sets from public health and census coverage evaluation studies. The performance of the estimate proposed is evaluated through extensive simulation study and the results are compared with existing competitors. The results exhibit superiority of the model over the existing competitors both in real data analysis and in a simulation study.

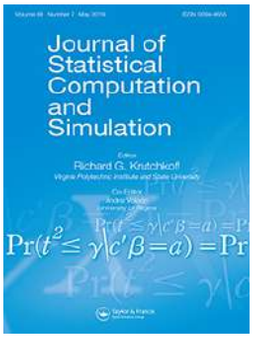
Keywords: Behavioural dependence; Disease surveillance; Maximum likelihood; Time-ordered capture; Trivariate Bernoulli model

1. Introduction

Estimation of population size or the number of vital events that have occurred, during a given time span, is a relevant statistical problem in various scientific disciplines including epidemiology, population studies and life sciences. Federal agencies are generally interested in such estimates for planning and policy formulation. In general, a census or any registration system often fails to capture all the individuals and that leads to undercoverage of the population under consideration. However, in some instances, duplicate records or members outside the target population are included in the census or any other registers because of erroneous enumeration. This issue is known as overcoverage, and it is a common practice to identify and remove the erroneous inclusions through administrative follow-up actions (Chipperfield *et al.*, 2017) or to adjust the census data on the basis of an estimate of the overcoverage rate (Zhang, 2015). In this paper, we focus only on the issues that are related to the commonly encountered problem of undercoverage, assuming that the available data are free from any erroneous inclusion. To reduce the undercoverage error, information from more than one attempt needs to be considered. The data that are obtained from various sources are summarized by matching the lists of captured individuals and analysed to obtain an estimate of the unknown population size (Rastogi and

Address for correspondence: Prajamitra Bhuyan, Department of Mathematics, Imperial College London, South Kensington Campus, London, SW7 2AZ, UK.
E-mail: bhuyan.prajamitra@gmail.com

0964–1998/20/183000



Journal of Statistical Computation and Simulation

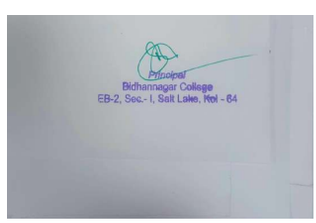
ISSN: 0094-9655 (Print) 1563-5163 (Online) Journal homepage: https://www.tandfonline.com/loi/gscs20

Nonparametric approaches for comparing three-period, two-treatment, four-sequence crossover designs

Suryasish Chatterjee & Uttam Bandyopadhyay

To cite this article: Suryasish Chatterjee & Uttam Bandyopadhyay (2019) Nonparametric approaches for comparing three-period, two-treatment, four-sequence crossover designs, Journal of Statistical Computation and Simulation, 89:7, 1153-1182, DOI: 10.1080/00949655.2019.1575381

To link to this article: https://doi.org/10.1080/00949655.2019.1575381



Autoethnography of an Anthropology Fieldworker in Two Housing Complexes in the City of Kolkata in India: A Semiotic Study on Anthropology of Space

Indian Journal of Anthropology
1(2): 227–239, 2019
© 2019 Classical Institute of Cultural and Social Research and SAGE
Reprints and permissions:
in.sagepub.com/journals-permissions-india
DOI: 10.1177/0972556819863193
journals.sagepub.com/home/ijan
SAGE

Sankha Priya Guha[1]

Abstract

The following paper is an outcome of a research project conducted on "Anthropology of Space" in two housing complexes in the city of Kolkata in India. I am to present my write up in two different contexts: the first one of which will include my fieldwork experience in an autoethnographic form in the studied complexes. One of the two is my own residential housing complex, while the other is new one for me. Majority of the residents of these complexes are the educated middle-class Bengali people, popularly and colloquially called *Maddhyabitta*. The second one will complement my fieldwork experience with theoretical discourse on "Anthropology of Space," the domain of the study. The collected information is thereafter analyzed using "semiotic cluster" and "semiotic chain" techniques. Finally, I will try to narrate the way, my fieldwork experience has led to the construction of an autoethnography in the studied complexes.

Keywords

Autoethnography, space, semiotics, urban

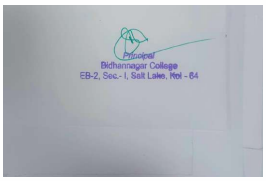
Introduction

Doing Anthropology in Housing Complex in a City

City life of today is characterized by a new form of settlement, popularly called housing complex. The concept of housing, in its broadest sense, refers to

[1] Department of Anthropology, Bidhannagar College, West Bengal State University, Kolkata, West Bengal, India.

Corresponding author:
Sankha Priya Guha, Department of Anthropology, Bidhannagar College, West Bengal State University, Kolkata, West Bengal 700064, India.
E-mail: spgwbes@gmail.com



J. Indian Anthrop. Soc. 55 (3) (2020)

The Dynamics of Place and Space in the Mountain Village of Sillarygaon in Kalimpong District, West Bengal

Sanjoy Peter Guha and Kalyan Bhattacharya
Department of Anthropology, Bidhannagar College, Kolkata

Abstract: The present paper is an outcome of a fieldwork conducted in a multiethnic mountain village of Sillarygaon, district Kalimpong, West Bengal, India. The strategic location of the village facing the picturesque Kanchenjunga range has opened up a new avenue of livelihood in form of tourism for the residents of the village. Most of the resident families (51.5%) have constructed 'Homestay' which is a new form of staying place for the tourists. This staying place for the tourists has lead to creation of an 'Inscribed Space', controlled by social and economic capital which has a considerable impact on the material life of the locally settled communities. However, the communities have continuously kept on trying to sustain their tradition, be it in terms of material, social or supernatural realms of everyday life and thereby reproducing the sense of proxemics which has its imprint written over the entire community landscape.

Key words : Homestay, Place, Space, Capital, Proxemics, Sillarygaon, West Bengal

INTRODUCTION

The concept of 'Place' and 'Space' is most significant in the production of culture across societies and communities around the globe. De Carteau (1984) has stated that " space is a practised place" where historically and culturally situated people create a locality of familiar 'here' and 'there' in the same way as the speakers act out language system in creation of vernacular meanings. 'Place Making' in terms of dwelling unit represents "ethnography of locality" which in Cohen's term is "an account of how people experience and express their difference from others" and the "way in which people express their attachment to a locality" (Cohen 1982: 2-3). Cohen's focus was on the social relations between people and groups that make up the local population. 'Locality' and 'Place' tend to be treated as passive settings for relational matrix among people (Rodman 1992: 640-641, 643). In recent years, a growing number of ethnographers and geographers are interested to understanding the process of place making by examining the way people create place from their attachments and simultaneously definition of the self (Basso, 1996; Bender, 1993; Feld and Basso, 1996; Rodman, 1992).

'Inscribed Space' has its focus on the fundamental relationship between the humans and the environment they occupy. It implies the way humans write in an enduring way about their presence in their surroundings (Low and Zuniga, 2003). Anthropologists over the years have contributed in documenting the way people form meaningful relationships with the localities they occupy; the way humans attach relational meaning to space with different

সৈয়দ মুজতবা আলীর ফরাসি কথার তাকিয়া

উদয়শংকর বর্মা

সৈয়দ মুজতবা আলীর মজলিসী স্বভাব, রসবোধ ও পাণ্ডিত্য কোনও বাঙালি পাঠকেরই অজানা নয়। ধর্ম, ভাষাতত্ত্ব, রাজনীতি, দর্শন, ইতিহাস, সমাজতত্ত্ব ও সাহিত্য নিয়ে তাঁর কথকতা রমণীয় এবং প্রবাদপ্রতিম। শুধু পনেরোটি ভাষার পারঙ্গমতায় বা বিপুলা জ্ঞানের মাধুকরী বৃত্তিতেই নয়, পাঠক চিত্তে সে জ্ঞান সঞ্চারিত করার ক্ষেত্রেও তিনি অদ্বিতীয়। কেননা আলী সাহেব পাঠককে কখনই তত্ত্ব বা তথ্যভারে ক্লিষ্ট করেন না। তাঁর কথার তাকিয়ায় সমাসীন পাঠক সর্বদাই নিঃসন্দেহে এক নৈসর্গিক আয়েস লাভ করেন। ফরাসি ভাষার কিছু শব্দ আলোচনা করতে গিয়ে তিনি নিজেই এই বিশেষ তাকিয়াটির কথা বলেছেন। তিনি সেখানে একটি ফার্সী শব্দবন্ধ ব্যবহার করেছেন। শব্দবন্ধটি হলো *তাকিয়া-ই-কালাস*। তিনি জানান যে, *তাকিয়া-ই-কালাস* মানে হচ্ছে কথার তাকিয়া অর্থাৎ যার উপর ভর করে কথাবার্তা আরাম পায় — জমে ওঠে[১]। সন্দেহ নেই যে, এই কথার তাকিয়ায় আসীন হয়ে আসর জমাতে আলী সাহেবের তুলনা নেই। আর তা যদি হয় ফরাসি দেশ, ফরাসি ভাষা ও সাহিত্যের প্রসঙ্গ, তবে তো সোনায় সোহাগা।

যাকে বিধিবদ্ধ সমালোচনা বলে সেরকম কোনও আঁটসাঁট শৈলীতে সৈয়দ মুজতবা আলী কখনই উৎসাহিত বোধ করেছেন বলে মনে হয় না। কিন্তু বিধিবদ্ধ সমালোচনার যে সুফল তাকে সহজ সৌন্দর্যে আলী সাহেব তাঁর কথকতায় বিন্যস্ত করেছেন। গল্প বলুন, উপন্যাস বলুন, ভ্রমণকাহিনি বলুন, স্মৃতিকাহিনি বলুন, প্রবন্ধ বা রম্যরচনা যাই বলুন সর্বত্রই আয়েস করে আসর বসানোর ক্ষেত্রে তিনি যেন বাংলা গদ্যের মধ্যমণি। কথায় কথায় অনর্গলভাবে রবীন্দ্রনাথের কবিতা, সংস্কৃত শ্লোক, ফার্সী বয়েত, ইংরেজি, জার্মান, ফরাসি কবি সাহিত্যিক, দার্শনিকদের উজ্জ্বল বাক্যমালায় পাঠকদের তিনি মুগ্ধ বিস্ময়ে জাগিয়ে রেখেছেন। সম্ভবত সংশ্লিষ্ট যাবতীয় ভাষা ও সংস্কৃতিগুলির প্রতি তাঁর গভীর অনুরাগ ও অনুসন্ধিৎসাই তাঁকে এই সাফল্য এনে দিয়েছে। আরবী, ফার্সী, ইংরেজি, জার্মান প্রভৃতি বিদেশি এবং বাংলা, হিন্দী, উর্দুর গা ঘেঁষাঘেঁষি করে ফরাসি ভাষা নিয়ে মুজতবা আলী কখনও সিরিয়াস ভঙ্গিতে, কখনও বা লঘুভাবে অনেক কথা বলেছেন। সেসবের মধ্যে তাঁর ভাষাজ্ঞান, চিন্তাশীলতা ও রসিকতার আভা ফুটে বেরিয়েছে। কখনও তিনি ফরাসি ভাষার বিশিষ্টতা ও গুরুত্ব নিয়ে মন্তব্য করেছেন। কখনও ফরাসি সাহিত্যিকদের নিয়ে তাঁর অভিজ্ঞতা, মতামত ব্যক্ত করেছেন। নিজস্ব ভঙ্গীতে তাঁদের মূল্যায়ন করেছেন। কখনও

সমালোচক সত্যেন্দ্রনাথ রায়

উদয়শংকর বর্মা

রবীন্দ্রনাথের সাহিত্যতত্ত্ব, দর্শন, ধর্ম, ইতিহাস, শিক্ষা ও স্বদেশ ভাবনা; এককথায় রবীন্দ্রজীবনদর্শনের বিভিন্ন দিক নিয়ে আলোচনায় সত্যেন্দ্রনাথ রায়ের উজ্জ্বল মনীষা প্রকাশিত হয়েছে। বঙ্কিমচন্দ্রের সমালোচনাসাহিত্যের বিশ্লেষণেও তাই। এমনকি বাংলা উপন্যাসের আধুনিকতা নিয়েও তিনি নতুন দৃষ্টিভঙ্গীর পরিচয় দিয়েছেন। এর পাশাপাশি তাঁর আলোচনার বৃত্তে রয়েছে এ যুগের ধর্মসংকট, বাংলা নাটক, গান ইত্যাদি। আছে *পূর্বাচলের পানে তাকাই (২০০৬)* নামে একখানি স্মৃতিকথাও। সুতরাং সত্যেন্দ্রনাথ রায়ের রচনাসম্ভারের ব্যাপকতা ও বিচিত্রতা অনুমেয়। কিন্তু আমাদের দুর্ভাগ্য এই যে, তাঁর রচিত এ গ্রন্থগুলির অধিকাংশই আর এখন সুলভ নয়, কিছু কিছু দুষ্প্রাপ্যও বটে। সে জন্যেই কিনা জানা নেই যে, ২০১৮ সালটি তাঁর জন্মের শতবর্ষ হওয়া সত্ত্বেও তাঁকে নিয়ে কোথাও একটি স্মরণলেখও প্রকাশিত হলো না! অথচ এ কালের এই অগ্রণী সমালোচককে বিস্মরণের আঁধারে পাঠিয়ে বাংলা সমালোচনা সাহিত্যের একটি গুণমানসম্পন্ন ঐতিহ্যকে কতটা রক্ষা করা গেল সে প্রশ্ন ওঠা অসঙ্গত নয়। অনেকটা সে কারণেই সত্যেন্দ্রনাথ রায়ের রচনা নিয়ে ক্ষুদ্র এ নিবন্ধের অবতারণা। বলাই বাহুল্য, সত্যেন্দ্রনাথ রায় সম্পর্কিত নিবন্ধে তাঁর বঙ্কিমচন্দ্র ও রবীন্দ্রসাহিত্যতত্ত্ব বীক্ষণের দিকটিকেই সূচনাবিন্দু হিসেবে মান্যতা দেওয়া হচ্ছে।

বঙ্কিম ও রবীন্দ্রসাহিত্যতত্ত্ব

সমালোচক সত্যেন্দ্রনাথ রায়ের মূল অভিনিবেশের কেন্দ্র বঙ্কিমচন্দ্র ও রবীন্দ্রনাথের সাহিত্যতত্ত্ব ও সমালোচনা পদ্ধতি। এ নিয়ে বাংলা ভাষায় তিনিই যে প্রথম সবিস্তারে আলোচনা করেছেন, তা নয়। কেননা এর আগে ১৯৬০-এ বেরিয়েছিল সুবোধচন্দ্র সেনগুপ্তের 'বাংলা সমালোচনা পরিচয়' এবং ১৯৬৯-এ অসিতকুমার বন্দ্যোপাধ্যায়ের 'সাহিত্য জিজ্ঞাসায় রবীন্দ্রনাথ (প্রথম খণ্ড)' ইত্যাদি গ্রন্থ। কিন্তু নিঃসন্দেহে পূর্বসূরীদের বিচারপদ্ধতি ও উপস্থাপনরীতি থেকে সত্যেন্দ্রনাথ সম্পূর্ণ আলাদা পথ অবলম্বন করেছেন। সুবোধচন্দ্র তাঁর গ্রন্থে প্রথমেই প্রাচ্য ও পাশ্চাত্য সমালোচনার তুলনামূলক ইতিহাস ও উভয়ের স্বরূপ ব্যাখ্যান করেছিলেন। পরে বাংলা সমালোচনা সাহিত্যের ইতিহাস বর্ণনা করেছেন এবং সেই ইতিহাসের সূত্রেই বঙ্কিমচন্দ্র থেকে রবীন্দ্রনাথ

এবং মুশায়েরা

হাইডেগারের কাব্য ভাবনা

উদয়শংকর বর্মা

অতি সংক্ষিপ্ত পরিসরে কয়েকটি মাত্র সূত্র-সমবায়ে হাইডেগারের কাব্যভাবনার পরিচয় দেওয়া নিঃসন্দেহে খুব কঠিন। কারণ তাঁর অনুধ্যানমূলক (contemplative) কাব্যভাবনা সাহিত্যের আদর্শের চেয়ে দর্শনের ভাষ্যকেই প্রাধান্য দিয়েছে। হাইডেগারের পূর্বসূরী অ্যারিস্টটল কিন্তু কাব্যতত্ত্ব রচনার সময় দর্শনকে সরিয়ে রেখে বিশুদ্ধ সাহিত্যাদর্শকেই প্রাধান্য দিয়েছিলেন। কবিতার বিষয় এবং আঙ্গিক উভয় দিক নিয়েই অ্যারিস্টটল আলোচনা করেছিলেন। কিন্তু হাইডেগার তা করেন নি। কবিতাকে তিনি অস্মিতা কিংবা সত্তার প্রকাশ ছাড়া অন্য কোনও রূপে দেখতে চান নি এবং সেই প্রকাশের শৈলী নিয়েও তাঁর কোনও মাথাব্যথা ছিল না। *সত্তা ও সময় (Being and Time)* গ্রন্থে হাইডেগার লিখেছেন যে, শব্দের মধ্যে এক ধরনের মৌল আবির্ভাবই কবিতা। এ ছাড়া কিছু নয়।[১] অর্থাৎ পৃথিবীতে সত্তা হিসেবে অস্তিত্বের উন্মোচনই কবিতা। অন্যত্রও তিনি বলেছিলেন যে, কবিতা বলতে প্রকৃতপক্ষে বোঝায় কারুর সত্তার জাগরণ ঘটানো বা শৃঙ্খলাবোধ তৈরি করা যার মাধ্যমে সেই ব্যক্তিটি তার স্বীয় অস্তিত্বের ভূমিতে ফিরে যেতে পারে। হ্যেল্ডারলিনের কবিতা নিয়ে আলোচনা করার সময় (*Hölderlin's Hymns Germania and the Rhine*) তিনি বলেছিলেন যে, হ্যেল্ডারলিনের কবিতায় চিন্তাগর্ভ দ্বন্দ্ব যখন সত্তার উন্মোচনের সময় প্রাধান্য লাভ করে তখনই হ্যেল্ডারলিনের কবিতা কাব্যিকতা অর্জন করে।[২] অ্যারিস্টটল অবশ্য কবিতায় পেয়েছিলেন জগতের অনুকরণ, কবিতা সেখানে ছিল জগতের এক ধরনের প্রতিবিম্ব। হাইডেগার সুস্পষ্টভাবে অ্যারিস্টটলের মাইমেসিস তত্ত্বের বিরোধিতা করেছিলেন।

বস্তুত দর্শনে হাইডেগার যে বীয়িং বা সত্তার মৌল সমস্যাটির উত্থাপন করেছিলেন, কবিতায়ও তারই প্রকাশ লক্ষ্য করেছেন। হাইডেগার সত্তাকে শুধু কালিক ও ঐতিহাসিক মনে করেন নি, সত্তাকে অস্তিত্বের প্রতিবিম্ব মনে করেছেন। তাঁর মতে সত্তা অস্তিত্বশীল কোনও বিষয় বা বস্তু থেকে উদ্ভূত নয়, তা স্বয়ং অস্তিত্ব বা স্বয়ম্ভূ অস্তিত্ব (Being in itself)। হাইডেগার তাঁর এই অস্তিত্ব-ভাবনাটিকে তুলে ধরেছেন তাঁর *ডাসাইন (Dasein)* তত্ত্বে। এই তত্ত্ব অনুযায়ী মানুষই একমাত্র অস্তিত্বশীল। কারণ মানুষই একমাত্র নিজের অস্তিত্ব সম্পর্কে সচেতন, জড় পদার্থ বা অন্য প্রাণীরা নয়। তাই মনুষ্যেতর প্রাণীর কোনও সত্তা থাকতে পারে না। বস্তুত অস্তিত্ববান হওয়া বা সত্তাশীল হওয়া মানে নিজেকে নিয়ে চিন্তা

ফরাসি সাহিত্যের ইতিহাস

উদয়শংকর বর্মা

আঠারো শতক

আলোকপ্রাপ্তির যুগ

পটভূমি

ইতিহাসের প্রেক্ষিত

সতেরো শতকের দ্বিতীয়ার্ধের ফরাসি সাহিত্যে রাজা, রাজপুরুষ ও রাজসভার ব্যাপক প্রভাব ছিল। ওই সাহিত্য একদিকে ছিল ধর্মকেন্দ্রিক অন্য দিকে ধ্রুপদী ঘরানার। আঠেরো শতকের ফরাসি সাহিত্য ওই তিনটি প্রভাব থেকেই প্রায় বেরিয়ে এসেছিল। তবে নতুন ধারার এই সাহিত্য মহৎ শিল্পবোধের চেয়ে সমকালীন উগ্র মতবাদকে বেশি প্রশ্রয় দিয়েছিল। সাহিত্যের বিষয় ও ভাবনাকে প্রভাবিত করেছিল নানা ধরনের রাজনৈতিক হিসেবনিকেশ, সমালোচনা, বিজ্ঞান ও সংশয়বাদী দার্শনিক চিন্তাধারাগুলি। বস্তুত ১৬৯৯ খ্রিস্টাব্দে রাসিনের মৃত্যুর পরই ফ্রান্সে নতুন সাহিত্য ও সমালোচনা-রীতির উদ্ভব হয়েছে। ঘনিয়ে এসেছে সতেরো শতকের সমাপ্তি। ১৭০৪ খ্রিস্টাব্দে আতোয়ান গালোঁ ফরাসি ভাষায় *সহস্র এক আরব্য রজনীর* প্রথম চার খণ্ডের অনুবাদ প্রকাশ করেছিলেন। সম্ভবত আতোয়ান ওয়াতোও এই সময়ই তাঁর বিখ্যাত চিত্রকর্মগুলি অঙ্কণ করেছিলেন।

লক্ষণীয় যে, আঠেরো শতকের গোড়ায় ১৭১৫ খ্রিস্টাব্দের দিকে চতুর্দশ লুই মারা যাওয়ার বেশ আগে থেকেই ফ্রান্সের রাষ্ট্রীয় ব্যবস্থায় ভাঙন দেখা দিয়েছিল। যুদ্ধ, দুর্ভিক্ষ, রাষ্ট্রীয় ঋণ, রাজস্বের অস্বাভাবিক বৃদ্ধি ইত্যাদি সবই সম্রাটের মাহাত্ম্যকে ক্ষুণ্ণ করেছিল। নঁতের অনুশাসনের পুনঃপ্রবর্তন প্রটেস্টানদের পুনরায় দেশ থেকে বিতারনের ব্যবস্থা করেছিল। যে *পোর্ট রয়্যাল* নৈতিক বিশ্বাসের একটা আশ্রয়স্থল হয়ে উঠেছিল, তার বিনষ্টি ঘটেছিল। ইউজেনিটাস বুল অর্থাৎ পোপের অনুশাসন চার্চের আধ্যাত্মিক উপাদানগুলোকে ছাঁটাই করে ফেলেছিল। ইতিমধ্যে ইউরোপে বিজ্ঞানের লক্ষণীয় অগ্রগতি ঘটে গেছে। ফলে, ধর্মীয় শূন্যতার স্থানটিকে বিজ্ঞান দখল করে নিয়েছিল। ১৭১৫ খ্রিস্টাব্দে চতুর্দশ লুই মারা যাওয়ার পর ফ্রান্সের শাসনতন্ত্র ভেঙে পড়তে শুরু করেছিল। বস্তুত ১৭১৫ খ্রিস্টাব্দ থেকে ১৭২৩ খ্রিস্টাব্দ পর্যন্ত অধ্যায়টি ছিল ছিল ফ্রান্সের কাছে একটা যুগসন্ধির কাল। কারণ ১৭১৫য় যখন পঞ্চদশ লুই (জন্ম ১৭১০ খ্রিস্টাব্দ) সম্রাটের পদে অভিষিক্ত হন, তখন তাঁর বয়স ছিল মাত্রই পাঁচ বছর। তাঁর তেরো বছর বয়স না হওয়া পর্যন্ত দেশ চালাতেন এবং মুশায়েরা

ChemPubSoc Europe

DOI: 10.1002/slct.201901941

Chemistry SELECT Reviews

Organic & Supramolecular Chemistry

Polycyclic Benzimidazole: Synthesis and Photophysical Properties

Susanta Kumar Manna,[a] Tapas Das,[b] and Shubhankar Samanta*[a]

Benzimidazole has tremendous application in medicinal chemistry and material science. The fusion of ring/substitution to benzimidazole nucleus produce polycyclic benzimidazole *e.g.*, pyrido[1,2-*a*]benzimidazole, benzimidazo[1,2-*a*]quinoline, pyrrolo[1,2-*c*]benzimidazolequinones (PBIs) and benzimidazo [2,1-*a*]isoquinolines and these are the important synthetic strategies in drug discovery. Benzimidazole analogues have versatile therapeutic properties which encouraged the researchers to develop new therapeutic agents. Hence, the synthetic literature survey towards the polycyclic benzimidazole is paramount important. Due to the beautiful fluorescent properties of fused benzimidazole moiety, they are also used in optoelectronics, optical lasers, and organic luminophores. In addition, this scaffold has broad applications in organometallic catalysis, co-ordination chemistry, and asymmetric catalysis. Herein, we report a vast synthetic route of benzimidazole embedded polyhetrocycles in the last eight years and their photophysical application in the modern research field.

1. Introduction

N-containing heterocyclic compound like benzimidazole 4 (the combination of benzene and imidazole) is bicyclic in nature and was first reported by Hobrecker in 1872.[1] Its structural similarity with several naturally occurring nucleotides allows it to interact with the biological system (s). Generally, the condensation of *o*-phenylenediamine 1 and formic acid or trimethyl orthoformate 2 produced benzimidazole 3 in the laboratory (Scheme 1).

Scheme 1. General schematic path for the synthesis of benzimidazole.

Two nitrogen atoms present in the imidazole ring are different in character and make the properties of the ring system diverse in nature. Due to the tautomerization of N–H proton with the other nitrogen atom present in the ring, the C-2 position of benzimidazole is reactive towards electrophilic as well as nucleophilic substrate (Scheme 2).

1.1. Importance of benzimidazole unit

The compound has got tremendous attention due to various physiochemical and pharmaceutical properties such as anti-microbial, antiviral, antifungal, antiprotozoal, anticancer, anti-coagulant, antioxidant, antidiabetic, anti-inflammatory and antihypertensive activities.[2–4] Benzimidazole units are the core structure of a range of clinical medicines.[5]

Scheme 2. Tautomerization of benzimidazole

Many drugs have been designed based upon benzimidazole core structure like lansoprazole[6] and pimobendan[7] which are act as therapeutic agents for proton pump inhibitor and congestive heart failure respectively. 2-substituted benzimidazole, albendazole has antiparasitic properties and is using in infections of tapeworms or other parasites.[8] The antifungal agent benomyl was first reported as a fungicide against a broad spectrum of agricultural fungal diseases and is using in plant cell and protoplast culture (Figure 1).[9] Later on, it has

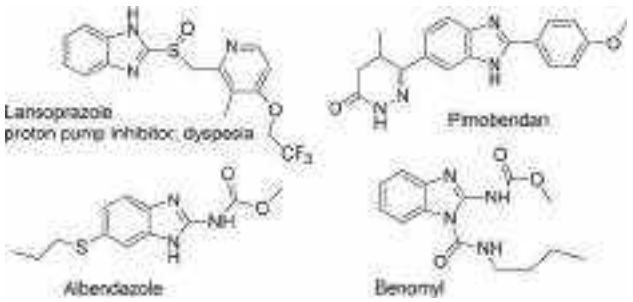


Figure 1. Marketed drugs containing benzimidazole core

[a] *Dr. S. K. Manna, Dr. S. Samanta*
Department of Chemistry, Bidhannagar College, Kolkata 700064, India
E-mail: chemshubha@gmail.com
[b] *Dr. T. Das*
Department of Chemistry, NIT Jamshedpur, Jamshedpur 831014, India

J. Indian Chem. Soc.,
Vol. 96, November 2019, pp. 1381-1385

Synthesis and crystal structure of a mixed bridged trinuclear Ni(II) complex derived from a tridentate NNO donor Schiff base ligand

Rituparna Biswas

Department of Chemistry, Bidhannagar College, EB-2, Sector-1, Salt Lake, Kolkata-700 064, India

E-mail: rituparna2040@yahoo.co.in

Manuscript received online 11 June 2019, accepted 21 August 2019

A new trinuclear Ni(II) complex $[Ni_3L_2(o\text{-}(NO_2)C_6H_4COO)_2(\mu_{1,1}\text{-}N_3)_2(CH_3OH)_2]\cdot 2H_2O$ (**1**) has been synthesized using a tridentate NNO donor Schiff base ligand, 1-[(3-dimethylamino-propylimino)-methyl]-naphthalen-2-ol (HL). Complex **1** has been characterized by X-ray crystallography, elemental analysis, IR and UV-Vis spectroscopy. Single crystal X-ray structure shows that complex **1** is a linear trinuclear Ni(II) complex containing μ-phenoxido, $\mu_{1,1}$-azido and *syn-syn* *o*-nitrobenzoato bridges between the terminal and the central Ni(II) ions. Complex **1** is crystallized in the monoclinic sp. gr. *P*21/*c* with the unit cell parameters *a* = 12.246(5) Å, *b* = 14.683(5) Å, *c* = 17.688(5) Å, and β = 104.208(5)°, *Z* = 2. The terminally coordinated methanol molecule involves in hydrogen bonding through the hydrogen atom H(7) with the oxygen atom O(22) of the solvent water molecule.

Keywords: Synthesis, crystal structure, Schiff base, mixed bridged, Ni(II) complex.

Introduction

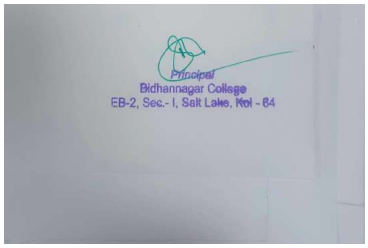
Polynuclear nickel(II) complexes of tridentate NNO donor Schiff base ligands have received considerable attention due to their potential applications in the field of structural chemistry, biological systems, catalysis and magnetism[1–4]. These types of NNO donor Schiff base ligands along with various polyatomic anions (N_3^-, NO_2^-, NO_3^-, $N(CN)_2^-$, $RCOO^-$) are excellent combination to produce coordination polymers with structural diversity and interesting magnetic properties also[4,5]. It is difficult to predict the structures of such mixed bridged Ni(II) polynuclear complexes in which Schiff base and more than one polyatomic bridging moieties are present together. In such cases there are too many factors that should be taken into consideration. In contrast to the phenoxido bridged Ni(II) complexes, the metal ions that are connected via mixed bridging ligands are less studied systems[6]. In connection to the synthesis of mixed bridged complexes, both azide and carboxylate ligands deserve special mention due to their wide variety of coordination modes. Among them the most common bridging modes of azide are end-to-end ($\mu_{1,3}$-N_3, EE) and end-on ($\mu_{1,1}$-N_3, EO)[7]. In general, monodentate terminal and bidentate bridging modes of carboxylate ligands are mostly studied but sometimes it may be coordinated to the metal center in tridentate fashion[8]. Furthermore, these bridging ligands (phenoxido, azido and carboxylato) may simultaneously exist in the same species, leading to interesting topologies and magnetic behaviors[9,10].

Literature survey reveals that mixed bridged trinuclear Ni(II) complexes containing a tridentate Schiff base ligand along with carboxylate and azide groups are comparatively rare. It should be noted that Ghosh *et al.* previously reported a similar compound of Ni(II) with an NNO donor Schiff base ligand (HL′) (2-[(3-dimethylamino-propylimino)-methyl]-phenol) in which the three Ni(II) centers are triply bridged by μ-phenoxido, $\mu_{1,1}$-azido and *syn-syn* acetato bridges[5]. Herein, we report synthesis, crystal structure and spectral studies of a new linear trinuclear Ni(II) complex derived from a tridentate NNO donor Schiff base ligand along with $\mu_{1,1}$-azide and *syn-syn* *o*-nitrobenzoate as two bridging co-ligands.

Experimental

Material:

The N,N-dimethyl-1,3-propanediamine and 2-hydroxy-1-napthaldehyde were purchased from Lancaster Chemical Co. The chemicals were of reagent grade and used without further purification. *o*-Nitrobenzoate salt of nickel(II) was prepared by the reaction of nickel carbonate and *o*-nitrobenzoic acid in hot aqueous solution.



NJC

PAPER

View Article Online
View Journal

Cite this: DOI: 10.1039/c9nj02471a

Synthesis, crystal structure, DFT calculations, protein interaction, anticancer potential and bromoperoxidase mimicking activity of oxidoalkoxidovanadium(v) complexes†

Debanjana Biswal,[a] Nikhil Ranjan Pramanik,*[b] Michael G. B. Drew,[c] Nancy Jangra,[d] Mannar R. Maurya,[d] Mousumi Kundu,[e] Parames C. Sil[e] and Syamal Chakrabarti*[a]

Received 13th May 2019,
Accepted 5th August 2019

DOI: 10.1039/c9nj02471a

rsc.li/njc

The tridentate ONO donor ligand, dipicolinic acid (H_2L), upon reaction with $[V^{IV}O(acac)_2]$ in various alcoholic media (ROH = ethanol/*n*-propanol/*n*-butanol) yields a series of homologous water soluble mononuclear oxidoalkoxidovanadium(v) complexes **1–3** of general formula $[VOL(OR)(H_2O)]$ [R = Et (**1**), *n*-Pr (**2**), and *n*-Bu (**3**)]. All the synthesized complexes have been characterized by elemental analysis, various spectroscopic (IR, ^{1}H NMR, and UV-vis) techniques, cyclic voltammetry and TG/DT analysis. The molecular structures of complexes **1** and **2** are successfully established by the single-crystal X-ray diffraction technique. The vanadium centre occupies a distorted octahedral environment in the complexes. DFT calculations are carried out to estimate the bond parameters, non-covalent interactions and to obtain the frontier orbitals for complexes **1–3**. The binding interaction of the complexes with BSA protein is studied by employing spectroscopic methods (absorption, fluorimetric titration, and circular dichroism) and molecular docking. The water soluble complexes **1–3** can be employed as efficient anticancer agents against human breast adenocarcinoma (MCF-7) cancer cells. The bromoperoxidase (VHPO) activities of the complexes **1–3** have been demonstrated through their efficient catalytic performance in the oxidative bromination of thymol. Both the biological and catalytic activities of the complexes are found to show strong dependence on their molecular structures.

Introduction

The coordination chemistry of vanadium is appealing and has driven a considerable amount of research because of its existence in various oxidation states from −3 to +5.[1] Under physiological conditions, *in vivo*, vanadium complexes are usually stable in their +4 and +5 oxidation states. In higher oxidation states, vanadium is highly oxophilic.[2] Among various transition metal complexes, the importance of vanadium chemistry is currently receiving considerable recognition owing to its diverse applications in biology and pharmacology.[3] This continuous upsurge of interest in vanadium is due to the important therapeutic role of vanadium as anticancer,[4] antimicrobial and antidiabetic agents.[5] Breast carcinoma is the most common malignant disease among women and is drawing significant concern. The prevention, diagnosis and treatment of cancer are equally important and demand great attention. Major discoveries regarding anticancer drugs are cases of serendipity or inhibition of the crucial metabolic pathways of cell division. Thus, the exact mechanism of action of a drug at the molecular level is challenging and a fertile field of research. The evolving paradigms of anticancer metallodrug development demonstrate the increasing importance of metal ions and their coordination chemistry. I
structure of compounds is
structure–activity relationships

[a] Department of Chemistry, University College of Science, 92, Acharya Prafulla Chandra Road, Kolkata 700009, West Bengal, India. E-mail: schakrabarti2014@gmail.com; Fax: +91-033-2351-9755; Tel: +91-033-2350-8386
[b] Department of Chemistry, Bidhannagar College, EB-2, Sector 1, Salt Lake, Kolkata, 700064, India. E-mail: nr_pramanik@yahoo.co.in; Fax: +91-033-2337-4782; Tel: +91-033-2337-4389
[c] Department of Chemistry, The University of Reading, Whiteknights, Reading RG6 6AD, UK
[d] Department of Chemistry, Indian Institute of Technology Roorkee, Roorkee 247667, India
[e] Division of Molecular Medicine, Bose Institute, P-1/12, CIT Scheme VII M, Kolkata 700054, India

† Electronic supplementary information (ESI) available: Fig. S1–S9 contain photograph of single crystals of complex **1**, ESI-MS, IR, ^{1}H NMR, electronic spectra of all the complexes, TG–DT curves, frontier orbitals and CD spectra. Tables S1 and S2 contain the CD secondary structure estimation of BSA and results of molecular docking. CCDC 1893278 (**1**) and 1893279 (**2**). For ESI and crystallographic data in CIF or other electronic format see DOI: 10.1039/c9nj02471a

Received: 8 March 2019 | Revised: 21 April 2019 | Accepted: 5 June 2019

DOI: 10.1002/htj.21510

RESEARCH ARTICLE

HEAT TRANSFER Asian Research WILEY

Dynamics of nonuniform viscosity of unsteady CuO–H_2O nanofluid flow from a spinning body

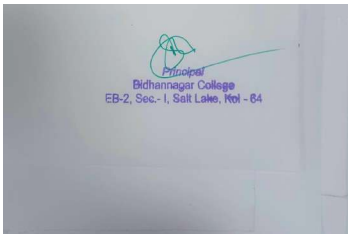
Shib Sankar Giri[1] | **Kalidas Das**[2] | **Prabir Kumar Kundu**[3]

[1]Department of Mathematics, Bidhannagar College, Kolkata, West Bengal, India

[2]Department of Mathematics, Krishnagar Government College, Nadia, West Bengal, India

[3]Department of Mathematics, Jadavpur University, Kolkata, West Bengal, India

Correspondence
Shib Sankar Giri, Department of Mathematics, Bidhannagar College, Kolkata, West Bengal 700064, India.
Email: shibsankar.math@gmail.com



Abstract

This paper studies an unsteady rotating flow over a sphere. The substantial effect of nonuniform viscosity is accounted in the extant study. CuO-H_2O nanofluid is used in adopted nanofluid model. A comparative study among the upshot of nonuniform viscosity and uniform viscosity on present nanofluid model is established here. Primary equations of adopted model have been standardized through similarity methodology and the subsequent equations have been resolved numerically by expending an RK-4 shooting exercise. The stimulus of encouraging flow parameters on the flow specific is made accurately through diagrams and charts. We witnessed that the heat transmission rate is intensified for unsteadiness factor of the present flow, which suggests that the rate of cooling improves. The unsteadiness factor supports the flow to upsurge in $x-$ direction and the reverse consequence originates in the spinning direction. The heat transmission rate is higher in case of nonuniform viscosity than uniform viscosity.

KEYWORDS

CuO, rotating sphere, variable viscosity

1 | INTRODUCTION

In various engineering divisions, such as chemical and industrial engineering,[1,2] external fluids flowing from rotating bodies are remarkable. In rotating schemes, rotation strongly sways

2010 Mathematics Subject Classification: 76W05

Bandopadhyay *J Pure Appl Microbiol,* **13**(**4**), 2159-2167 | December 2019
Article 5702 | https://doi.org/10.22207/JPAM.13.4.28

Print ISSN: 0973-7510; E-ISSN: 2581-690X

RESEARCH ARTICLE OPEN ACCESS

Optimization of Biofertilizer Production and its Application in Plants using Pot Culture Technique

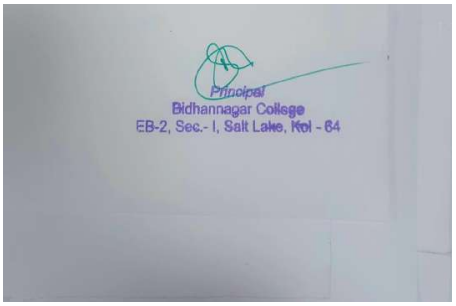
Sandip Bandopadhyay

Department of Microbiology, Bidhannagar College, Government of West Bengal, EB - 2, Sector - 1, Salt Lake, Kolkata - 700 064, West Bengal, India.

Abstract

Mass production of *Bacillus thuringiensis* A5-BRSC culture as biofertilizer, using cheap carbon sources revealed that mashed potato is the most effective carbon source followed by arrowroot and liquid waste of boiled rice. Biomass was mixed with charcoal, the carrier, and applied to the pots to study its plant growth stimulating effect using *Abelmoschus esculentus* as test plant. Biofertilizer inoculated plants showed high shoot and root length, high numbers of leaves, more numbers of fruits, increased fruit weight in comparison to control plants where no biofertilizer was inoculated. Microbial activity of biofertilizer in pot soil was studied by both soil dehydrogenase assay and carbon evolution method. Both of the study revealed that the biofertilizer is stable in soil condition up to 45 days.

Keywords: Biofertilizer, Bioprocess productivity, pot culture, charcoal, *Bacillus thuringiensis.*



***Correspondence:** microbiosandip@gmail.com; 9831896029

(Received: 08 July 2019; accepted: 14 December 2019)

Citation: Sandip Bandopadhyay, Optimization of Biofertilizer Production and its Application in Plants using Pot Culture Technique, *J Pure Appl Microbiol*., 2019; **13**(**4**):2159-2167. https://doi.org/10.22207/JPAM.13.4.28

The Plant Cell, Vol. 32: 486–507, February 2020, www.plantcell.org © 2020 ASPB.

A Tripartite Interaction among the Basidiomycete *Rhodotorula mucilaginosa*, N_2-Fixing Endobacteria, and Rice Improves Plant Nitrogen Nutrition

Karnelia Paul,[a,1] Chinmay Saha,[a,b,1,2] Mayurakshi Nag,[a] Drishti Mandal,[c] Haraprasad Naiya,[a,d] Diya Sen,[e,f] Souvik Mitra,[g] Mohit Kumar,[h] Dipayan Bose,[i] Gairik Mukherjee,[a] Nabanita Naskar,[j,k] Susanta Lahiri,[j] Upal Das Ghosh,[l] Sudipta Tripathi,[m] Mousumi Poddar Sarkar,[n] Manidipa Banerjee,[h] Aleysia Kleinert,[o] Alexander J. Valentine,[o] Sucheta Tripathy,[f] Senjuti Sinharoy,[c] and Anindita Seal[a,3]

[a] Department of Biotechnology and Dr. B.C. Guha Centre for Genetic Engineering and Biotechnology, University of Calcutta, Kolkata 700019, India
[b] Department of Endocrinology & Metabolism, Institute of Post Graduate Medical Education & Research and SSKM Hospital, Kolkata 700020, West Bengal, India
[c] National Institute of Plant Genome Research, New Delhi 110067, India
[d] ICAR-Indian Institute of Natural Resins and Gums Namkum, Ranchi 834010, Jharkhand, India
[e] Department of Plant Protection Biology, Swedish University of Agricultural Sciences, Stockholm, SE 75007, Sweden
[f] Computational Genomics Laboratory, Structural Biology and Bioinformatics Division, Council of Scientific and Industrial Research-Indian Institute of Chemical Biology, Kolkata 700032, India
[g] Department of Botany, Darjeeling Government College, Darjeeling 734101, India
[h] Kusuma School of Biological Sciences, Indian Institute of Technology Delhi, New Delhi 110016, India
[i] Crystallography and Molecular Biology Division, Saha Institute of Nuclear Physics, Kolkata 700064, India
[j] Saha Institute of Nuclear Physics, Kolkata 700064, India
[k] Department of Environmental Science, University of Calcutta, Kolkata 700019, India
[l] P.G. Department of Botany, Bidhannagar College, Kolkata 700026, India
[m] Agricultural Experimental Farm, Institute of Agricultural Science, University of Calcutta, Kolkata 700144, India
[n] Department of Botany, University of Calcutta, Kolkata 700019, India
[o] Botany & Zoology Department, University of Stellenbosch Private Bag X1 Matieland 7602 South Africa

ORCID IDs: 0000-0002-3921-7800 (K.P.); 0000-0002-6983-9336 (C.S.); 0000-0001-6291-4586 (M.N.); 0000-0002-1463-8596 (D.M.); 0000-0001-9260-719X (H.N.); 0000-0001-8097-7310 (D.S.); 0000-0003-3526-9942 (S.M.); 0000-0003-3147-3161 (M.K.); 0000-0001-9863-5538 (D.B.); 0000-0002-6181-891X (G.M.); 0000-0001-5097-2260 (N.N.); 0000-0003-0055-1569 (S.L.); 0000-0001-7501-5715 (U.D.G.); 0000-0003-4826-0840 (S.Tripathi); 0000-0002-6272-9118 (M.P.S.); 0000-0001-6202-5965 (M.B.); 0000-0002-1141-6189 (A.K.); 0000-0002-7995-0900 (A.J.V.); 0000-0003-0611-8088 (S.Tripathy); 0000-0003-2323-2587 (S.S.); 0000-0001-7951-7595 (A.S.)

Nitrogen (N) limits crop yield, and improvement of N nutrition remains a key goal for crop research; one approach to improve N nutrition is identifying plant-interacting, N_2-fixing microbes. *Rhodotorula mucilaginosa* JGTA-S1 is a basidiomycetous yeast endophyte of narrowleaf cattail (*Typha angustifolia*). JGTA-S1 could not convert nitrate or nitrite to ammonium but harbors diazotrophic (N_2-fixing) endobacteria (*Pseudomonas stutzeri*) that allow JGTA-S1 to fix N_2 and grow in a N-free environment; moreover, *P. stutzeri* dinitrogen reductase was transcribed in JGTA-S1 even under adequate N. Endobacteria-deficient JGTA-S1 had reduced fitness, which was restored by reintroducing *P. stutzeri*. JGTA-S1 colonizes rice (*Oryza sativa*), significantly improving its growth, N content, and relative N-use efficiency. Endofungal *P. stutzeri* plays a significant role in increasing the biomass and ammonium content of rice treated with JGTA-S1; also, JGTA-S1 has better N_2-fixing ability than free-living *P. stutzeri* and provides fixed N to the plant. Genes involved in N metabolism, N transporters, and *NODULE INCEPTION*-like transcription factors were upregulated in rice roots within 24 h of JGTA-S1 treatment. In association with rice, JGTA-S1 has a filamentous phase and *P. stutzeri* only penetrated filamentous JGTA-S1. Together, these results demonstrate an interkingdom interaction that improves rice N nutrition.

INTRODUCTION

Nitrogen (N) is a vital macronutrient for plant growth, but the limited availability of usable N has led to the extensive use of N fertilizers, which are both energy intensive to produce and environmentally unfriendly to use. N fixation, that is the conversion of N_2 to forms the plant can use, provides an attractive alternative to exogenous fertilizers. However, the ability to fix atmospheric N_2 is exclusive to prokaryotes and these N_2-fixing prokaryotes are termed diazotrophs. Moreover, only a monophyletic group of angiosperms of the order Eurosids I interacts with a group of specific diazotrophs to exploit the N fixed by these diazotrophs within symbiotic nodules (Soltis et al., 1995). These findings have prompted the development of synth
engineer N_2-fixing symbiosis in cer
2014).

On the Estimation of Population Size from a Dependent Triple Record System

Kiranmoy Chatterjee
Interdisciplinary Statistical Research Unit, Indian Statistical Institute
kiranmoy07@gmail.com
Prajamitra Bhuyan
Department of Mathematics, Imperial College London
bhuyan.prajamitra@gmail.com

Abstract

Population size estimation based on capture-recapture experiment under triple record system is an interesting problem in various fields including epidemiology, population studies, etc. In many real life scenarios, there exists inherent dependency between capture and recapture attempts. We propose a novel model that successfully incorporates the possible dependency and the associated parameters possess nice interpretations. We provide estimation methodology for the population size and the associated model parameters based on maximum likelihood method. The proposed model is applied to analyze real data sets from public health and census coverage evaluation study. The performance of the proposed estimate is evaluated through extensive simulation study and the results are compared with the existing competitors. The results exhibit superiority of the proposed model over the existing competitors both in real data analysis and simulation study.

Keywords : Behavioural dependence, Disease surveillance, Maximum likelihood, Time-ordered capture, Trivariate Bernoulli Model

1 Introduction

Estimation of population size or the number of vital events occurred, during a given time span, is a relevant statistical problem in various scientific disciplines including epidemiology, population studies, and life sciences. Federal agencies are generally interested in such estimates for

On the estimation of population size from a post-stratified two sample capture-recapture data under dependence

Kiranmoy Chatterjee
Interdisciplinary Statistical Research Unit, Indian Statistical Institute
kiranmoy07@gmail.com
Prajamitra Bhuyan
Department of Mathematics, Imperial College London
bhuyan.prajamitra@gmail.com

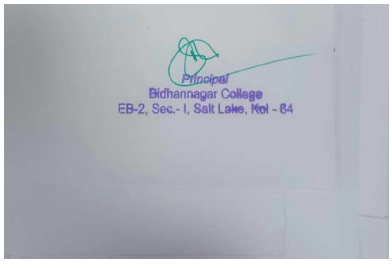
Abstract

Population size estimation based on two sample capture-recapture type experiment is an interesting problem in various fields including epidemiology, public health, population studies, etc. The Lincoln-Petersen estimate is popularly used under the assumption that capture and recapture status of each individual is independent. However, in many real life scenarios, there is an inherent dependency between capture and recapture attempts which is not well-studied in the literature of the dual system or two sample capture-recapture method. In this article, we propose a novel model that successfully incorporates the possible causal dependency and provide corresponding estimation methodologies for the associated model parameters based on post-stratified two sample capture-recapture data. The superiority of the performance of the proposed model over the existing competitors is established through an extensive simulation study. The method is illustrated through analysis of some real data sets.

Keywords : Behavioural dependency, Bivariate Bernoulli, Disease surveillance, Method of moments, Maximum likelihood, Post-stratification.

1 Introduction

Estimation of the size of a population is an interesting problem in different disciplines of epidemiological, medical, social and demographic studies. In order to formulate policies for



BIOSTATISTICS & EPIDEMIOLOGY
2019, VOL. 3, NO. 1, 109–125
https://doi.org/10.1080/24709360.2019.1660111

Taylor & Francis
Taylor & Francis Group

A response adaptive design for ordinal categorical responses weighing the cumulative odds ratios

Atanu Biswas[a], Rahul Bhattacharya[b] and Soumyadeep Das[c]

[a]Applied Statistics Unit, Indian Statistical Institute, Kolkata, India; [b]Department of Statistics, University of Calcutta, Kolkata, India; [c]Department of Statistics, Bidhannagar Government College, Kolkata, India

ABSTRACT

Weighing the cumulative odds ratios suitably, a two treatment response adaptive design for phase III clinical trial is proposed for ordinal categorical responses. Properties of the proposed design are investigated theoretically as well as empirically. Applicability of the design is further verified using a data pertaining to a real clinical trial with trauma patients, where the responses are observed in an ordinal categorical scale.

ARTICLE HISTORY
Received 2 November 2018
Accepted 11 July 2019

KEYWORDS
Response adaptive design; ordinal categorical responses; cumulative odds ratio

1. Introduction

A clinical trial is a large-scale experimentation with human patients to answer relevant health-related questions. Among the four phases of a clinical trial, phase III is very crucial, where entering subjects are randomized to different treatments under consideration. However, assignment of an incoming subject is a trade off between individual and collective ethics [1], where individual ethics refers to maximizing the benefit of each individual patient and collective ethics is concerned with maximizing the benefit of entire patient group to be treated. Naturally, the former demands more assignment of patients to the better treatment eventually whereas the latter requires detection of a significant treatment effect with higher precision. Complete randomization (CR), where the treatments are assigned to equal fractions of patients, is often the popular choice, but only takes care of the collective ethics. On the other hand, maintaining individual ethics requires knowledge of treatment effects. But treatment effectiveness is never known in advance and therefore, data driven randomization, where the allocation strategy is updated dynamically based on the available data, is a way to balance between the requirements of individual and collective ethics. Response adaptive randomization (RAR) is a data driven procedure (see, e.g. the book length treatments of [1,2]), which uses the past allocation and response information of the patients and skews the allocation towards the better performing treatment. But response adaptive allocations, in general, sacrifice the power of a test of equality of treatment effects [3] and hence may provide a safeguard to the individual but compromises a little in terms of collective ethics.

CONTACT Rahul Bhattacharya rahul_bhattya@yahoo.com Department of Statistics, Univ
Kolkata, India

JOURNAL OF STATISTICAL COMPUTATION AND SIMULATION
2019, VOL. 89, NO. 7, 1153–1182
https://doi.org/10.1080/00949655.2019.1575381

Taylor & Francis
Taylor & Francis Group

Nonparametric approaches for comparing three-period, two-treatment, four-sequence crossover designs

Suryasish Chatterjee[a] and Uttam Bandyopadhyay[b]

[a]Department of Statistics, Bidhannagar College, Kolkata, India; [b]Department of Statistics, University of Calcutta, Kolkata, India

ABSTRACT

The paper describes nonparametric approaches for comparing three-period, two-treatment, four-sequence crossover designs through testing the hypothesis that the treatments are interchangeable. The proposed approaches are based on a model which incorporates, along with the direct treatment effects, self and mixed carryover effects. Related asymptotic results are obtained. Comparisons among the designs are made numerically with respect to type I error rate and power of the tests considering compound symmetry and autoregressive covariance structures of the response variables. Lengths of the confidence intervals of the treatment differences are also used to make comparative study among the designs.

ARTICLE HISTORY
Received 18 January 2018
Accepted 24 January 2019

KEYWORDS
Asymptotic distribution; asymptotically distribution-free; Balaam's design; crossover design; mixed carryover effect; self carryover effect; step-down approach

1. Introduction

In clinical research, where two or more treatments are under comparison, patients receive treatments in groups. Here it is important that single measurement from each patient is not appropriate in the statistical sense and it may produce bias due to his/her initial condition. This emerges the concept of repeated measurement studies by which subjects are given treatments more than once over time. Crossover and parallel group trials produce such studies in practice. In particular, when disease under study is chronic and stable (e.g., cancer, arthritis, obesity, asthma), clinical researchers are inclined to crossover trials as they possess certain medical ethics.

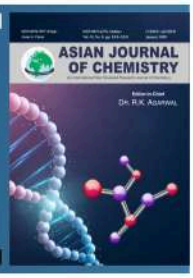
In crossover design with more than two periods, there should be a restriction to those designs in which the first two periods represent one of the basic crossover designs. Thus, for comparing two treatments, denoted by A and B, through crossover design, the first two periods should be $\{AB, BA\}$ (usual crossover design) or $\{AA, AB, BA, BB\}$ (Balaam's design). See, for example [1–3]. This is because of the fact that, if the extra treatment periods result in an excessive number of withdrawals, it will still be possible to carryout analysis with the first two periods in the usual way [4]. This leads us an approach to get a three-period design with a view to achieve higher efficiency than the corresponding two-period crossover design.

CONTACT Uttam Bandyopadhyay ubandyopadhyay08@gmail.com Department of Stati
Calcutta, 35 Ballygunge Circular Road, Kolkata 700019, India

Asian Journal of Chemistry; Vol. 32, No. 10 (2020), 2416-2422

ASIAN JOURNAL OF CHEMISTRY

https://doi.org/10.14233/ajchem.2020.22785



REVIEW

Study of Organization and Dynamics of Multi-Tryptophan Protein Molecules Utilizing Red Edge Excitation Shift Approach

ANISUR R. MOLLA[1,*] and PRITHA MANDAL[2]

[1]Department of Chemistry, Bidhannagar College, Salt Lake, Kolkata-700064, India
[2]Department of Chemistry, Krishnagar Government College, Krishnagar-741101, India

*Corresponding author: E-mail: anisur.chem@gmail.com

Received: 20 April 2020; *Accepted*: 4 June 2020; *Published online*: 25 September 2020; AJC-20046

A shift in the fluorescence emission maxima with gradual increase in excitation wavelength is termed as red edge excitation shift (REES). Tryptophan residues are widely utilized as intrinsic fluorescence probe to investigate the protein structures. Wavelength selective tryptophan fluorescence can explore the dynamics of surrounded water molecules, the ubiquitous biological solvent. Thus REES experiment of various protein conformational states can provide significant input to the study of protein folding pathway and it can also be useful to study interaction of proteins with others. In this review article, we shall focus on red edge effect of various multi-tryptophan proteins in their respective native, intermediate and denatured state.

Keywords: Fluorescence, Multi-tryptophan protein, Red edge excitation shift, Red edge effect, Protein structure.

INTRODUCTION

Proteins, the ubiquitous biological macromolecules, are workhorse of the living cell. They regulate numerous biological processes *in vivo* by acting as enzymes, antibodies, hormones, neurotransmitter, nutrient storage and many more. Polypeptide chains, build up from naturally occurring amino acids, fold into unique native structure of protein, in post translational period. Protein molecules are often organized in highly ordered conformation in the crowded milieu of the cell. These conformations show characteristic dynamic properties which enable the interaction of protein molecule with its counter parts and owes significantly to protein function [1]. Thus the interplay between structure and dynamics of protein molecules is crucial for its function. Crystallization and thereafter X-ray crystallographic diffraction analysis of many soluble proteins provides detailed and precise information about their structure [2]. But all these information about protein structure obtained from X-ray crystallography, are necessarily static in nature and can't give insight into the dynamic properties of protein molecules which is intricately related with its function [3]. Again in case of membrane proteins, we have lesser crystallographic information since crystallization of the membrane proteins are extremely challenging [4]. Further, apart from its native form protein molecules can also exist in different conformations like molten globule, denatured or misfolded states depending on environmental demand. It is not often possible to characterize these states by crystallographic technique because of the transient nature of these non native states. In this context, spectroscopic techniques are very much appreciated because they can provide subtle information about the structure as well as organization and dynamics of protein molecules.

Fluoroscence spectroscopy is a widely used technique for analysis of protein structure, dynamics and function because of its intrinsic sensitivity, suitable time scale, non-invasive nature and minimum perturbation [5]. Tryptophan, the essential amino acid, serves as the intrinsic fluorescence probe of protein molecules. Tryptophan fluorescence is widely used spectroscopic technique for extracting information about protein structure in solution. A shift in the emission maximum of fluorescence spectra towards higher wavelength due to shift of the excitation wavelength towards the red edge of the absorption spectrum, is termed as red edge excitation shift (REES) [5]. The study of REES is a novel approach of fluorescence spectroscopy to

Journal of Advanced Scientific Research

Available online through http://www.sciensage.info

ISSN
0976-9595
Short Communication

HEXAFLUOROISOPROPANOL-INDUCED SECONDARY STRUCTURE PERTURBATION OF SOYBEAN AGGLUTININ

Anisur Rahaman Molla

Department of Chemistry, Bidhannagar College, Salt Lake, Kolkata, West Bengal, India

**Corresponding author: anisur.chem@gmail.com*

ABSTRACT

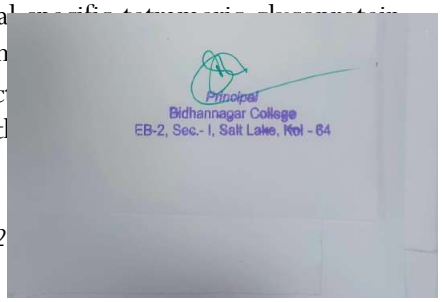
Fluoroalcohols like 1,1,1,3,3,3-hexafluoroisopropanol (HFIP) are widely used as cosolvent along with the biological solvent water to perturb the native protein molecules. The non native states obtained are of immense importance in the field of protein structure and folding, since these states may be present in the protein folding pathway or in the off pathway which leads to amyloid formation. In this study, HFIP-induced structure perturbation at secondary level of the tetrameric legume lectin, soybean agglutinin (SBA) is examined by far-UV circular dichroism (CD) spectroscopy. Like other member of the legume lectin family, native SBA is also an all β-sheet protein. Analysis of the far-UV CD spectra shows formation of α-helix rich conformations at the expense of native β-sheet in presence of higher concentration (50% or more) of HFIP. Visible aggregation is noticed at lower HFIP concentration (~10%) which disappears at higher concentration of HFIP with concomitant induction of the α-helical secondary structure. The results confirm about the helix propensity of amino acid sequence of SBA and helical intermediates may be involved in the early stage of its folding process.

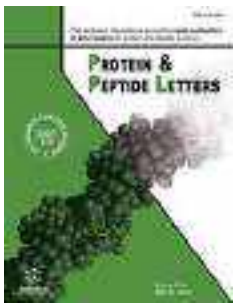
Keywords: Solvent perturbation, Hexafluoroisopropanol, Lectin, β-Sheet, α-Helix, Far-UV CD

1. INTRODUCTION

Perturbation of protein native structure is of paramount importance in the study of protein structure and folding. Non native states obtained by structure perturbation may resemble the 'folding intermediates' present in the folding pathway of a nascent polypeptide chain leading to the native functional protein [1] or these states may be representative of off pathway structures leading to protein aggregation and eventually amyloid formation [2, 3]. Alcohols and mostly fluoroalcohols are extensively used as cosolvent along with the biological solvent water to perturb the native proteins [4, 5]. 2,2,2-Trifluoroethanol (TFE) and 1,1,1,3,3,3-hexafluoroisopropanol (HFIP) are the two fluorinated alcohols used frequently for this purpose. Fluorinated alcohols tend to stabilize conformers with predominantly helix secondary structure as seen in case of various peptides and proteins [6-9]. Even proteins with natively β-sheet structure were also reported for high helical conformation in presence of fluoroalcohol [10-12]. In order to address the reasoning behind alcohol perturbation, the whole problem can be viewed as two parts. First, there occurs perturbation of native protein structure and secondly, formation of a regular secondary structure mainly alpha helix. Disruption of the native structure happens because of decreasing hydrophobic effect in alcoholic medium [13]. But why does it adopt preferentially helical structure? Explicit answer to this question still remains unknown. Theoretical computational study using a two-dimensional lattice model indicates about weakening nonlocal hydrophobic contacts and strengthening local helical interactions [14]. Helix forming ability does not depend on exclusively on the property of added alcohol, but also on the intrinsic properties of a particular peptide or protein. So the amino acid sequence is also a determining factor [15, 16].

Lectins, an important protein family, are comprised of protein molecules which bind carbohydrates specifically and reversibly [17]. Lectins are oligomeric proteins and have been involved in various biological processes. Soybean Agglutinin (SBA) is a member of most extensively studied lectin sub-family – legume lectins. SBA is a GalNAc / Ga[illegible] with one Man-9 oligon[illegible] [18]. Like all other lec[illegible] sheet component as t[illegible]





General Review Article

Solvent Perturbation of Protein Structures - A Review Study with Lectins

Author(s): Pritha Mandal (http://orcid.org/0000-0001-7867-5620), Anisur R. Molla* (http://orcid.org/0000-0002-4442-0643)

Journal Name: Protein & Peptide Letters

Volume 27 , Issue 6 , 2020

DOI : 10.2174/0929866526666191104145511 (https://doi.org/10.2174/0929866526666191104145511)

ScienSage

Journal of Advanced Scientific Research

Available online through http://www.sciensage.info

ISSN
0976-9595
Review Article

MEDIUM RING BENZOFUSED HETEROCYCLIC COMPOUNDS: RELEVANCE AND RECENT SYNTHETIC APPROACHES

Tirtha Pada Majhi

Department of Chemistry, Bidhannagar College, Kolkata, West Bengal, India

**Corresponding author: tirthamajhi@yahoo.com*

ABSTRACT

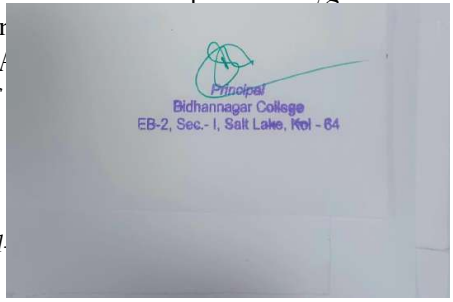
Benzofused medium ring heterocycles find a wide range of application in pharmaceuticals and medicinal chemistry due to their binding capability with multiple receptors. Synthesis and exploration of these types of compounds will help researchers to discover biologically active compounds with a broad range of medicinal values.

Keywords: Heterocycles, Synthesis, Pd-catalyzed reactions, ring closing metathesis, radical cyclization

1. INTRODUCTION

The term 'medium size ring' introduced by Prelog and Brown [1] is usually applied to alicyclic compounds having a ring size in the range of 8 to 11. However, 7-membered and 12-membered rings are often included for comparison purpose. Benzofused medium ring heterocyclic compounds are worth our attention for many reasons; chief among them are their biological activities. More than 80 % of approved drug molecules contain a nitrogen heterocycle within their structure [2]. Almost all of these are easy-to-make 5-7 membered rings. Although medium-ring nitrogen heterocycles (containing 8–11 members) are present in biologically active natural products, they are absent from medicinally important structures. This is principally due to the difficulties associated with their synthesis. Efficient access to medium-sized rings remains a challenging goal in synthetic organic chemistry. The unfavorable entropy effect and transannular interactions are among the difficulties that have to be overcome in order to achieve such transformations. Therefore, organic chemists have been making extensive efforts to produce these heterocyclic compounds by developing new and efficient synthetic transformations.

Benzofused cyclic molecules incorporating at least one nitrogen atom in the structure are often referred to as "privileged structures" owing to their capability of binding to multiple receptors with high affinity [3]. Benzofused seven- or eight membered cyclic amines, named as benzazepines or benzazocines respectively, exhibit important pharmacological properties and are currently under intense scrutiny for their physiological activity. For example, 1-benzazepine systems [4] have shown significant antimicrobial and analgesic activity. 2-Benzazepines have been reported [5] to be used as non-peptide mimics for the well-known tri-peptide sequence Arg-Gly-Asp (RGD), which interacts with αvβ3 integrin, a pivotal protein that plays a key role in cell-cell signaling and acts as its antagonist. 3-Benzazepines have inhibitory effect on reverse transcriptase [6]. 1-Benzazocine derivatives are described as CCR-5 antagonists and used against HIV infections and some other diseases also [7]. These cyclic amine moieties are present in many pharmaceutically active naturally occurring molecules, for example: i) Galanthamine (**1**) [8] isolated from *Galanthus woronowii* or *Galanthus nivalis* is one of the effective drugs for Alzheimer disease, the most common case of elderly dementia; ii) (+) –FR900482 (**2**) [9] isolated from *Streptomyces sandaensis* and acts as an anti-tumor antibiotic;. iii) (-) Pancracine (**3**) [10] isolated from *Rhodophiala bifida* of USA shows hypotensive and anticonvulsive activities. Lorcaserin (**4**), [11] a 3-benzapepine derivative, is a selective serotonin 5-HT2C receptor agonist for the treatment of obesity is recently synthesised. Besides cephalotaxine (**5**), [12] buflavine (**6**), [13] lycoramine (**7**), [14] chilenine (**8**), [15] and montanine (**9**) [16] are notable for their unique and synthetically challenging structures (Fig 1). Similarly a number of natural products endowed with diverse biological activities are found to incorporate oxygen heterocycles of varying r
aromatic moiety (Fig 1). A
belongs to a new group of



Cu(I) catalyzed first example of decarboalkoxymethylation of alkyl 2-(1-(pyridin-2-yl)-1H-pyrrol-2-yl)acetates

Sk Asraf Ali,[ab] Anirban Bera,[a] Susanta Kumar Manna,[a] Subrata Santra,[b] Mijanur Rahaman Molla,[b]* Shubhankar Samanta*[a]

[a]*S. A. Ali, A. Bera, Dr. S.K. Manna, Dr. S. Samanta, Department of Chemistry, Bidhannagar College, Kolkata 700064, India*

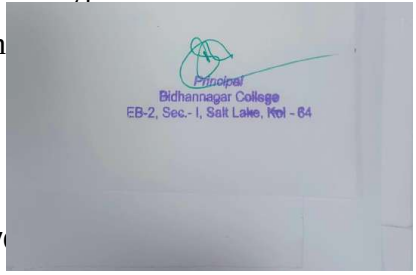
[b]*S. Santra, Dr. M. R. Molla, Department of Chemistry, University of Calcutta, Acharya Prafulla Chandra Road, Kolkata 700009, India*

Email: chemshubha@gmail.com; Fax : (9133) 2337 4782 Mobile: 919775550193

Abstract:

Herein we report an unprecedented functional group assisted decarboalkoxymethylation (-CH_2CO_2R) of *N*-pyridinyl pyrrolo esters by using air stable and cheap copper (I) catalyst. 2-formyl substituent of pyrrole unit is the key isolated intermediate for this novel transformation. This methodology is quick and tolerates a wide range of functional groups in open flask conditions. This protocol provides a large array of tricyclic *N*-pyridinyl 2, 5 unsubstituted fused pyrrole derivatives with high yield (up to 92%).

Towards the discovery of drugs, medicines, natural products and synthetic building block, many methods have been adopted by using various new molecules and the progress is going on by leaps and bounds. Among them, defunctionalization reactions have an fair share importance in chemical synthesis; especially for the preparation of simple organic motif from complex one.[1] High bond dissociation energy of C-C or C-X (X = heteroatom) bond possess a challenge in the selective removal of functional groups (FGs). Despite this challenge, a significant number of defunctionalization reactions (decarboxylation, decarbonylation, deoxygenation, dehalogenation, etc.) have successfully developed over the last couple of decades. This can be easier by metal catalyzed reaction,[2] where organometallic intermediate creates an electrophilic/nucleophilic center for further incorporation of another functionality.[3] There is a lot of example of decarboxylation of aromatic or heteroaromatic derivatives *via* copper catalyst with numerous ligand.[4] In the current era, metal-assisted de-esterification is considered as the growin



NJC

ROYAL SOCIETY OF CHEMISTRY

PAPER

View Article Online
View Journal

Cite this: DOI: 10.1039/c9nj05808g

A solvent- and catalyst-free tandem reaction: synthesis, and photophysical and biological applications of isoindoloquinazolinones†

Anirban Bera,[ab] Sk Asraf Ali,[a] Susanta Kumar Manna,[a] Mohammed Ikbal,[c] Sandip Misra,[d] Amit Saha *[b] and Shubhankar Samanta *[a]

Received 21st November 2019,
Accepted 13th February 2020

DOI: 10.1039/c9nj05808g

rsc.li/njc

An easy green synthetic approach for fused isoindoloquinazolinones has been developed under neat reaction (yields up to 91%) conditions. This new one-pot tandem methodology involves condensation of readily available anthranilamide with 3-(2-formylcycloalkenyl)-acrylic ester under solvent- and catalyst-free conditions. This strategy avoids the use of oxidant, and heavy metal catalysts and also is free from work-up and generation of toxic by-products. A dramatic change of photophysical properties of dihydroisoindoloquinazolinones in basic and aqueous media has also been documented in our study. Moreover, our model synthetic compound shows cytotoxic activity towards metastatic HepG2 and PC3 cancer cell lines.

Introduction

In recent years, one-pot tandem chemical transformations under metal- and solvent-free conditions have widely been used for complex organic molecule syntheses with reduced reaction time period and minimum energy requirement. A variety of chemical conversions, like oxidation, reduction, substitution, condensation, *etc.* have been developed using this principle.[1] Hence, heterocyclic ring formation using this green technique has been an active and attractive field in the recent era.[2]

Among the heterocyclic molecular architectures, *N*-fused heterocycles are ubiquitous in nature and a common structural motif for bioactive molecules and drug candidates. In particular, substituted quinazolinones have a wide range of biological and pharmacological activities, such as diuretic, anti-inflammatory, antidiabetic, anti-hepatitis C, anticonvulsant, antileshmanial, anticancer and so forth.[3] Two major types of fused quinazolinones available in nature are carbocycle fused quinazolinones, such as phaitanthrin, tryptanthrin, vasicione *etc.* (Fig. 1)[4] and heterocycle fused quinazolinones, like luotonin A and wuzhuyurutine A.[5] Quinazolinone molecular frameworks are also popular as efficient organic fluorescence materials.[6] Hence, development of a modern synthetic strategy for fused quinazolinones and their applications in *in vitro* and *in vivo* bio-systems are highly needed.[7]

Different approaches have been reported in the literature to synthesize highly condensed quinazolinone derivatives.[8] Suzuki coupling followed by Pd/Cu catalysed oxidative C–H amination,[9] and tandem Sonogashira coupling and hydroamination cyclization[10] are the two independent approaches towards fused quinazolinone, where 2-bromobenzaldeyde and anthranilamide were taken as the starting materials. Another recent report involves ruthenium(II)-catalyzed one-pot oxidative C–H/N–H functionalization of substituted dihydroquinazolinones with alkynes.[11] Radical cyclization of *N*-(2-iodobenzyl)-*N*-acylcyanamides is another reported strategy to access fused pyrroloquinazoline.[12] Li-Jiang Xuan and his group synthesized the same scaffolds *via* ruthenium-catalyzed oxidative coupling of 2-arylquinazolinones followed by an intramolecular aza-Michael reaction.[13] However, to the best of our knowledge, no attention has been devoted towards the synthesis of fused quinazolinones under metal- and solvent-free conditions. For eco-friendly reaction conditions, the chemical community always searches for green reactions under metal-free and solvent-free conditions. It is always better to perform the reaction in a non-hazardous solvent medium such as water, but it is also far better to run a reaction without any solvent, which reduces the steps in a multistep procedure *e.g.* work up and purification. As a part of our ongoing studies devoted towards the development of new heterocycles,[14] we have disclosed here an operatively simple, catalyst- and solvent-free synthesis of pyrrolo/isoindolo quinazolinone derivatives from 3-(2-formylcycloalkenyl)-acrylic est
amide **2** under heating conditi
good yields (Scheme 1). In additio
have been studied, which are limi

[a] Department of Chemistry, Bidhannagar College, Kolkata 700064, India. E-mail: chemshubha@gmail.com; Fax: (9133) 2337 4782; Tel: +919775550193
[b] Department of Chemistry, Jadavpur University, Kolkata 700032, India. E-mail: amit.saha@jadavpuruniversity.in
[c] Department of Chemistry Berhampore Girls' College, Berhampore 742101, India
[d] Department of Microbiology, Bidhannagar College, Kolkata 700064, India

† Electronic supplementary information (ESI) available. CCDC 1945935. For ESI and crystallographic data in CIF or other electronic format see DOI: 10.1039/c9nj05808g

IOP Publishing Physica Scripta
Phys. Scr. 95 (2020) 015803 (11pp) https://doi.org/10.1088/1402-4896/ab4637

Induced magnetic field and second order velocity slip effects on TiO_2-water/ethylene glycol nanofluids

Kalidas Das[1], **Shib Sankar Giri**[2,4] and **Prabir Kumar Kundu**[3]

[1] Dept. of Mathematics, Krishnagar Government College, Krishnagar, PIN-741101, West Bengal, India
[2] Dept. of Mathematics, Bidhannagar College, Kolkata-700064, West Bengal, India
[3] Dept. of Mathematics, Jadavpur University, Kolkata 700032, West Bengal, India

E-mail: kd_kgec@rediffmail.com, shibsankar.math@gmail.com and kunduprabir@yahoo.co.in

Received 3 June 2019, revised 9 September 2019
Accepted for publication 19 September 2019
Published 4 December 2019

Abstract

This paper explores stagnation-point flow mechanism and the convective heat transmission of an incompressible viscous fluid encouraged by impermeable stretching sheet. Water (H_2O) and the ethylene glycol (EG) driven nanofluids comprising titanium oxide (TiO_2) nanoparticles in company of non-uniform heat source/sink accounted here. Effect of second order velocity slip and induced magnetic-field accounted in the presumed model. Primary equations of adopted model have been standardized through similarity methodology and resolved the subsequent equations numerically by expending RK-4 shooting exercise. The stimulus of encouraging flow parameters on the flow specific is made accurately through diagrams and charts. We measure the strength besides trend of the relation amongst the numerous emergent flow parameters with Skin friction coefficient, Nusselt number by using correlation co-efficient and the impression of the relation confirmed by employing Ficher's t-test. Here dual characteristic of induced magnetic-field has been witnessed for magnetic Prandtl number.

Keywords: induced magnetic field, titanium oxide nanoparticle, slip condition

(Some figures may appear in colour only in the online journal)

Nomenclature

u, v	velocity components
u_w, u_e	stretching and free stream velocity
H_1, H_2	magnetic components
H_e	magnetic field at free stream
μ_{nf}	viscosity of the nanofluid
ρ_{nf}	density of the nanofluid
κ_{nf}	thermal conductivity of the nanofluid
α_{nf}	electrical conductivity of the nanofluid
ν_f, ρ_f	kinematic viscosity and the density of fluid
α_1	magnetic diffusivity
T	temperature of the nanofluid
T_∞	Ambient temperature of the nanofluid
A^*, B^*	space and temperature dependent heat source/sink factors
σ_s, σ_f	electrical conductivity of nanoparticles and base-fluid
ϕ	is nanoparticles concentration
a, c, A, B	constant parameters
α	coefficient of momentum
λ	molecular mean free path
K_n	Knu
L	char
M	mag
Pr	Pran

[4] The author to whom any correspondence should be addressed.

Journal of Computational Design and Engineering, 2020, 7(3), 337–351

doi: 10.1093/jcde/qwaa028
Journal homepage: www.jcde.org
Advance Access Publication Date: 10 April 2020

RESEARCH ARTICLE

Homogeneous–heterogeneous reaction mechanism on MHD carbon nanotube flow over a stretching cylinder with prescribed heat flux using differential transform method

Shib Sankar Giri[1,*], Kalidas Das[2] and Prabir Kumar Kundu[3]

[1]Department of Mathematics, Bidhannagar College, Kolkata 700064, West Bengal, India; [2]Department of Mathematics, Krishnagar Government College, Krishnagar 741101, West Bengal, India and [3]Department of Mathematics, Jadavpur University, Kolkata 700032, West Bengal, India

*Corresponding author. E-mail: shibsankar.math@gmail.com

2010 Mathematics Subject Classification: 76W05.

Abstract

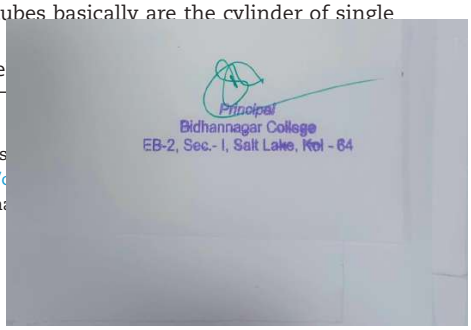
Hydromagnetic nanofluid flow through an incompressible stretching cylinder accompanying with homogeneous–heterogeneous chemical reaction has been executed in current literature. SWCNTs (single-walled carbon nanotubes) and MWCNTs (multiwalled carbon nanotubes) as nanoparticles in appearance of prescribed heat flux are accounted here. Leading equations of the assumed model have been normalized through similarity practice and succeeding equations resolved numerically by spending RK-4 shooting practice and analytically by engaging differential transform method. The impulse of promising flow constraints on the flow characteristic is finalized precisely through graphs and charts. We perceived that velocity outlines and temperature transmission are advanced in MWCNT than SWCNT in every case.

Keywords: carbon nanotubes; nanofluid; stretching cylinder; prescribed heat flux; homogeneous–heterogeneous chemical reaction; DTM

1. Introduction

To utilize solar energy, researchers, scientists, and engineers are devoted to develop energy resources and the energy technologies due to significant dependence on it of human society. It is a well-known reality that improvement in thermal characteristic can be made by adding little amount of nanoparticles having high thermal characteristic. However, in recent times nanofluid (Bhatti, Abbas, & Rashidi, 2017; Daniel, Aziz, Ismail, & Salah, 2018; Dhlamini, Kameswaran, Sibanda, Motsa, & Mondal, 2019; Mondal, Almakki, & Sibanda, 2019), which is a new kind of fluid categorized due to solid–liquid arrangement in metal or nonmetal nanoparticle suspension; originated by Choi (1995), to highten thermal conductivity of the fluid. Carbon nanotubes basically are the cylinder of single or multiple sheets of graphene. Centered on sheets of the graphene, carbon nanotubes are and multiple-walled carbon nanotubes (SWCNTs and MWCNTs). CNT is generally used in e

Received: 24 June 2019; **Revised:** 9 September 2019; **Accepted:** 1 December 2019



European Journal of Physics

PAPER

Insights from intracules and Coulomb holes

Golam Ali Sekh[1], Benoy Talukdar[2] and Supriya Chatterjee[3]

Published 8 June 2020 • Standard

European Journal of Physics, Volume 41, Number 4

Citation Golam Ali Sekh *et al* 2020 *Eur. J. Phys.* **41** 045403

DOI 10.1088/1361-6404/ab835f

sciendo

Journal of Official Statistics, Vol. 36, No. 1, 2020, pp. 25–48, http://dx.doi.org/10.2478/JOS-2020-0002

Identifying the Direction of Behavioral Dependence in Two-Sample Capture-Recapture Study

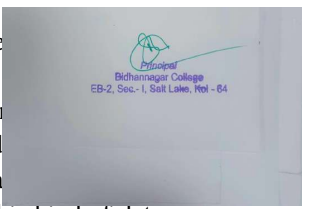
Kiranmoy Chatterjee[1] *and Diganta Mukherjee*[2]

With the possibility of dependence between the sources in a capture-recapture type experiment, identification of the direction of such dependence in dual system of data collection is vital. This has a wide range of applications, including in the domains of public health, official statistics and social sciences. Owing to the insufficiency of data for analyzing a behavioral dependence model in dual system, our contribution lies in the construction of several strategies that can identify the direction of underlying dependence between the two lists in the dual system, that is, whether the two lists are positively or negatively dependent. Our proposed classification strategies would be quite appealing for improving the inference as evident from recent literature. Simulation studies are carried out to explore the comparative performance of the proposed strategies. Finally, applications on three real data sets from various fields are illustrated.

Key words: Classification; direction of behavioral dependence; human population; randomized rule; recapture probability.

1. Introduction and Motivation

Estimation of the size of a given population is an important statistical conce
application in the field of public health, population studies and animal
practice, it is mostly impossible to count all the individuals in a populatio
any attempt, especially when the population is large enough or very hard
remedy, more than one attempt is carried out independently and the popula
estimated by matching the available (two or more) lists of information. This kind of data structure is known as a multiple-record system, which is equivalent to the capture-recapture system popularly relevant to abundance of animal population. However, in the context of a closed human population, use of more than two sources of information is uncommon in the official registration systems of most countries. When two attempts have been made to estimate the N in capture-recapture format, then the resulting data structure is known as a dual-record system (DRS), which is presented in Table 1. Estimation of census coverage error (Gerritse et al. 2017; Chatterjee and Mukherjee 2016a), epidemiological events (Iñigo et al. 2003; Granerod et al. 2013), size of hard-to-count



[1] Department of Statistics, Bidhannagar College, Salt Lake City, Kolkata, 700064, India. Email: kiranmoy07@gmail.com
[2] Sampling and Official Statistics Unit, Indian Statistical Institute, Kolkata, 700108, India. Email: diganta@isical.ac.in
Acknowledgments: Authors gratefully acknowledge the partial financial support by the research fellowship award (Office Order No. DS/JSTK-CC-0020F Dated 11 July, 2013) received by the first author from Indian Statistical Institute, India during his attachment with the institute.

ScienSage

Journal of Advanced Scientific Research

Available online through http://www.sciensage.info

ISSN
0976-9595
Short Communication

HEXAFLUOROISOPROPANOL-INDUCED SECONDARY STRUCTURE PERTURBATION OF SOYBEAN AGGLUTININ

Anisur Rahaman Molla

Department of Chemistry, Bidhannagar College, Salt Lake, Kolkata, West Bengal, India

**Corresponding author: anisur.chem@gmail.com*

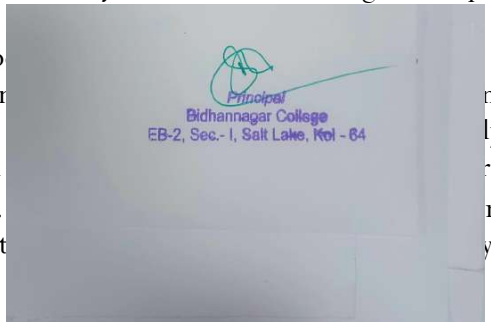
ABSTRACT

Fluoroalcohols like 1,1,1,3,3,3-hexafluoroisopropanol (HFIP) are widely used as cosolvent along with the biological solvent water to perturb the native protein molecules. The non native states obtained are of immense importance in the field of protein structure and folding, since these states may be present in the protein folding pathway or in the off pathway which leads to amyloid formation. In this study, HFIP-induced structure perturbation at secondary level of the tetrameric legume lectin, soybean agglutinin (SBA) is examined by far-UV circular dichroism (CD) spectroscopy. Like other member of the legume lectin family, native SBA is also an all β-sheet protein. Analysis of the far-UV CD spectra shows formation of α-helix rich conformations at the expense of native β-sheet in presence of higher concentration (50% or more) of HFIP. Visible aggregation is noticed at lower HFIP concentration (~10%) which disappears at higher concentration of HFIP with concomitant induction of the α-helical secondary structure. The results confirm about the helix propensity of amino acid sequence of SBA and helical intermediates may be involved in the early stage of its folding process.

Keywords: Solvent perturbation, Hexafluoroisopropanol, Lectin, β-Sheet, α-Helix, Far-UV CD

1. INTRODUCTION

Perturbation of protein native structure is of paramount importance in the study of protein structure and folding. Non native states obtained by structure perturbation may resemble the 'folding intermediates' present in the folding pathway of a nascent polypeptide chain leading to the native functional protein [1] or these states may be representative of off pathway structures leading to protein aggregation and eventually amyloid formation [2, 3]. Alcohols and mostly fluoroalcohols are extensively used as cosolvent along with the biological solvent water to perturb the native proteins [4, 5]. 2,2,2-Trifluoroethanol (TFE) and 1,1,1,3,3,3-hexafluoroisopropanol (HFIP) are the two fluorinated alcohols used frequently for this purpose. Fluorinated alcohols tend to stabilize conformers with predominantly helix secondary structure as seen in case of various peptides and proteins [6-9]. Even proteins with natively β-sheet structure were also reported for high helical conformation in presence of fluoroalcohol [10-12]. In order to address the reasoning behind alcohol perturbation, the whole problem can be viewed as two parts. First, there occurs perturbation of native protein structure and secondly, formation of a regular secondary structure mainly alpha helix. Disruption of the native structure happens because of decreasing hydrophobic effect in alcoholic medium [13]. But why does it adopt preferentially helical structure? Explicit answer to this question still remains unknown. Theoretical computational study using a two-dimensional lattice model indicates about weakening nonlocal hydrophobic contacts and strengthening local helical interactions [14]. Helix forming ability does not depend on exclusively on the property of added alcohol, but also on the intrinsic properties of a particular peptide or protein. So the amino acid sequence is also a determining factor [15, 16]. Lectins, an important protein family, are comprised of protein molecules which bind carbohydrates specifically and reversibly [17]. Lectins are oligomeric proteins and have processes. Soyb of most exter me lectins. SBA lycoprotein with monomer [18]. rised of β-sheet structure



Asian Journal of Chemistry; Vol. 32, No. 10 (2020), 2416-2422

ASIAN JOURNAL OF CHEMISTRY

https://doi.org/10.14233/ajchem.2020.22785

REVIEW

Study of Organization and Dynamics of Multi-Tryptophan Protein Molecules Utilizing Red Edge Excitation Shift Approach

ANISUR R. MOLLA[1,*] and PRITHA MANDAL[2]

[1]Department of Chemistry, Bidhannagar College, Salt Lake, Kolkata-700064, India
[2]Department of Chemistry, Krishnagar Government College, Krishnagar-741101, India

*Corresponding author: E-mail: anisur.chem@gmail.com

Received: 20 April 2020; *Accepted*: 4 June 2020; *Published online*: 25 September 2020; AJC-20046

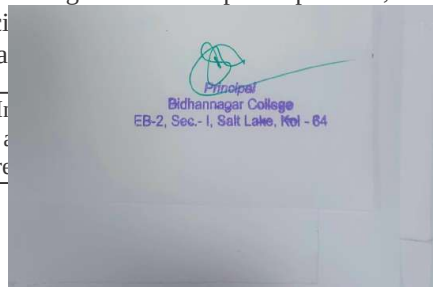
A shift in the fluorescence emission maxima with gradual increase in excitation wavelength is termed as red edge excitation shift (REES). Tryptophan residues are widely utilized as intrinsic fluorescence probe to investigate the protein structures. Wavelength selective tryptophan fluorescence can explore the dynamics of surrounded water molecules, the ubiquitous biological solvent. Thus REES experiment of various protein conformational states can provide significant input to the study of protein folding pathway and it can also be useful to study interaction of proteins with others. In this review article, we shall focus on red edge effect of various multi-tryptophan proteins in their respective native, intermediate and denatured state.

Keywords: Fluorescence, Multi-tryptophan protein, Red edge excitation shift, Red edge effect, Protein structure.

INTRODUCTION

Proteins, the ubiquitous biological macromolecules, are workhorse of the living cell. They regulate numerous biological processes *in vivo* by acting as enzymes, antibodies, hormones, neurotransmitter, nutrient storage and many more. Polypeptide chains, build up from naturally occurring amino acids, fold into unique native structure of protein, in post translational period. Protein molecules are often organized in highly ordered conformation in the crowded milieu of the cell. These conformations show characteristic dynamic properties which enable the interaction of protein molecule with its counter parts and owes significantly to protein function [1]. Thus the interplay between structure and dynamics of protein molecules is crucial for its function. Crystallization and thereafter X-ray crystallographic diffraction analysis of many soluble proteins provides detailed and precise information about their structure [2]. But all these information about protein structure obtained from X-ray crystallography, are necessarily static in nature and can't give insight into the dynamic properties of protein molecules which is intricately related with its function [3]. Again in case of membrane proteins, we have lesser crystallographic information since crystallization of the membrane proteins are extremely challenging [4]. Further, apart from its native form protein molecules can also exist in different conformations like molten globule, denatured or misfolded states depending on environmental demand. It is not often possible to characterize these states by crystallographic technique because of the transient nature of these non native states. In this context, spectroscopic techniques are very much appreciated because they can provide subtle information about the structure as well as organization and dynamics of protein molecules.

Fluoroscence spectroscopy is a widely used technique for analysis of protein structure, dynamics and function because of its intrinsic sensitivity, suitable time scale, non-invasive nature and minimum perturbation [5]. Tryptophan, the essential amino acid, serves as the intrinsic fluorescence probe of protein molecules. Tryptophan fluorescence is widely used spectroscopic technique for extracting information about protein structure in solution. A shift in the emission maximum of fluorescence spectra towards higher wavelength due to shift of the excitation wavelength towards the red edge of the absorption spectrum, is termed as red edge exci
REES is a novel approa



NJC

ROYAL SOCIETY OF CHEMISTRY

PAPER

View Article Online
View Journal

Cite this: DOI: 10.1039/d0nj03702h

The vital role of ditopic *N–N* bridging ligands with different lengths in the formation of new binuclear dioxomolybdenum(VI) complexes: synthesis, crystal structures, supramolecular framework and protein binding studies†

Debanjana Biswal,[a] Malini Roy,[a] Nikhil Ranjan Pramanik,*[b] Suvendu Paul,[c] Michael G. B. Drew[d] and Syamal Chakrabarti *[a]

A new series of binuclear dioxomolybdenum(VI) complexes **1–4** of general formula $[(MoO_2L)_2(N–N)]$ with an ONS donor Schiff base ligand (**H_2L** = *S*-benzyl-β-*N*-(5-bromo-2-hydroxyphenyl)methylenedithiocarbazate) and bridging auxiliary ligands having different lengths and flexibilities [*N–N* donor 4,4′-bipyridine (4,4′-bipy), 1,2-bis(4-pyridyl)ethene (bpe), 1,3-bis(4-pyridyl)propane (tmp) and 1,4-bis[(1*H*-imidazole-1-yl)methyl]benzene (bix)] have been synthesized. The complexes have been thoroughly characterized by elemental analyses, IR, ^{1}H NMR and UV-Vis spectroscopy, cyclic voltammetry and thermal analyses. The molecular structures of all four complexes **1–4** have been determined by single-crystal X-ray diffraction techniques. Crystal structures of binuclear molybdenum complexes having bridging 1,3-bis(4-pyridyl)propane and 1,4-bis[(1*H*-imidazole-1-yl)-methyl]benzene ligands are reported for the first time. Each molybdenum site in the binuclear complexes adopts a distorted octahedral geometry. The auxiliary spacers (*N–N*) act as bis-monodentate ligands occupying one axial position of each molybdenum centre thereby connecting two molybdenum(VI) atoms. The influence of auxiliary ligands on structural and supramolecular features of the complexes has been studied. Hirshfeld surface and fingerprint plots uncover the central role of different intermolecular interactions and their comparative dimension to build up the crystal architectures of the molybdenum complexes. Supportive DFT calculations regarding non-covalent interactions and molecular orbitals have been carried out to support the experimental data. Apart from these interesting structural features, the effects of binding of the ligand **H_2L** and complexes **1–4** with bovine serum albumin (BSA) have been explored using absorption and steady-state fluorescence titration measurements. Molecular docking studies have also been carried out to further deepen the understanding of interaction patterns and binding modes of the ligand and binuclear dioxomolybdenum(VI) complexes with BSA.

Received 22nd July 2020,
Accepted 14th September 2020

DOI: 10.1039/d0nj03702h

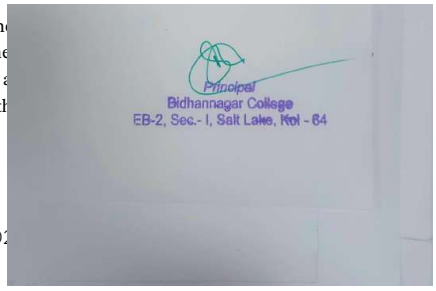
rsc.li/njc

Introduction

Coordination chemistry of molybdenum is one of the most fascinating areas of chemical research and will continue to be so in the years to come. Molybdenum is much less toxic and more environment friendly compared to other transition metals.[1] Characteristic features of molybdenum are its ability to form oxo-anions and a wide range of oxidation states (−2 to +6)[2] of relatively similar stability. The important oxidation states of molybdenum are +IV, +V and +VI since biological systems work

[a] Department of Chemistry, University College of Science, 92, Acharya Prafulla Chandra Road, Kolkata 700009, West Bengal, India. E-mail: schakrabarti2014@gmail.com; Fax: +91-033-2337-4782, +91-033-2351-9755; Tel: +91-033-2350-8386, +91-033-2337-4389
[b] Department of Chemistry, Bidhannagar College, EB-2, Sector1, Salt Lake, Kolkata 700064, India. E-mail: nr_pramanik@yahoo.co.in
[c] Department of Chemistry, University of Kalyani, Kalyani, Nadia, West Bengal 741235, India
[d] Department of Chemistry, The University of Reading, Whiteknights, Reading RG6 6AD, UK

† Electronic supplementary information (ESI) available: Supplementary figures S1 and S2 shows IR and UV spectra of th
the CV diagrams, Hirshfeld surface plots, frontier orbitals, TG-DT curves, FRET and molecular docking images of the
plots of the complexes. Table S5 presents Hirshfeld surface volume and surface area of the complexes **1–4**. The FRET
Tables S6 and S7 respectively. CCDC 1974269–1974272 contain the supplementary crystallographic data for th
crystallographic data in CIF or other electronic format see DOI: 10.1039/d0nj03702h



Tropical Ecology
https://doi.org/10.1007/s42965-020-00108-3

International Society for Tropical Ecology

RESEARCH ARTICLE

Carbon estimation in the undershrub layer and the soil of a dry deciduous forest of West Bengal (eastern India)

S. Saha[1] · **S. Bera**[2]

Received: 18 June 2019 / Revised: 30 August 2020 / Accepted: 6 September 2020

Abstract

In the present context of global warming, it is essential to estimate the entrapped carbon in biomass and soil. In India, the dry deciduous forest is the premier forest type. However, in such forest type of West Bengal, there has not been estimation of the carbon contents at any vegetation layer. This article describes the carbon contents in biomass, litter and soil of the undershrub layer as well as its species composition-diversity. Five distinct sites–dry *nullah* (S1), forest clearing (S2), forest middle (S3), forest edge (S4) and foot track (S5) were identified. The above ground biomass (AGB) and litter were estimated through harvest and forest floor sweeping, respectively. For the measurement of below ground biomass (BGB), soil monoliths were dug out. The total biomass (AGB + BGB + Litter) across the forest ranged between 3.15 t ha^{-1} and 37.58 t ha^{-1} (av. 18.39 t ha^{-1}). The AGB-carbon ranged between 0.59 t C ha^{-1} and 3.63 t C ha^{-1} (av. 1.97 t C ha^{-1}), the BGB-carbon ranged between 0.51 t C ha^{-1} and 12.92 t C ha^{-1} (av. 4.91 t C ha^{-1}) and the litter-carbon ranged between 0.32 t C ha^{-1} and 2.39 t C ha^{-1} (av. 1.40 t C ha^{-1}). The organic carbon in acidic sandy soil of the forest ranged between 12.47 t ha^{-1} and 17.31 t ha^{-1} (av. 15.14 t ha^{-1}). Of the total entrapped carbon in the forest, the AGB-carbon contributed 8%, the BGB-carbon 21%, while the litter-carbon 6%. The balance pool of 65% was supplied by the soil organic carbon. Seventeen undershrub species were identified with density of 6690 individuals ha^{-1} and the average indices of diversity and concentration of dominance was 0.77 and 0.22, respectively. Thus, to contribute in understanding the carbon stocking potential in a specific forest type and also to add to the inventory of carbon budget in the Indian forests, this micro level study was carried out in a dry topical forest (of eastern India).

Keywords Above ground and below ground biomass · Carbon budget · Forest sites · Litter · Soil organic carbon · Vegetation layer

Introduction

One among the several significant services provided by the forest is its role in carbon cycle. This is because, the forest stores large quantity of carbon in the biomass, litter and soil. There is an estimate that about 86% and 73% of the earth's terrestrial above ground and soil carbon, respectively to be stored in forests (Rodger 1993). But, forests can also be a source as well as sink of carbon (Vashum and Jayakumar 2012). India with its huge population and expanding habitation has a very low per capita forest cover (0.06 ha). But it is amongst the few tropical countries where the forest carbon stock has either stabilized or is set to increase (Ravinranath et al. 2008). In this country, tropical forests cover about 86% of its total forested areas and of which 53% belongs to the dry deciduous forest type (Singh and Singh 1991). Being the premier forest type, these forests have been thoroughly studied with respect to density, diversity, disturbance, biomass and carbon contents by several workers (Singh and Singh 1981, 1991; Sukumar et al. 1992; Pandey and Shukla 1999; Sagar et al. 2003; Mehta et al. 2008a; Chaturvedi et al. 2011; Sundarapandian et al. 2013; Chaturvedi and Rag
Naidu et al. 2018; R
forests are also amo
of man (Miles et al.
Sagar et al. 2012; C

✉ S. Saha
san204in@yahoo.com

[1] Post Graduate Department of Botany, Bidhannagar College, Salt Lake City, Kolkata 700064, India

[2] Post Graduate Department of Botany, Jogamayadevi College, Kolkata 700026, India

Published online: 15 September 2020

Majumder et al. Journal of Genetic Engineering and Biotechnology (2020) 18:47
https://doi.org/10.1186/s43141-020-00061-7

Journal of Genetic Engineering and Biotechnology

RESEARCH Open Access

An analysis of *exo*-polygalacturonase bioprocess in submerged and solid-state fermentation by *Pleurotus ostreatus* using pomelo peel powder as carbon source

Kausik Majumder[1,2*], Bubai Paul[1] and Rakhi Sundas[1]

Abstract

Background: As there has been an increasing trend in the effective utilization of plant and crop residues for microbial transformation into a desired product, an attempt was made to compare of *exo*-polygalacturonase production using logistic and Luedeking-Piret kinetic model by *Pleurotus ostreatus* in submerged (smf) or solid-state fermentation (ssf) using pomelo peel powder, an agro-forestry residue as carbon substrate.

Results: Cultures grown in submerged fermentation produced a peak of *exo*-polygalacturonase activity as 6160 Ul^{-1} on the 4th day of culture as compared with 2410 Ul^{-1} on the 5th day of fermentation by solid-state fermentation. The enzyme yield coefficient ($Y_{E/X}$) is of higher value in smf vs. ssf system ($Y_{E/X} = 1.05 \times 10^3$ vs. 0.622×10^3) indicating the more efficient product yield in smf as compared with ssf. The plots derived from λ versus ζ clearly demonstrate that the secondary product destruction is higher in smf than in ssf.

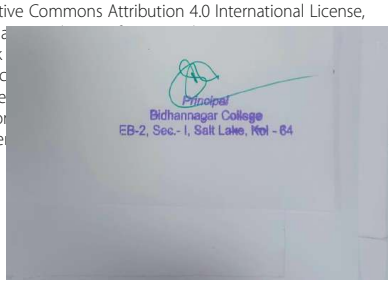
Conclusion: *P. ostreatus* performs much better in submerged fermentation as compared with solid-state fermentation in respect to *exo*-polygalacturonase production although ssf technique produced a more thermostable *exo*-polygalacturonase in crude extract, which is highly desirable in various industrial applications.

Keywords: Polygalacturonase, *Pleurotus*, Pomelo peel powder

Background

Microbial pectinolytic enzymes of fungal origin have many industrial applications viz food processing, textile, etc. with tremendous potentials [1]. Filamentous fungi, e.g., *Aspergillus niger* are the most frequently used microorganism in the enzyme industry since they produce about 90% of enzyme extra-cellularly. Research reports are available on *exo*-polygalacturonase production by *Aspergillus* species using a wide range of substrates through either ssf or smf. Moreover, comparative assessment between these two techniques, i.e., smf and ssf on the production of polygalacturonase are also reported [2, 3] in which *Aspergillus niger* was used. There are very few works available about the production of polygalacturonase from the edible fungi, such as *Lentinus edodes* [4] or *Pleurotus ostreatus* [5]. These studies are confined either submerged or solid-state fermentation, although no research work has been on record about the comparative assessment on the kinetics of *exo*-polygalacturonase (*exo*-PG, EC 3.2.1.67) production by these two techniques. Moreover, enzymes obtained from the edible fungi can be suitably employed in food processing industries. In recent years, there has been an increasing trend in the effective utilization of crop residues for microbial degradation and transformation into a specific desired product of industrial values and

* Correspondence: majumderkausik@yahoo.co.in
[1]Post-Graduate Department of Botany, Darjeeling Government College, Government of West Bengal, Darjeeling, West Bengal 734101, India
[2]Present address: Department of Botany, Bidhannagar College, Government of West Bengal, EB-2, Sector-1, Salt Lake City, Kolkata, West Bengal 700 064, India



Received: 13 May 2020
DOI: 10.1002/mma.6818

WILEY

RESEARCH ARTICLE

Influence of nanoparticle diameter and interfacial layer on magnetohydrodynamic nanofluid flow with melting heat transfer inside rotating channel

Shib Sankar Giri[1] | **Kalidas Das**[2] | **Prabir Kumar Kundu**[3]

[1]Department of Mathematics, Bidhannagar College, Kolkata, India

[2]Department of Mathematics, Krishnagar Government College, Krishnanagar, India

[3]Department of Mathematics, Jadavpur University, Kolkata, India

Correspondence
Shib Sankar Giri, Department of Mathematics, Bidhannagar College, Kolkata 700064, West Bengal, India.
Email: shibsankar.math@gmail.com

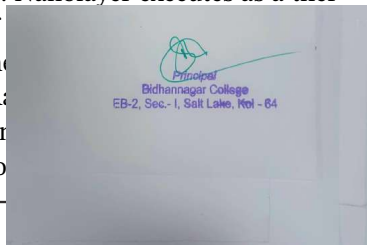
The present article addresses melting heat transmission phenomenon in MHD nanofluid flow between two horizontally located plates in rotating structure. This exploration is executed in engine oil-based nanofluid accompanied by graphene oxide nanoparticles. Thermal conductivity of the nanofluid incorporated with effect of diameter of graphene oxide and solid–liquid interfacial layer has been engaged here. Non-linear radiation is added in accepted nanofluid model. Through similarity technique, we obtain non-linear ODEs from leading PDEs, and numerically, by employing RK-4 shooting practice, we resolve the succeeding equation. Stimulus of inspiring flow factors on the flow specifically is accomplished precisely through figures and charts. Temperature circulation enhances with nanoparticle diameter and interfacial layer factors. Primary and secondary velocity outlines are reverse in nature when melting factor enhances.

KEYWORDS
heat transfer, interfacial layer, melting heat, nanofluid, nanoparticle diameter, rotating channel

MSC CLASSIFICATION
76W05; 76V05

1 | INTRODUCTION

For extensive choice of application, conception of nanofluid is a step in advance topic towards the scholar. Nanofluid can be framed among two phase systems: solid phase and liquid phase. Crucial causes recognized are their strengthened heat transmission characteristics. There has been enormous scale of theoretical and experimental investigation[1–5] to accomplish utmost effective nanofluid model of several thermophysical properties such as viscosity and thermal conductivity. For spherical- and cylindrical-shaped nanoparticles, Murshed et al.[6] and Leong et al.[7] made an expression for thermal conductivity of nanofluid by considering the consequence of sizes of nanoparticles and interface among solid particles and liquid. They clarified that base fluid molecules form a coating around nanoparticles, whose molecules are good in order than base fluid. This coating is recognized as interfacial layer or nanolayer. Nanolayer executes as a thermal bridge among nanoparticles and base liquid. Xie et al.[8] explored the consequence of
tive thermal conductivity of nanofluid and deduced an expression to compute enrich
general solution of heat conduction equation in the structure of spherical coordinates. Ra
quence of nanolayer conductivity and nanoparticle diameter on mixed convective i
numerically and analytically. The influence of nanolayer and nanoparticle size on nano



Neurochemical Research
https://doi.org/10.1007/s11064-020-03061-8

ORIGINAL PAPER

Neuroprotective Role of Quercetin on Rotenone-Induced Toxicity in SH-SY5Y Cell Line Through Modulation of Apoptotic and Autophagic Pathways

Sourav Pakrashi[1,2] · Joyeeta Chakraborty[1] · Jaya Bandyopadhyay[1]

Received: 6 April 2020 / Revised: 6 April 2020 / Accepted: 25 May 2020

Abstract
The detrimental impact on the food chain due to the overuse of rotenone is partly responsible for alpha-synuclein (α-syn) mediated neurotoxicity. It is hypothesized that rotenone overdose leads to cytosolic proteopathy resulting in modulation of apoptosis and autophagic pathways. The aim of our study is to explore the neuroprotective role of quercetin, a beneficial polyphenol against rotenone-induced neurotoxicity in dopaminergic human SH-SY5Y cell lines. In our study we demonstrated the correlation of rotenone-induced neurotoxicity through elevation of intracellular reactive oxygen species (ROS) and imbalance in the mitochondrial membrane potential (MMP). Moreover, the morphological distortion of cell, condensation of nuclei, externalization of the inner phosphatidylserine, cleavage of caspase 3, and Poly ADP Ribose Polymerase (PARP) confirmed apoptosis. However, all these lethal effects were ameliorated by treatment of quercetin to the cells. On the other hand rotenone has a strong effect on autophagy which is a regulated degrading and recycling cellular process to remove dysfunctional proteins. Indeed, rotenone-mediated autophagy resulted in the enhancement of autophagosome-bound microtubule-associated protein light chain-3 (LC3-II) expression. Furthermore, excess accumulation of acidic vesicles was detected in presence of rotenone. Lysosome associated membrane protein (LAMP-2A) is yet another crucial protein that recruits overexpressed or misfolded proteins into the lumen of lysosome to trigger autophagy. In all cases the impact of rotenone on the cells acquired significant protection through quercetin treatment. In the present work we therefore opine the prospects of quercetin as a therapeutic candidate against neurotoxicity.

Keywords α-Syn · Rotenone · Neurotoxicity · Quercetin · Apoptosis · Autophagy

Introduction

Parkinson's disease (PD) is the second most common neurodegenerative disorders caused due to loss of dopaminergic neuron at substantia nigra in the mid brain [1]. Classical symptoms of PD are muscular stiffness, bradykinesia, tremor, imbalance in body posture, and amnesia. Progressively, the detrimental effects of PD enhances with age. Expression level of various human genes is misregulated by environmental pollutants like pesticides which gradually lead to development of neurodegenerative disorders such as PD and Alzheimer's disease (AD) [2]. Uncontrolled application of pesticides, e.g. rotenone in the agriculture fields eventually reaches human body through several trophic layers of food chain [3]. Rotenone has shown much impact in stimulating aggregation, misfolding and overexpression of various neuronal protein(s) viz. alpha-synuclein (α-syn), and aggregated tau at the cellular levels, resulting in the gradual formation of *Lewy body*, a neuropathological hallmark event of PD [4, 5]. Rotenone induces oxidative stress, accumulation of nonfunctional proteins, impairment in mitochondrial health, and imbalance in chaperone-mediated autophagic pathway within the neuronal cytoplasm. As molecular mechanism of such diseases has remained unknown, the regimen of exact me
be explored. L-3,4-D
dopamine antagonist

✉ Jaya Bandyopadhyay
jaya.bandyopadhyay@gmail.com

[1] Department of Biotechnology, Maulana Abul Kalam Azad University of Technology, West Bengal, Haringhata, West Bengal, India

[2] Department of Microbiology, Bidhannagar College, Kolkata, West Bengal, India

Published online: 01 June 2020

Pramana – J. Phys. (2020) 94:141
https://doi.org/10.1007/s12043-020-02010-y

On the analytic representation of Newtonian systems

BENOY TALUKDAR[1], SUPRIYA CHATTERJEE[2] and SEKH GOLAM ALI[3],*

[1]Department of Physics, Visva-Bharati University, Santiniketan 731 235, India
[2]Department of Physics, Bidhannagar College, EB-2, Sector-1, Salt Lake, Kolkata 700 064, India
[3]Department of Physics, Kazi Nazrul University, Asansol 713 303, India
*Corresponding author. E-mail: skgolamali@gmail.com

MS received 27 January 2020; revised 13 June 2020; accepted 3 July 2020

Abstract. We show that the theory of self-adjoint differential equations can be used to provide a satisfactory solution of the inverse variational problem in classical mechanics. A Newtonian equation, when transformed to the self-adjoint form, allows one to find an appropriate Lagrangian representation (direct analytic representation) for it. On the other hand, the same Newtonian equation in conjunction with its adjoint provides a basis to construct a different Lagrangian representation (indirect analytic representation) for the system. We obtain the time-dependent Lagrangian of the damped harmonic oscillator from the self-adjoint form of the equation of motion and at the same time identify the adjoint of the equation with the so-called Bateman image equation with a view to construct a time-independent indirect Lagrangian representation. We provide a number of case studies to demonstrate the usefulness of the approach derived by us. We also present similar results for a number of nonlinear differential equations by using an integral representation of the Lagrangian function and make some useful comments.

Keywords. Calculus of variation; inverse problem; Lagrangians; linear and nonlinear systems.

PACS Nos 45.05.+x; 02.30.Zz; 02.03.Hq

1. Introduction

In point mechanics the term 'analytic representation' refers to the description of Newtonian systems by means of Lagrangians [1]. Understandably, to find the analytic representation of a mechanical system one begins with the equation of motion and then constructs a Lagrangian function by using a strict mathematical procedure discovered by Helmholtz [2,3]. In the calculus of variation, this is the so-called inverse variational problem which is more complicated than the usual direct problem where one first assigns a Lagrangian function using phenomenological consideration and then computes the equation of motion using the Euler–Lagrange equation [4]. However, there are two types of analytic representations, namely, the direct and indirect ones. We can introduce the basic concepts of direct and indirect analytic representations by using a system of two uncoupled harmonic oscillators with equations of motion

$$\ddot{q}(t) + \omega^2 q(t) = 0 \tag{1}$$

and

$$\ddot{y}(t) + \omega^2 y(t) = 0. \tag{2}$$

It is straightforward to verify that the system of eqs (1) and (2) can be analytically represented either by the Lagrangian

$$L_d = \frac{1}{2}(\dot{q}^2(t) + \dot{y}^2(t)) - \frac{\omega^2}{2}(q^2(t) + y^2(t)) \tag{3}$$

or by the Lagrangian

$$L_i = \dot{q}(t)\dot{y}(t) - \omega^2 q(t) y(t). \tag{4}$$

Here overdots denote differentiation with respect to time t. The function L_d refers to a Lagangian that gives direct analytic representation of the system presumably because it yields the equation of motion for $q(t)$ $(y(t))$ via the Euler–Lagrange equation written in terms of $q(t)$ $(y(t))$. On the other hand, L_i yields the equation of motion for $q(t)$ $(y(t))$ via the Euler–Lagrange equation written in terms of $y(t)$ $(q(t))$. This is why the representati
is called indirect analyt
example indicates that
Newtonian systems are
non-uniqueness of the I

Published online: 21 September 2020

UTTAR PRADESH JOURNAL OF ZOOLOGY

41(10): 77-85, 2020
ISSN: 0256-971X (P)

ASSESSMENT OF GUT HELMINTH OF BLACK BENGAL GOAT SLAUGHTERED AT KOLKATA MARKET, WEST BENGAL, INDIA

SUMAN MUKHERJEE[1*], INDRANI BISWAS[1] AND DIPAN ADHIKARI[2]

[1]Parasitology and Immunobiology Laboratory, Department of Zoology, Bidhannagar College, EB-2, Sector-1, Salt Lake City, Kolkata, 700064, India.

[2]Plant Cell and Molecular Genetics Research Laboratory, Department of Botany, Hooghly Mohsin College, Chinsurah, Hooghly, 712101, India.

AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. Author SM designed the study, created photographs using microscope and managed the analyses of the study. Author IB managed the literature searches, wrote the protocol and performed the experiment. Author DA created photographs using microscope. All authors read and approved the final manuscript.

Article Information

Editor(s):
(1) Prof. Jean-Marie Exbrayat, University of Lyon, France.
Reviewers:
(1) Chandrawathani Panchadcharam, Malaysia.
(2) Eliane Da Silva Fernandes, Universidade Estadual De Maringá, Brazil.

Received: 05 June 2020
Accepted: 11 August 2020
Published: 20 August 2020

Original Research Article

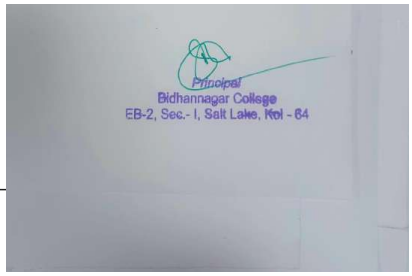
ABSTRACT

The present study was conducted to isolate and examine the different parasitic helminths, their distribution and prevalence in stomach and intestine of adult Black Bengal Goat during six months' time interval of the year 2017-2018. Goat organs were collected from Garfa urban local market of Kolkata and after parasitological study, they were mainly found to be infested with cestodes and nematodes. The most prevalent parasites were *Choanotaenia* sp., *Trichuris* sp., *Ostertagia* sp., *Strongyloides* sp., *Dictyocaulus* sp., *Haemonchus* sp., *Trichostrongylus* sp. The seasonal study revealed the maximum parasitic prevalence during pre and post winter season. The month November and April of a particular period studied exhibits most parasitic abundance and prevalence in relation to mixed infection. Histopathological study of the infected tissue revealed cellular damage, infiltration and disintegration.

Keywords: Helminth; infection; goat.

ABBREVIATIONS

GI : Gastrointestinal;
AFA :Alcohol Formalin Acetic acid



**Corresponding author: Email: biosmukherjee@gmail.com, sumanmukherjee1976@gmail.com;*

ScienSage

Journal of Advanced Scientific Research

Available online through http://www.sciensage.info

ISSN
0976-9595
Research Article

EVALUATION OF ACUTE TOXICTIY STUDIES ON COPPER-INDUCED OXIDATIVE STRESS IN *LATHYRUS SATIVUS* L., (VARIETY RATAN) GERMINATING SEEDS: A BIOMARKER BASED RISK ASSESSMENT

Tuhin Ghosh[1], Suman Mukherjee[2], Dipan Adhikari*[3]

[1]*Department of Chemistry (UG &PG), Durgapur Government College (Affiliated to Kazi Nazrul University, Asansol), Durgapur, District- Paschim Bardhaman, West Bengal, India*

[2]*Parasitology and Immunobiology Laboratory, Post Graduate Department of Zoology, Bidhannagar College, EB-2, Sector-1, SaltLake City, Kolkata, West Bengal, India*

[3]*Dept of Botany (UG and PG), Plant Cell and Molecular Genetics Research Laboratory, Hooghly Mohsin College, Chinsurah, Hooghly, West Bengal, India*

**Corresponding author: dipanadhikari@gmail.com*

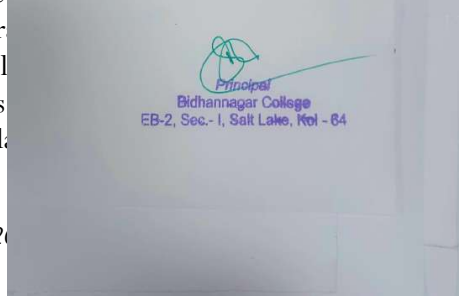
ABSTRACT

Copper has been assigned to be a heavy metal which occurs most abundantly in agricultural soils owing to its large-scale use in metal industry as-well-as in agriculture as fungicides. Mitotic index, rate and categories of anatelophase chromosome aberrations, as well as the frequency and types of metaphase disturbances were scored in root tip meristems of *Lathyrus sativus* L (variety Ratan) after seed exposure to copper, provided as copper acetate at six concentrations (10, 8, 6, 4, 2, and 1 ppm) respectively. Except the 1 and 2 ppm concentration, all the other concentrations of copper acetate brought forth mito-depressive action. The copper genotoxicity is expressed in the increased levels and rates of chromosome aberrations in mitotic ana-telophase stages including chromosome bridges, laggards and complex aberrations are the most numerous, although multipolarity, fragments and micronuclei are present, but with lower frequency in lower treatments. Metaphases with chromosomes expulsed from equatorial plate are numerically preponderant, followed by C-metaphases. At higher doses (6 ppm onwards) copper exhibited micronucleoli formation and nucleolar disintegration *i.e.,* micronucleoli formation in germinating root tip cells which augmented the fact that although a essential micronutrient, but above suboptimal concentration copper stands out as potential cyto-nuclear poison for plant life which is also proved by inhibition of seed germination percentages, root length inhibition, reduction in total soluble protein and disruption of root metabolic activity by inhibition of dehydrogenase activity. These observations constitute a signal about the risks of the widespread and increasing presence of copper in ecosphere and could be considered for a high throughput evaluation of copper and its effects on other organisms, even on human health, due to large use of copper compounds, inclusively as pesticides and fungicides.

Keywords: Grass pea, Seed germination, Aneugenic effects, Clastogenic action, Genotoxicity, Soluble protein, ROS, Biomarker

1. INTRODUCTION

In the twenty first century high anthropogenic activity [1] brings about large scale heavy metal pollution which pollutes the biosphere in a multidimensional propensity. According to Kabata-Pendias [2] among the most toxic heavy metals reported so far for both higher plants and micro organisms; Copper (Cu), although an essential metal for nutrition, has been an heavy metal evokes a threat for biological world above suboptimal concentrations. As like other bivalent metal cations, excess amount Cu^{2+} comes in agricultural soils and in ecosystem from its use in industry and agriculture as fungicide, algaecide, or bactericides in different countries [3]. Copper has been assigned to be an essential micronutrient for plant growth and has found to impart important role in metabolic systems plants in addition to protein and carbohydrate metabolism, detoxification of free radicals, cell wall lignification, photosynthesis, respir... most importantly in pl... as a cofactor controls... enzymes such as pl...



Sustainable Chemistry

Amidation and Intramolecular Aza-Michael Reaction: One-Pot Synthetic Strategy of Isoindolinones

Sk Asraf Ali,[a, b] Anirban Bera,[a] Mijanur Rahaman Molla,*[b] and Shubhankar Samanta*[a]

Herein, we report one-pot Cu(I) catalyzed open flask synthetic strategy of 3-substituted *N*-pyridinyl isoindolinones from alkyl (*E*)-3-(2-formylphenyl)acrylate by oxidative amidation and intramolecular aza-Michael reaction using cheap air stable Cu(I) single catalyst. We have also established a synthetic route of *N*-aryl substituted isoindolinones with acid-amine coupling reaction of (*E*)-2-(3-alkoxy-3-oxoprop-1-en-1-yl)benzoic acid followed by aza-Michael reactions. Unexpected synthetic route of *N*-(1H-inden-1-yl)pyridin-2-amine derivatives have been documented from the same precursors using Cu(I) catalyst.

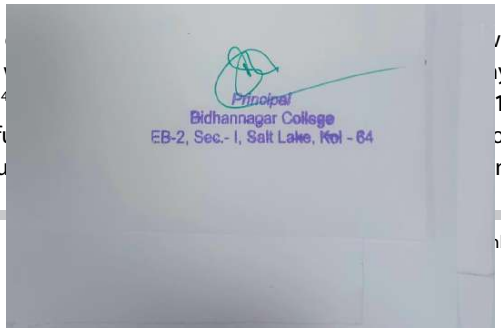
Introduction

The isoindolinone scaffold is widely spread in nature as it exists in various biologically active compounds and many of the pharmaceutically relevant compounds (Figure 1).[1] As for instance Pazinaclone plays the role of agonist at the binding site of human GABA-A receptor and displays excellent anxiolytic and sedative activities.[2] Pagoclone is used as anxiolytic agent and it is commonly known as sleeping drug, zopiclone.[3] Nuevamine is one of the naturally occurring isoindolinone alkaloid which exhibits potential biological properties such as antitumoral, anti-inflammatory and antimicrobial.[4] There are many more natural isoindolinone derivatives which were used as sedative and arrhythmias drug.[5] So, the isoindolinone core or in particular 3-substituted analogues is observed to play as a key molecule for the synthesis of various natural products and biologically active compounds.[6] Hence, several synthetic methodologies associated with 3-substitued isoindolinones have been found in the literature report where amidation followed by cyclization is observed to be the crucial step.[7]

In organic transformation amidation reactions are used as an important tool for the generation of various lactams, peptides and pharmaceutically pertinent compounds.[8] The amide bond generally forms by the coupling reaction with carboxylic acid and amine partners. But it is explained in many literature that amide formation in alcohols,[9a–b] aldehydes,[9c–f] α, β-unsaturated ketones,[9g] and alkynes,[9h] through oxidative amidation. Intramolecular amidation reaction took an important role for the preparation of bio-active isoindolinone derivatives *via* the consecutive reaction with aldehyde-ester/[10b–c] carboxylic acid-halide/[10d–e] aldehyde-cyanide[10f–g] and amine partner.[10] More specifically, 3-substituted *N*-pyridinyl/*N*-aryl isoindolinones have been prepared *via* either multi-steps process or one-pot protocol. Recently, Wu and co-workers developed Pd-catalyzed C–H carbonylation of benzyl-amines to form 3-substituted isoindolinone derivatives in presence of TFBen (Benzene-1,3,5-triyl Triformate) as CO source.[11] In very recent literature by Zang *et al.* and Verma *et al.* they synthesized *N*-pridinyl isoindolinones in two independent approaches.[12] Both the groups used 4th row transition metal Rh and Ru along with the supportive additive Cu (II) for the amidation, C–H activation and aza-Michael reaction. It was significant to note that more than one additive are used here to make the reaction successful and get good yield. The presence of more additive is harmful to our environment as well as it has higher probability to get side products. It is also difficult to find out the exact pathway of organic transformations. Despite having impressive advances, the use of expensive rhodium/ruthenium metal required inert atmosphere for oxidative amidation. To avoid the complex condition by using of double metal [Ru and Cu(II)] and pre-preparation of amide functionality herein we report one-pot Cu(I) catalyzed open air synthetic strategy of 3-substituted *N*-pyridinyl isoindolinones from alkyl (*E*)-3-(2-formylphenyl)acrylate **1** *via* oxidative amidation and intramolecular aza-Michael reaction (Scheme 1). We have also established a synthetic route of *N*-aryl substituted isoindolinones with acid-amine coupling reaction of **2** followed by aza-Michael reactions. In continuation of defunctionalisation strategy,[13a] we have also demonstrated accidental synthetic route of *N*-(1H-inden-1-yl)pyridin-2-amine derivatives from the same substrate **1** using Cu(I) catalyst.

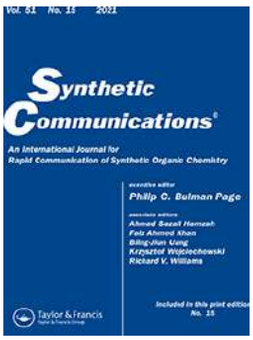
Result and discussion

The tandem
carried out
acrylate **1a**[14
has proper fu
and latter su



[a] *S. Asraf Ali, A. Bera, Dr. S. Samanta*
Department of Chemistry, Bidhannagar College, Kolkata 700064, India
E-mail: chemshubha@gmail.com
[b] *S. Asraf Ali, Dr. M. Rahaman Molla*
Department of Chemistry, University of Calcutta,
Acharya Prafulla Chandra Road, Kolkata 700009, India
Fax : (9133) 2337 4782
Mobile: 919775550193
E-mail: mrmchem@caluniv.ac.in

Supporting information for this article is available on the WWW under https://doi.org/10.1002/slct.202101259



Synthetic Communications

An International Journal for Rapid Communication of Synthetic Organic Chemistry

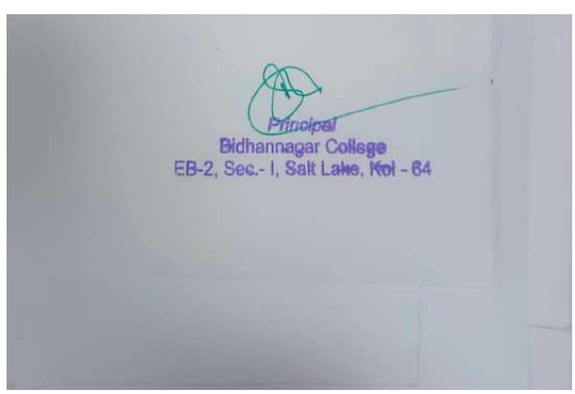
ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/lsyc20

Neat synthesis of *c*-fused pyrroles and its application to macrolactamization

Anirban Bera, Sk Asraf Ali, Amit Saha & Shubhankar Samanta

To cite this article: Anirban Bera, Sk Asraf Ali, Amit Saha & Shubhankar Samanta (2021) Neat synthesis of *c*-fused pyrroles and its application to macrolactamization, Synthetic Communications, 51:15, 2377-2386, DOI: 10.1080/00397911.2021.1939054

To link to this article: https://doi.org/10.1080/00397911.2021.1939054



Journal of the Indian Chemical Society 98 (2021) 100085

Contents lists available at ScienceDirect

Journal of the Indian Chemical Society

journal homepage: www.editorialmanager.com/JINCS/default.aspx

Pyrrolo-benzodiazepine fluorophore for trace amount detection of Cu^{2+} and application in living cells☆

Arup Kumar Adak [a,b], Basudeb Dutta [b], Sk Asraf Ali [a], Kunal Pal [c,d], Kuladip Jana [d], Shubhankar Samanta [a], Chittaranjan Sinha [b,*]

[a] Department of Chemistry, Bidhannagar College, EB-2, Sector –1, Salt Lake, Kolkata, 700064, West Bengal, India
[b] Department of Chemistry, Jadavpur University, Kolkata, 700032, West Bengal, India
[c] Department of Biotechnology, Techno India University, Kolkata, 700091, West Bengal, India
[d] Division of Molecular Medicine, Bose Institute, Kolkata, 700056, India

ARTICLE INFO

Keywords:
Pyrrolo-benzodiazepine
Spectral characterization
Cu^{2+}-sensing
Job's plot
Live cell imaging

ABSTRACT

In general, paramagnetic ions serve as fluorescence quencher. Very few fluorogens are known who could enhance emission on binding with paramagnetic transition metal ions. In this work, a novel (3-methoxy-7-pyridin-2-yl-5, 6, 8, 13-tetrahydro-7H-8, 13a-diaza-benzo [f]naphtho [2,1-a]azulen-14-yl)-acetic acid methyl ester (**HPBD**) is characterized by spectroscopic techniques who selectively senses Cu^{2+} ions with the 'turn-on' fluorescence enhancement at 463 nm over 25 metal ions. Limit of detection is as low as 35.58 nM (EPA recommended tolerance limit, 20 μM) in buffered (HEPES, pH, 7.4) acetonitrile (MeCN)/H_2O (v/v, 19:1) medium. The 1:1 composition of $[\mathbf{Cu\text{-}PBD}]^+$ complex is supported by fluorometric Job's plot, mass spectra and Bensei-Hildebrand plot (association constant $K_a = 5.2 \times 10^4\ M^{-1}$). It is further studied to monitor Cu^{2+} ions in Hep G2 cells by fluorescence microscope.

1. Introduction

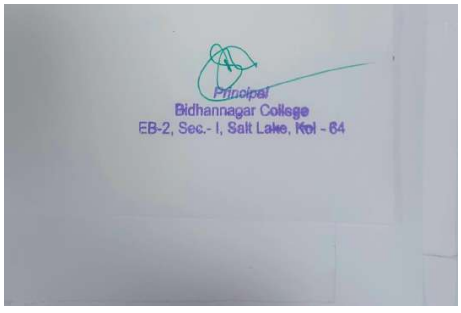
About one-third of 92 naturally occurring elements involve in the origination, growth and survivability of human life. The biologically important cations monitor the physiological process, including oxygen transport, cellular energy generation and signal transduction [1]. Amongst them, Cu^{2+} serves as a catalyst in many enzymatic reactions in life involving tyrosinase, superoxide dismutase, cytochrome *c* oxidase etc. [2–5]. Meanwhile, the widespread use of Cu^{2+} ions display metal toxicity and it is a causative factor for few severe neuromotor degenerative diseases such as Wilson diseases, Menkes Alzheimer's disease and Indian childhood cirrhosis (ICC) [6–10]. Maximum possible limit of tolerance of copper in drinking water as proposed by EPA (Environmental Protection Agency) is 1.3 ppm (~20 μM) [11].

Trace detection of Cu^{2+} ions involve the high-tech procedures like, AAS, ICP-AES, ICP-MS, voltammetry and electrochemistry [12–16]. Some of these are very costly and involve high salaried expert operators and also follow time-consuming sample preparation steps. Hence, the construction of low cost Spectrophotometric but equally sophisticated process is very urgent. Absorption and Fluorescent spectrophotometers are readily available; while fluorescence spectroscopy is 10^4 times more sensitive, selective and specific than absorption process. Use of fluorogens for detecting transition metal ions are of highly significance for biological and environmental applications [17–22]. The 3d transition metal ions (TM) mainly act as fluorescence quenchers due to their paramagnetic properties [23–26]. Most of the sensors go through nonspecific quenching of emission on binding/colliding with TM cations, such as Cu^{2+} ions [27–32]. A few examples of fluorogenic sensors are reported who are demonstrating an enhancement of fluorescence on binding with Cu^{2+} ions [33–39]. In this work, a hitherto unknown pyrrolo [1,2-*a*] [1,4] benzodiazepine derivative (**HPBD**) is used as an efficient probe for sensing Cu^{2+} ions in sulfate buffered acetonitrile solution by enhancement of emission. The formation of the probe-Cu^{2+} complex is examined by Job's titration and different spectroscopic techniques. The cell line toxicity of HPBD is examined by MTT assay and the cell survivability is determined for human lung fibroblast cells, WI38. The effects of probe and Cu^{2+} on the growth of Hep G2 cells are also examined.

☆ This article is dedicated to 160th Birth Anniversary Celebration of Acharya P . C. Ray, Father of Indian Chemistry.

* Corresponding author.
E-mail address: crsjuchem@gmail.com (C. Sinha).

https://doi.org/10.1016/j.jics.2021.100085
Received 9 June 2021; Received in revised form 18 June 2021; Accepted 19 June 2021



ScienSage

Journal of Advanced Scientific Research

Available online through http://www.sciensage.info

ISSN
0976-9595
Research Article

SUPRAMOLECULAR INTERACTIONS THROUGH ANION-π, π-π, CH-π, C_{ARENE}-H---ANION IN COMPOUNDS OF Zn (II), Cd (II) AND IN H_2L^{2+} INVOLVING MULTIRING NITROGEN-HETEROCYCLIC LIGAND: A STRUCTURAL STUDY

Tirtha Pada Majhi*[1], Nabanita Kundu[2]

[1]*Department of Chemistry, Bidhannagar College, EB-2, Sector-I, Salt Lake, Kolkata, West Bengal, India*

[2]*Department of Chemistry, Lady Brabourne College, P1/2 Suhrawardy Avenue, Kolkata, West Bengal, India*

**Corresponding author: tirthamajhi@yahoo.com*

ABSTRACT

The extended structure of the protonated form $[H_2(L)](CF_3SO_3)_2$ (**1**) of a new redox-active bis-bidentate nitrogenous heterocyclic ligand, viz., 3,3′-dipyridin-2-yl[1,1′]bi[imidazo[1,5-a]pyridinyl] (**L**), and its zinc(II) and cadmium(II) complexes (**2** and **3**) have been characterized by single-crystal X-ray diffraction analysis. The structures of **1-3** also involve anion−π, π-π, CH−π-type noncovalent interactions as well as C_{arene}-H---anion type non-classical H-bonding interactions that play dominant roles in shaping the extended structures of these molecules in the solid state.

Keywords: Zinc (II), Cd (II) compounds, Multiring nitrogen heterocyclic ligand, Non-covalent interactions.

1. INTRODUCTION

A recently developed branch of supramolecular chemistry has unveiled novel types of non-covalent forces between electron deficient aromatic ring and anion (anion-π interaction) as well as between electron deficient aromatic systems and lone-pair of electrons. Anions are essential species in biological systems in which they often play crucial structural and functional roles [1]. Several electron deficient aromatic moieties are found to be present in biomolecules. In biological system anion recognition is of prime importance since more than 70% of enzyme substrates and cofactors are anions [2]. Such interactions have received much attention in recent years as important strategy in developing receptors [3a-c,3e,4] and transporters [5] which are of prime importance for environmental [3a,6], biological and medicinal applications [3a,3d,4a-b,7] as well as in catalysis [8].

We have recently synthesized [9,10] a π-electron-deficient N-heterocyclic compound, viz., 3,3′-dipyridin 2-yl[1,1′]bi[imidazo[1,5-a] pyridinyl] (**L**) containing a pair of biologically relevant [11] imidazo[1,5-a]pyridine moieties. The ligand L is capable of acting as a bis-bidentate ligand, and its copper (II) compound (**1**) offers a unique example of valence tautomerism in solution [9]. Herein, we report the non-covalent interactions in the protonated form of this ligand (**1**) as well as its zinc(II) (**2**) and cadmium(II) (**3**) helicate complexes. This unique heteroaromatic ligand with its flexible backbone as well as electron deficient aromatic rings is capable of influencing the supramolecular structures of these helicates (**1-3**) through a variety of non-covalent interactions of viz. π-π, anion-π and CH-π types.

2. SYNTHESES

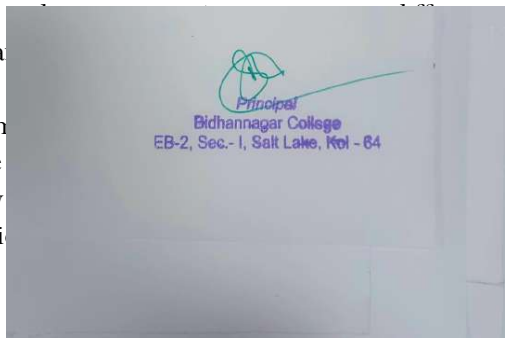
Compounds **1-3** were prepared as described elsewhere [9].

$[H_2(L)](CF_3SO_3)_2$ (**1**), $[Zn_2(L)_3](ClO_4)_4 \cdot 2.25H_2O$ (**2**), $[Cd_2(L)_3(H_2O)](ClO_4)_4 \cdot 0.5H_2O$ (**3**)

3. RESULTS AND DISCUSSION

3.1. Syntheses

The protocol followed for the synthesis of **1-3** is summarized in scheme 1. Being electron deficient, the aromatic rings of the ligand is capable of interacting with anions and solvent of crystallizations of the complexes (anion-π and
supramolecula
halves, each
rings, viz., in
fused pyridine
py, and azopy
of this discussi



Journal of Molecular Structure 1234 (2021) 130192

Contents lists available at ScienceDirect

Journal of Molecular Structure

journal homepage: www.elsevier.com/locate/molstr

Synthesis, characterization, DFT calculations, protein binding and molecular docking studies of mononuclear dioxomolybdenum(VI) complexes with ONS donor ligand

Malini Roy[a], Debanjana Biswal[a], Oiendrilla Sarkar[a], Nikhil Ranjan Pramanik[b,*], Suvendu Paul[c], Chandan Kumar Manna[d], Tapan Kumar Mondal[d], Syamal Chakrabarti[a,*]

[a] Department of Chemistry, University College of Science, 92, Acharya Prafulla Chandra Road, Kolkata,700009, West Bengal, India
[b] Department of Chemistry, Bidhannagar College, EB-2, Sector-1, Salt Lake, Kolkata 700064, India
[c] Department of Chemistry, University of Kalyani, Kalyani, Nadia, West Bengal, 741235, India
[d] Department of Chemistry (Inorganic Section), Jadavpur University, Kolkata 700032, India

ARTICLE INFO

Article history:
Received 6 January 2021
Revised 20 February 2021
Accepted 22 February 2021
Available online 25 February 2021

Keywords:
Dioxomolybdenum(VI)
ONS donor ligand
DFT calculations
Protein interaction
Molecular docking

ABSTRACT

Several new dioxomolybdenum(VI) complexes containing tridentate ONS donor ligand (H_2L) derived from pyridoxal and S-benzyldithiocarbazate have been synthesized by refluxing $MoO_2(acac)_2$ with Schiff base ligand and Lewis base (B) (where, B = pyridine, γ-picoline, 1-methylimidazole, tetrahydrofuran) in 1:1:1.5 molar proportions in methanol. The complexes having general formula MoO_2LB (**1**–**4**) are thoroughly characterized by elemental analyses and various spectroscopic techniques (IR, ^{1}H NMR, UV–Vis and mass spectra). The structures of the complexes have been optimized by Density Functional Theory (DFT) calculations. The hexa coordinated metal center possesses a distorted octahedral geometry in all the complexes. The redox behavior of the complexes is studied by cyclic voltammetry. The oxo-transfer reactivity of the MoO_2LB complexes with PPh_3 has also been examined. The interactions of the complexes with Bovine Serum Albumin (BSA) protein are investigated spectroscopically by absorption, fluorescence titration and fluorescence life time measurements. The values of the Stern-Volmer constant (K_{SV}), binding constant (K_b) and number of binding sites (n) are determined which indicates significant binding with BSA protein. Fluorescence spectral change also indicates efficient FRET from the protein to ligand and complexes. Molecular docking studies have also been carried out to understand the binding modes and interaction patterns of the dioxomolybdenum(VI) complexes with BSA.

1. Introduction

The chemistry of molybdenum has been widely explored due to its versatility in several fields. It constitutes the active site of so many metalloenzymes such as hydroxylase [1], oxotransferases [2] and nitrogenase [3]. The biochemical role of molybdenum is based on its ability to facilitate electron exchange and coordinate with a variety of ligands containing different donor environments [4]. The useful role of molybdenum is not restricted to biological systems alone, but it also exhibits catalytic activities in a variety of chemical reactions like epoxidation of olefins [5], olefin metathesis [6] and ammoxidation of propenes [7]. Oxygen atom transfer (OAT), in both nature and industry also involves the reduction of mononuclear Mo(VI) moiety by PPh_3 towards Mo(IV) complexes [8].

Pyridoxal [3–hydroxy-5-(hydroxymethyl)-2-methyl pyridine-4-carbaldehyde] is one of three natural forms of Vitamin B6 and is present as cofactor in various enzymatic processes [9]. Pyridoxal and its derivatives also exhibit significant roles in treatment and the prevention of cancer [10]. The presence of pyridoxal as one of the building block of the ligand is quite advantageous as it is not expected to give rise any toxic metabolites and improve the solubility of the final complexes.

Dithiocarbazates and their metal complexes are very much interesting scaffolds and possess anticancer, antibacterial, antifungal and insecticidal activities [11]. The Schiff base ligands derived from pyridoxa… ety of coordina… ehyde group at… of the properti… tona-tion of t…

* Corresponding authors.
E-mail addresses: nr_pramanik@yahoo.co.in (N.R. Pramanik), schakrabarti2014@gmail.com (S. Chakrabarti).

https://doi.org/10.1016/j.molstruc.2021.130192
0022-2860/

Polyhedron 200 (2021) 115144

Contents lists available at ScienceDirect

Polyhedron

journal homepage: www.elsevier.com/locate/poly

Structural elucidation, DFT calculations and catalytic activity of dioxomolybdenum(VI) complexes with N—N donor ligand: Role of halogen atom coordinated to the molybdenum centre

Malini Roy [a], Debanjana Biswal [a], Nikhil Ranjan Pramanik [b,*], Michael G.B. Drew [c], Suvendu Paul [d], Payal Kachhap [e], Chanchal Haldar [e], Syamal Chakrabarti [a,*]

[a] Department of Chemistry, University College of Science, 92, Acharya Prafulla Chandra Road, Kolkata:700009, West Bengal, India
[b] Department of Chemistry, Bidhannagar College, EB-2, Sector-1, Salt Lake, Kolkata, 700064, India
[c] Department of Chemistry, The University of Reading, Whiteknights, Reading RG6 6AD, UK
[d] Department of Chemistry, University of Kalyani, Kalyani, Nadia, West Bengal- 741235, India
[e] Department of Applied Chemistry, Indian Institute of Technology (ISM), Dhanbad, Dhanbad-826004, Jharkhand, India

ARTICLE INFO

Article history:
Received 3 January 2021
Accepted 2 March 2021
Available online 10 March 2021

Keywords:
Dioxomolybdenum(VI)
N—N donor ligand
Crystal structure
Hirshfeld surface analysis
Catalytic activities

ABSTRACT

Two new isostructural mononuclear dioxomolybdenum(VI) complexes of the formula MoO_2X_2L [where, X = Cl (**1**), Br (**2**)] have been synthesized with a N—N donor 2-(3-methyl-5-phenyl pyrazol-1-yl) benzthiazole ligand (L). The reaction is carried out in open air and the $Mo^{V}O^{3+}$ centre in the precursor molecule, $MoOX_3L$ undergoes spontaneous aerial oxidation, leading to the formation of molybdenum(VI) complexes **1** and **2**. The complexes are characterized by a wide range of spectroscopic techniques (IR, UV–Vis and ^{1}H NMR) and elemental analyses. Crystal structures of the ligand and complexes **1** and **2** have been determined by single crystal X-ray diffraction which reveal a distorted octahedral geometry around the molybdenum(VI) centre in both the complexes. The ligand and the complexes build up fascinating supramolecular assembly *via* several non-covalent interactions including hydrogen bonding, C—H···π and π···π interactions. Further, a detailed study of Hirshfeld surface analysis and fingerprint plots of complexes **1** and **2** are presented for understanding the intermolecular interactions involved in building self-assembled frameworks. Supportive DFT and TD-DFT calculations have also been carried out. Electrochemical properties of the complexes have been examined by cyclic voltammetry. Catalytic performance of the synthesized complexes has been evaluated for the oxidation of different olefins in the presence of hydrogen peroxide.

1. Introduction

Molybdenum chemistry has been mostly investigated in recent years due to the presence of molybdenum in metalloenzymes i.e., nitrogenase [1], hydroxylases [2] and oxotransferases [3]. It also plays a vital role in many of earth's biochemical cycle [4–7]. Another important aspect of molybdenum complexes is their efficiencies in the industrial catalytic processes. They show good catalytic performances in some organic transformations such as olefin metathesis [8], oxidation of alcohols [9], alkanes [10], ammoxidation of propene [11], epoxidation of olefins [12] etc. since molybdenum possess a large number of accessible oxidation states [13] as well as coordination numbers.

Benzthiazole nucleus finds its applications in biological activities *viz*. anticancer [14], antimicrobial [15] and fungicidal activities [16]. Further, substituted pyrazoles also exhibit a promising role as anticancer [17], insecticidal [18] and effective antibacterial agents [19]. Metal complexes with specific N—N donor ligands derived from benzthiazole and 2-pyridyl derivatives have been previously studied [20,21].

During the previous years, there has been increasing interest in transition metal complexes containing neutral N—N donor ligands [22,23]. Despite the great importance of molybdenum complexes with multidentate ligands, only a few articles have been published in which molybdenum(VI) complexes are coordinated with neutral bidentate N—

In accorda f both benzthiazole e syn-

* Corresponding authors.
E-mail addresses: nr_pramanik@yahoo.co.in (N.R. Pramanik), schakrabarti2014@gmail.com (S. Chakrabarti).

https://doi.org/10.1016/j.poly.2021.115144
0277-5387/

Received: 5 April 2021 | Revised: 2 June 2021 | Accepted: 9 June 2021

DOI: 10.1002/htj.22226

RESEARCH ARTICLE

HEAT TRANSFER WILEY

Influence of Hall current effect on hybrid nanofluid flow over a slender stretching sheet with zero nanoparticle flux

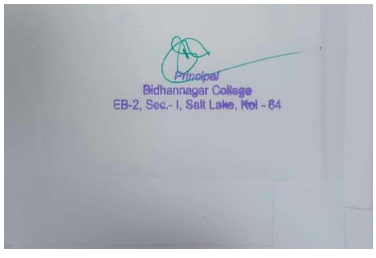
Kalidas Das[1] | **Shib S. Giri**[2] | **Prabir K. Kundu**[3]

[1]Department of Mathematics, Krishnagar Government College, Nadia, West Bengal, India

[2]Department of Mathematics, Bidhannagar College, Kolkata, West Bengal, India

[3]Department of Mathematics, Jadavpur University, Kolkata, West Bengal, India

Correspondence
Shib S. Giri, Department of Mathematics, Bidhannagar College, Kolkata, West Bengal 700064, India.
Email: shibsankar.math@gmail.com



Abstract

The present article explores steady, incompressible, and electrically conducting viscous hybrid-nanofluid flow through an impermeable slender stretching sheet. We have opted for water (H_2O) as base fluid and two nanoparticles namely Al_2O_3 and graphene for the hybrid-nanofluid. The consequence of nonuniform magnetic field and Hall current is accounted for in the flow distribution. Zero mass-flux boundary conditions have been included here. The leading partial differential equations of the acknowledged model revise to similarity variables. Next, the subsequent equations are numerically solved by a shooting scheme based on Runge–Kutta fourth-order procedure. The consequences of boosting flow factors on transport systems are achieved accurately through the requisite figures and charts. Concentration outlines are dual in nature when the wall-thickness factor intensifies. The rate of heat and mass transmit augments with wall-thickness factor.

KEYWORDS

Hall current, hybrid nanofluid, nanofluid, slendering stretching sheet, zero nanoparticles flux

MSC 2010

76W05

Biomedical & Pharmacology Journal, June 2021. Vol. **14**(2), p. 709-723

Biocontrol Effect of Lytic Bacteriophages against Various Foodborne Diseases

S. Rehan Ahmad[1]*, Abul Kalam[2] and Pritha Ghosh[3]

[1]Department of Zoology , H M M College for Women , Kolkata ,W.B , India.
[2]Department of Microbiology , Bidhannagar College , Kolkata, India.
[3]National Institute of Nutrition (ICMR), Hyderabad, Telangana, India.
*Corresponding author Email : zoologist.rehan@gmail.com

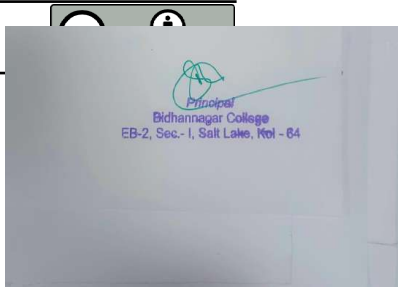
https://dx.doi.org/10.13005/bpj/2174

(Received: 12 September 2020; accepted: 17 April 2021)

Foodborne disease is one of the major causes of hospitalization and death around the world. Many advance antimicrobial techniques, food sanitation techniques are present nowadays but still Foodborne diseases are become more serious day by day. Some traditional well known antimicrobial methods including chemical treatment, pasteurization, high pressure processing, and irradiation are some popular techniques to control bacteria causing Foodborne diseases but they have several drawbacks like high cost, machine and processing equipment damage, damage nutritive value and organoleptic properties of foods and more importantly adverse effect on health. In this situation most promising and safe technique is biocontrol method. The interest for natural antimicrobial agent has exhibited due to consumer awareness towards the use of chemical based pathogen control methods or preservatives in food processing sectors. Use of bacteriophage is one of the most useful and promising natural biocontrol methods that targets specific strains of bacteria and kill the specific bacterial cell (or inhibit bacterial cell count). Bacteriophages can control foodborne disease outbreaks and ensure food safety by four different stages including therapy, biocontrol, biosanitation, and preservation. Bacteriophages are easily available in the environment and can be used safely in various foods ranging from fresh fruits, perishable animal product, and vegetables to ready-to-eat food products for bacterial decontamination. Approved commercial bacteriophages are also available to ensure food safety. bacteriophage biocontrol is recently recognized as an alternative method to reducing pathogenic bacteria from foods naturally and secure food safety. This review work is a brief overview of current bacteriophage related work in the field of foodborne diseases and food safety.

Keywords : Biological preservation , Bacteriophages , Food born disease & Biocontrol.

Consumption of contaminated food stuffs during any step of pre harvest, post harvest, storage, delivery and consumption process cause food-borne diseases. Wide range of pathogenic microorganisms like virus (4%), bacteria (66%), fungi, parasites (4%) and microorganism derived toxins and some harmful chemicals (26%) are some main causes of food borne diseases. Currently bacteria causing foodborne disease is the most prevalent public health problem globally. Bacteria contributes two third of food borne disease including 250 types of different diseases. 31 pathogens have been detected that resulting foodborne diseases, but among them some bacterial pathogens like *Salmonella* species, *Staphylococcus aureus*, *Listeria monocytogenes*, *Campylobacter* species, *Escherichia coli* are most common. Animal food products including meat,



Journal of Statistical Computation and Simulation

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/gscs20

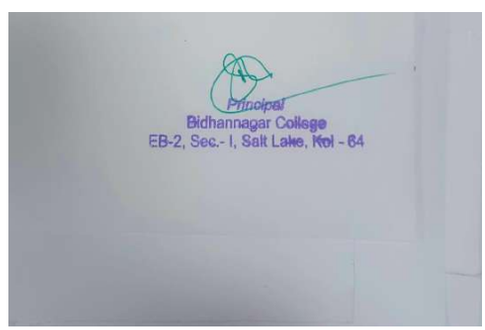
On the estimation of population size under dependent dual-record system: an adjusted profile-likelihood approach

Kiranmoy Chatterjee & Diganta Mukherjee

To cite this article: Kiranmoy Chatterjee & Diganta Mukherjee (2021): On the estimation of population size under dependent dual-record system: an adjusted profile-likelihood approach, Journal of Statistical Computation and Simulation, DOI: 10.1080/00949655.2021.1908284

To link to this article: https://doi.org/10.1080/00949655.2021.1908284

Published online: 22 Apr 2021.



UTTAR PRADESH JOURNAL OF ZOOLOGY

42(5): 1-8, 2021
ISSN: 0256-971X (P)

EFFECT OF FENVALERATE ON SUPEROXIDE ANION AND NITRIC OXIDE GENERATION IN THE JUVENILES OF *Bellamya bengalensis* AN EDIBLE GASTROPOD OF WEST BENGAL

CHIRANJIB MANDAL[1*] AND SUMAN MUKHERJEE[2]

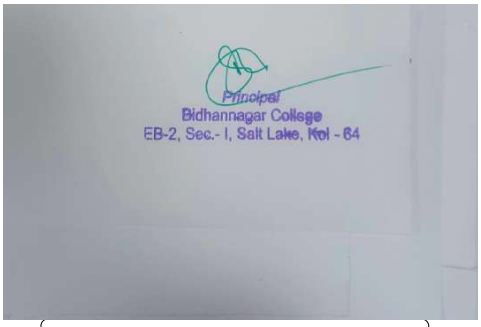
[1]Department of Biological Science and Environmental Studies, Ghatakpur Swamiji Vidyapith High School (H.S), Village and P. O.- Ghatakpur, Dist- South 24 Parganas, West Bengal, India.
[2]Department of Zoology, Bidhannagar College, SaltLake City, Kolkata-700064, West Bengal, India.

AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration between both authors. Author CM designed study, literature searches, wrote the protocol and performed the experiment. Author SM performed the statistical analysis of data. Both authors read and approved the final manuscript.

Article Information

Editor(s):
(1) Dr. Juan Carlos Troiano, Professor, University of Buenos Aires, Argentina.
Reviewers:
(1) Rozane Maria Restello, Brazil.
(2) Luidi Eric Guimarães Antunes, State University of Rio Grande do Sul, Brazil.



Received: 30 December 2020
Accepted: 07 March 2021
Published: 18 March 2021

Original Research Article

ABSTRACT

Mollusc represents a vital component of freshwater ecosystem of our country. *Bellamya bengalensis* is an edible viviparous gastropod constitutes a traditional food item of human, poultry and fish. It demands a special importance in ecology, ethnomedicine and economy. Natural habitat of *B. bengalensis* is under ecological risk due to indiscriminate and unrestricted use of a synthetic pyrethroid pesticide fenvalerate by Indian farmers. Mollusc in general, depends on hemocytes in elicitation of immunological responses including production of cytotoxic agents like superoxide anion and nitric oxide against environmental xenobiotics and pathogen. Present study is aimed to assess cytotoxic response with superoxide anion and nitric oxide generation in hemocytes of juvenile specimens of *B. bengalensis* to examine any immune alteration of the edible species.. Present study would provide an important information base of immunotoxicity of fenvalerate in juvenile specimens of *B. bengalensis*, which can be utilized in formulating a sustainable strategy of conservation and culture of aquatic mollusc in their natural habitat for human consumption.

Keywords: Pesticide; mollusc; hemocyte; superoxide anion generation; nitric oxide.

**Corresponding author: Email: chiranjib.san@gmail.com;*

Applied Ecology and Environmental Sciences, 2021, Vol. 9, No. 3, 340-346
Available online at http://pubs.sciepub.com/aees/9/3/4
Published by Science and Education Publishing
DOI:10.12691/aees-9-3-4

The Modulation of Oxidative Stress Biomarkers in Assessing Arsenic Induced Toxicity in *Channa punctatus*

Suman Mukherjee*

Parasitology and Immunobiology Laboratory, Post Graduate Department of Zoology,
Bidhannagar College, EB-2, Sector-1, SaltLake City, Kolkata-700064, West Bengal, India
*Corresponding author: biosmukherjee@gmail.com

Received February 03, 2021; Revised March 09, 2021; Accepted March 18, 2021

Abstract *Channa punctatus* is a common fresh water fish in India and regularly consumed because of its high nutritional value. Heavy metals are common pollutants of the aquatic environment because of their persistent and tendency to concentrate in aquatic organisms. This freshwater fish is continuously exposed to arsenic toxicity as this metalloid enters the body through gills and arsenic contaminated food. Fresh water murrel, *C. punctatus* were exposed to different sub-lethal concentrations of sodium arsenite for varied span of time in controlled laboratory condition to assess the impact of metalloid toxicity on marker enzymes in gill. Arsenic-induced stress can specifically achieved in fish through elevated level of reactive oxygen species which is responsible for biochemical, cell metabolism and physiological activities. Arsenic induced changes in Acid phosphatase and Alkaline phosphatase activity in gill of freshwater murrel after one week of exposure. Results revealed reduction of Superoxide dismutase and Glutathione-S-transferase activity after 7 days of exposure in sub lethal concentration of sodium arsenite in gill. Result revealed that enzyme assays determination is relevant tool to monitor stress in freshwater ecosystem. The present study is also indicative of immune alteration in *C. punctatus* that may lead to decline population size in its natural habitat.

Keywords: *Arsenic, Channa punctatus, SOA, ACP, ALP, SOD, GST*

Cite This Article: Suman Mukherjee, "The Modulation of Oxidative Stress Biomarkers in Assessing Arsenic Induced Toxicity in *Channa punctatus*." *Applied Ecology and Environmental Sciences*, vol. 9, no. 3 (2021): 340-316. doi: 10.12691/aees-9-3-4.

1. Introduction

Channa punctatus is one of the most important fish species of Indian flood plains [1] and has a great demand in market because of its high nutritional value. Heavy metals are common pollutants of the aquatic environment because of their persistent and tendency to concentrate in aquatic organisms [2]. Arsenic, a sulphydryl reactive metalloid is one of the most important and concerned global environment toxicant widely spread in the aquatic environment as a result of both geogenic processes and anthropogenic disturbances [3]. Due to adverse effects on human health, the contamination of aquatic ecosystems with arsenic (As) has been receiving worldwide attention. In aquatic environments several species of microorganism make arsenic biologically available to organisms including fish [4]. Fish appear to be particularly susceptible to arsenic toxicity as they are continually exposed to it through gills and intake of arsenic contaminated food [5]. Enzymes are biochemical macromolecules that control metabolic process of organisms, thus a slight variation in enzyme activities would affect the organism by disturbing its metabolism [6]. Acid phosphatase and Alkaline phosphatase was estimated as a representative of metabolic modulation at the backdrop of metalloid toxicity. Several reactive oxygen species occur as a result of normal oxygen metabolism, but can be produced in large quantities during toxicant-induced interactions, leading to oxidative stress. The extent, to which such biological damage occurs, depends on the effectiveness of antioxidant defenses and detoxification mechanism to remove reactive oxygen species [3]. Thus, oxyradical production ultimately poses a threat to the fitness and health of organisms. In this present study, superoxide anion radical was estimated as a representative of reactive oxygen species. Superoxide dismutase and Glutathione-S-transferase represent the main enzymatic defenses against reactive oxygen species. For the study of xenobiotic induced impairment in relation to biochemical adaptive response, activities of metabolic enzymes like Acid phosphatase and Alkaline phosphatase, antioxidant enzymes like Superoxide dismutase and detoxification enzyme like Glutathione-S-transferase was quantified in gill o
would provide infor
stress and will est
biomarker of the h
community.

Eco. Env. & Cons. 27 (2) : 2021; pp. (790-798)
Copyright@ EM International
ISSN 0971–765X

A study on the seasonal fluctuation of water quality parameters and Ichthyofaunal diversity in determination of ecological health of Mathura Beel, A Flood plain Wetland of West Bengal

Chandan Sarkar[1], Suman Bej[2] and Nimai Chandra Saha[3*]

[1]P.G. Department of Zoology, Krishnagar Govt. College, Nadia 741101, West Bengal, India.
[2]P.G. Department of Zoology, Bidhannagar College, EB-2, Sector-1, Salt Lake City, Kolkata 700 064, West Bengal, India.
[1,2,3]Fishery and Ecotoxicology Research Laboratory, Vice-Chancellor's Research Group, Department of Zoology, The University of Burdwan, Burdwan 713 104, West Bengal, India.

(Received 12 September, 2020; accepted 4 October, 2020)

ABSTRACT

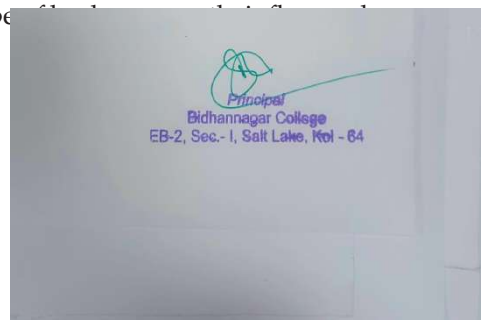
Fish diversity and their correlation with seasonal fluctuation of water quality parameters of Mathura Beel was studied during the period 2015-16 to 2017-18. 39 species of fish belonging to 18 families under 8 orders were recorded from this floodplain wetland of North 24 Parganas district of West Bengal. The most dominant family was Cyprinidae with 13 species. The beel is alkaline in nature as the pH varies 7.7-10.5. The dissolved oxygen content is good. In this beel, Shannon-Weaver species diversity index (*H'*) has positive correlation with Free CO_2, DO, alkalinity and hardness whereas negative correlation with temperature, pH and BOD. Margalef's Species richness index (*D*) has positive correlation with temperature, pH and BOD while has negative correlation with Free CO_2, DO, alkalinity and hardness. Pielou's Species evenness index (*J'*) has positive correlation with Free CO_2, alkalinity, hardness and BOD whereas negative correlation with temperature, pH and DO. The overall ecological health of the beel was suitable for aquaculture.

Key words : *Floodplain wetlands, Beels, Physicochemical parameters, Fish, Diversity indices*

Introduction

Floodplain wetlands are formed from main stream of river when river meanders are cuts due to erosion and siltation of river banks. Some floodplain lakes are permanently cut offs from the river and forms closed ecosystem and others remains seasonally connected with river. These wetlands or lakes are known as beels or baurs or ox-bow lakes. (Jhingran and Jha, 1988). These beels houses many aquaculture industries in India particularly eastern part of the country and act as important source of inland fisheries also (Mondal and Kaviraj, 2009).

West Bengal, a state of eastern India, has more than 150 floodplain wetlands which covers almost 42,000 ha, constitutes 22% of state's total freshwater area (ICAR, 2006). These beels functions vitally in waste water treatment, water storage, ground water recharge and controlling flood. Not only that, beels acts as natural habitats of many common and rare fish species also. The diversity of fish and their occurrence in such type



Journal of Advanced Scientific Research
Available online through http://www.sciensage.info
ISSN
0976-9595
Review Article

INHIBITION OF AMYLOID BETA FIBRILIZATION BY SMALL ORGANIC MOLECULES: AN IMPLICATION TO THERAPEUTIC ROUTE OF ALZHEIMER'S DISEASE

Pritha Mandal*[1], Anisur Rahaman Molla[2]
[1]*Department of Chemistry, Krishnagar Government College, Krishnagar, Nadia, West Bengal, India*
[2]*Department of Chemistry, Bidhannagar College, Salt Lake, Kolkata, West Bengal, India*
**Corresponding author: prithamandal@yahoo.com*

ABSTRACT
The exact reason of Alzheimer's disease is still not understood but deposition of extracellular plaques formed by the aggregation of amyloid β peptide and intracellular accumulation of neuro fibril tangles (NFT) formed by phosphorylated tau protein are the two hall marks of Alzheimer's disease. Therapeutic route to Alzheimer's disease is still unknown. Studies with natural products, short peptides and synthetic organic molecules have identified a pool of small organic molecules with aggregation inhibitory activity. These molecules can be considered as lead compounds in the drug discovery of Alzheimer's disease.

Keywords: Amyloid β protein, Aggregation, Alzheimer 's disease, Small organic molecule.

1. INTRODUCTION
Neurodegenerative diseases significantly affect the quality of life of elderly people across the globe. Alzheimer's Disease (AD) and Parkinson's disease are the most common among the neurodegenerative diseases [1]. Loss of memory is the most prominent symptom of Alzheimer's disease. Degeneration of brain neurons causes gradual loss of movement, breathing, talking in AD patients [2]. Protein misfolding is the main reason of Alzheimer's disease. AD patients suffer from damage of brain cell neurons due to formation of extracellular plaques by aggregation of amyloid β protein and intracellular accumulation of neurofibril tangles (NFT) by tau protein [3, 4]. Prevalence of Alzheimer's disease has inspired scientific community of whole world to find therapeutic route to but till now very few medicines are available which can only treat the disease symptomatically and provide limited benefit. In this context, it is very much important to find ways to inhibit the aggregation process of amyloid beta and tau protein which can stop or postpone Alzheimer's disease. Many studies are taking place all over the world in which natural products, synthetically accessible small molecules and also peptides are being used as potential amyloid β inhibitors [5-9]. This article aims to review the *in vitro* and *in vivo* studies with small and simple organic molecules which show ability to suppress or postponed fibrillation process of amyloid β protein and thus can be very important in the path of drug discovery of Alzheimer's disease.

2. PROTEIN MISFOLDING
Proteins are workhorse of the living cell. They act as enzymes, hormones, neurotransmitters, nutrient storage, antibodies and many more to regulate the life of a living cell [10]. Proteins have marvelous versatility in their structure and keen specificity in their function. Structure and function of protein molecules are crucially related [11]. Specific function of protein molecules is completely governed by its correctly folded native structure. Most protein fold in the posttranslational period [12]. Protein disulfide isomerase (PDI) and peptidyl-prolyl cis-trans isomerase (PPI) have important role in the protein folding phenomenon [13, 14]. Chaperons assist significantly in correct folding of proteins. Chaperons can rescue incorrectly folded proteins to proper route of folding [15]. Beside chaperon, cell has its own quality control mechanism which discriminates between correctly folded and
degrades the misfold
17]. In spite of th
misfolding takes pl
Misfolding can be in
sequence; error invo

Journal of Advanced Scientific Research

Available online through http://www.sciensage.info

ISSN
0976-9595
Research Article

SIGNAL RESPONSE BETWEEN NITRIC OXIDE SYNTHASE AND METALLOTHIONEIN IN CHROMIUM AND LEAD TREATED BACTERIA ISOLATED FROM COAL MINE AREA

Rini Roy

Department of Microbiology, Bidhannagar College, Kolkata, West Bengal, India

**Corresponding author: for_rini_roy@yahoo.co.in*

ABSTRACT

In the study an attempt was made to reveal signal cross talk between metallothionein (MT) and Nitric Oxide Synthase (NOS) in the bacteria isolated from soil of Raniganj Coal mine area after treatment of bacteria with Chromium (Cr) and Lead (Pb). Cr(VI) reducing ability of the bacteria and hence its metal remediation was studied by the Chromate reductase activity of the bacteria. Lead bioremediation was assayed by the Atomic absorption spectroscopy (AAS) after treatment of bacteria with Pb(II). MT was extracted from bacteria isolated from coal mine area. Induction of protein like MT having molecular weight 14 kD occurs in isolated bacteria upon treatment with heavy metals like Cr(VI) and Pb(II) as evidenced from SDS PAGE. The thiol content in metal treated bacteria increased in comparison with the control (metal untreated bacteria). Metals induce NOS activity when it is compared to the control. NOS binds transition metals and demonstrates increment in expression of NOS activity in presence of metals like Cr(VI) and Pb(II). In this study, the effects of these heavy metals on the activity of NOS and the effects of NOS on the thiol content of proteins have been discussed. The mechanism of action of xenobiotics like Pb and trace metals like Cr are to some extent different in terms of thiol content and NOS activity. A hypothesis regarding the relationship between MT and NOS has been proposed here. Bacteria where MT synthesis is regulated by NOS can be used in sites contaminated with higher concentrations of heavy metals.

Keywords: Metallothionein, Lead, Chromium, bacteria, Nitric oxide synthase.

1. INTRODUCTION

Cr(VI) is harmful for the living system whereas Cr(III) is not, instead it acts as an essential micronutrient in humans. Isolation of chromium reducing bacteria which are Cr(VI) resistant can be used for environmental clean-up and bioremediation of heavy metals contaminated industrial wastes by evaluating their Cr(VI) reducing ability to Cr(III) through chromate reductase assay. In the present study, the effect of Chromium on bacteria isolated from the coal mine area is observed and its chromate reductase activity and thus its metal remediation capacity are ascertained [1].

Chromium toxicity is one of the major causes of environmental pollution emanating from tannery effluents. The Cr(III) species predominantly existing as hydroxides, oxides, or sulphates, are less water soluble, mobile (100 times less toxic), and (1,000 times less) mutagenic. Chemical reduction and precipitation, adsorption on activated carbon, ion exchange, and reverse osmosis, in a basic medium are the principal techniques for recovering or removing Cr(VI), from wastewater. However, these methods have certain drawbacks, namely, high cost, low efficiency, and generation of toxic sludge or other wastes that require disposal and imply operational complexity [2,3]. Bioremediation of Cr(VI) by bacteria is an eco-friendly approach.

Lead is a ubiquitous toxic metal which have mutagenic, carcinogenic, genotoxic, anthropogenic, and phytotoxic effects [4]. Lead is a xenobiotic heavy metal present as a pollutant in the environment which must be remediated. The use of fossil fuels including past use of leaded gasoline, some types of industrial facilities, and past use of lead-based paint in homes are the sources of lead exposure. Pb(II) can be also bioremediated by bacteria.

The defining feature of a nitric oxide synthase (NOS) is a heme and pterin-binding oxygenase domain, and enzymes that possess this domain are found in animals and bacteria. Recent pr
of bacterially derived
protection from vario
transcriptional regulato
The nitric oxide synthas

ScienSage

Journal of Advanced Scientific Research

Available online through http://www.sciensage.info

ISSN
0976-9595
Research Article

EFFECT OF CADMIUM AND ZINC HEAVY METALS ON THE SOIL BACTERIA ISOLATED FROM COAL MINE REGION

Rini Roy

Department of Microbiology, Bidhannagar College, Kolkata, West Bengal, India

**Corresponding author: for_rini_roy@yahoo.co.in*

ABSTRACT

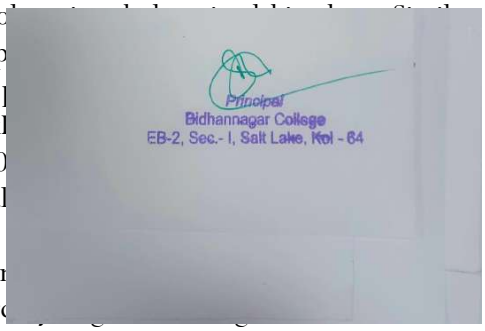
Study of growth pattern of isolated soil bacteria from Raniganj coal mine area shows an unusual increase in growth rate of the isolated bacteria when treated with heavy metal stress in the culture media. The metals used were Cadmium (Cd) and Zinc (Zn). Utilization of metal ions by the bacterial cells was studied by detection of leftover metal in the culture medium after optimal growth, by Dithizone method and surface adsorption of metal ions on bacterial cell by FTIR technique. The amount of total thiol and non-protein thiol of the bacterial culture was assayed for the presence of thiol containing protein like Metallothionein. Metallothionein production was also studied using SDS-PAGE and Western blot technique to find if the cells were stressed in the presence of increasing concentration of Zn^{2+} and Cd^{2+}. Metallothioneins (MTs) are proteins rich in cysteine residues having low molecular weight. They perform different functions like scavenging of free radicals, involvement in maintaining metal balance, regulation of metabolic activities and protective role against damage caused by heavy metals. Metallothioneins can be correlated with heavy metal contamination of an environment and thus may be considered as bio-marker for environmental pollution.

Keywords: Cadmium, Zinc, Dithizone, Bacteria, Metallothionein.

1. INTRODUCTION

Persistence of heavy metals having toxicity in biogeochemical cycle largely depends on microbes. Microbes also help to remove contamination of toxic heavy metals. Metals possessing atomic density greater than 4000 Kg/m^3 are known as heavy metals [1]. At high concentration, Zinc, Nickel, Copper, Cobalt and Manganese have toxic effect on human health and different organisms [2]. On the other hand, Cadmium, Mercury, Lead etc. do not have any biological role and are harmful to the organisms even at minute concentration [3]. The existence of heavy metals occurs both in bioavailable and non-bioavailable forms. Mobility of heavy metals depends on the metallic element precipitating as positively charged ions as well as the one, which constitute negatively charged part of salt. Detrimental effects are observed on the environmental microbes when the concentration of heavy metals exceeds threshold levels. Otherwise, microorganisms might develop higher resistance against toxic heavy metals when they are exposed to the increased concentrations of these metals [4-6]. Additionally, various means have been developed by the microorganisms dwelling in metal polluted soils to withstand metal stress. Such metal resistant microorganisms can show strong bioremediation capacity. To survive in the metal stressed conditions, bacteria have devised various pathways to resist the intake of heavy metal ions. The pathways adopted for withstanding the heavy metals are accumulation and complexation of the metal ions inside the cell, reduction of the heavy metal ions to a less toxic state [6,7,8] and metal ions efflux outside the cell. Reports already exists on the different metal-resistant bacteria. Isolation of bacteria was done from contaminated sediments, soils, and waters.

Margoshes and Valee discovered Metallothioneins in 1957 as newly invented proteins isolated from the tissue [9] of a horse renal cortex. These proteins possess high degree of homo
proteins are exp
express similar
(from 5 to 14 k
(higher than 30
with 7-12 metal
amino acids are
MTs bind sever
Zinc (Zn), Mer



DNA Repair 107 (2021) 103197

Contents lists available at ScienceDirect

DNA Repair

journal homepage: www.elsevier.com/locate/dnarepair

Review Article

Non-canonical function of nuclear PTEN and its implication on tumorigenesis

Sandip Misra [b], Ginia Ghosh [a], Sougata Ghosh Chowdhury [a], Parimal Karmakar [a,*]

[a] Department of Life Science and Biotechnology, Jadavpur University, Kolkata, India
[b] PG Department of Microbiology, Bidhannagar College, EB-2 Sector-1, Saltlake, Kolkata, India

ARTICLE INFO

Keywords:
PTEN Post translational modification
DNA repair
Replication stress
Chromatin

ABSTRACT

Suppression of genomic instability is the key to prevent tumor development. PTEN is a unique tumor suppressor protein having both lipid and protein phosphatase activities. Interestingly though it is a cytoplasmic protein, but a significant pool of PTEN can also be localized in nucleus. The function of cytoplasmic PTEN is well defined and extensively studied in various literatures focusing mainly on the negative regulation of oncogenic PI-3Kinase-AKT pathway but functional regulation of nuclear PTEN is less defined and therefore it is a fascinating subject of research in cancer biology. Post-translation modulation of PTEN such as phosphorylation, sumorylation, acetylation and methylation also regulates its cellular localization, protein-protein association and catalytic function. Loss or mutation in PTEN is associated with the development of tumors in various tissues from the brain to prostate. Here we have summarized the role of nuclear PTEN and its epigenetic modulation in various DNA metabolic pathways, for example, DNA damage response, DNA repair, DNA replication, DNA segregation etc. Further, pathways involved in nuclear PTEN degradation are also discussed. Additionally, we also emphasize probable potential targets associated with PTEN pathway for chemotherapeutic purpose.

1. Introduction

Phosphatase and Tensin homolog deleted on chromosome ten (PTEN) is a unique and bona fide tumor suppressor protein that possesses both lipid and protein phosphatase activity. This protein has been identified simultaneously by two research groups in the year 1997 as tumor suppressor genes located at chromosome 10q23 in glioblastoma and prostate cancer cell lines [1,2]. Soon after its discovery, it has been found that the frequency of monoallelic mutations at this locus has been estimated at 50 %–80 % in sporadic endometrial carcinoma, and at 30 %–50 % in breast, colon, and lung carcinoma. Accumulation of PTEN germline mutations develops in a group of autosomal dominant syndromes characterized by various developmental disorder, neurological deficits, multiple hamartomas, and an increased risk of breast, thyroid, and endometrial cancers which are collectively referred to as the PTEN hamartoma tumor syndromes (PHTS), that includes Cowden syndrome, Lhermitte-Duclos disease, Bannayan-Riley-Ruvalcaba syndrome and Proteus and Proteus-like syndromes [3]. The latest list of COSMIC cancer database includes more than 2700 mutations in PTEN in 28 different tumor types, and the cBio portal of The Cancer Genome Atlas (TCGA) lists 1120 mutations in 27 tumor types. Considering the vast mutational diversity of PTEN in different tumor specimens, it is essential to understand the functional regulation of PTEN in cancer.

The crystal structure of PTEN (403 amino acid) revealed that it is a multi domain protein: N terminal phosphatase domain, the C2 domain and the C-terminal tail. C2 domain as well as 6 to 15 amino acid residues of N-terminus are involved in membrane localization through interaction with phospholipid PIP3 [3–5]. The C-terminal tail contains a number of phosphorylation sites at Serine 370, Serine 380, Threonine 382, Threonine 383, and Serine 385 residues. Interestingly phosphorylation of Ser 380, Thr 382, Thr 383 residues (collectively named STT motif) but not Ser 370 or Ser 385, increases the stability of PTEN and at the same time decreases its phosphatase activity [6]. It has been suggested that mutations or dephosphorylation of this STT cluster unwraps the protein conformation, making it less stable, but increases its phosphatase activity [6,7]. Thus STT motif of PTEN regulates its catalytic activity as well as its stability. Apart from C terminal phosphorylation sites, there are also multiple phosphorylation, sumorylation, acetylation and methylation sites which are important for PTEN nuclear functions (See Fig. 1 and Table 1). PTEN specifically dephosphorylates the D3

* Corresponding author.
E-mail address: pkarmakar_28@yahoo.co.in (P. Karmakar).

https://doi.org/10.1016/j.dnarep.2021.103197
Received 11 November 2020; Received in revised form 13 June 2021; Accepted 26 July 2021
Available online 29 July 2021

Received: 27 March 2020 | Revised: 25 November 2020 | Accepted: 13 March 2021

DOI: 10.1002/bimj.202000089

Biometrical Journal

RESEARCH ARTICLE

An optimal multiarmed response adaptive design for survival outcome with independent censoring

Soumyadeep Das[1] | **Rahul Bhattacharya**[2]

[1] Department of Statistics, Bidhannagar Government College, Kolkata, India

[2] Department of Statistics, University of Calcutta, Kolkata, India

Correspondence
Rahul Bhattacharya, Department of Statistics, University of Calcutta, Kolkata 700 019, India.
Email: rahul_bhattya@yahoo.com

This article has earned an open data badge "**Reproducible Research**" for making publicly available the code necessary to reproduce the reported results. The results reported in this article were reproduced partially due to their computational complexity.

Abstract

Compromising ethics and precision in the context of a multiarmed clinical trial, an optimal order adjusted response adaptive design is proposed for survival outcomes subject to independent random censoring. The operating characteristics of the proposed design and the follow-up inference are studied both theoretically as well as empirically and are compared with those of the competitors. Applicability of the developed design is further illustrated through redesigning a real clinical trial with survival responses.

KEYWORDS

survival trials, response adaptive design, independent censoring, optimal allocation

1 | INTRODUCTION

Clinical trial is a research study involving treatments and patients to find the treatments for future recommendation. Involvement of human patients forces this study to maintain ethics. Consequently, a double-blinded clinical trial always tries to maintain a balance between "individual ethics" and "collective ethics" (Rosenberger & Lachin, 2016), where "individual ethics" demands assignment of maximum number of patients to the eventually best performing treatment(s) and "collective ethics" urges for maximization of statistical precision. Complete randomization (CR), blind to the performances of the treatments, is most adopted for the equal assignment of the patients but takes care of only the "collective ethics." However, treatment effectiveness is never known in advance, and hence skewing the allocation towards the promising treatment(s) in the intermediate stages based on the repeated analysis of the sequentially accrued data through some adaptive randomization seems justified to maintain the "individual ethics." But maintaining "individual ethics" causes lack of balance in allocation and subsequently loses precision. In fact, ethics and precision behaves like two types of errors in hypothesis testing, that is, they vary in the opposite directions. As a result, adaptive randomization favoring the better performing treatment for future allocation (i.e., maintaining "individual ethics") sacrifices statistical precision (i.e., fails to maintain "collective ethics"), in general. Therefore, an adaptive randomization procedure balancing the contrasting aspects of ethics and precision seems reasonable. This urges the experimenter to think of optimal adaptive design (Rosenberger & Lachin, 2016), which is well known for their ability to compromise the contrasting aspects within the same framework. Thus, an optimal design, ensuring high precision, needs relatively smaller sample sizes to depict the best treatment(s) for future patients.

Often, the response of the patients is time-to-event observations. For example, in survival trials, the response may be the time of progression free survival or overall survival (OS). Naturally, in such a trial, carrying the trial until all responses

Res. J. of Agril. Sci. (July-Aug 2021) 12(4): 1262-1266
www.rjas.org

Full Length Research Article

Evaluation of Phagocytosis and Cytotoxicity Response in Fresh Water Snail, *Bellamya bengalensis*, Following Exposure to Chlorpyrifos

Suman Mukherjee*1

Received: 20 Apr 2021 | Revised accepted: 27 Jun 2021 | Published online: 26 July 2021

ABSTRACT

Freshwater edible mollusc *Bellamya bengalensis* (Mollusca: Gastropoda) is an economically important species. Chlorpyrifos is a crystalline organophosphate insecticide and is used in the agricultural field for control insect pests. Mollusc mostly elucidates effective immunological responses by producing cytotoxic molecules like generation of superoxide anion and nitric oxide against environmental xenobiotics. Haemocytes of *B. bengalensis* are an immune effector cell of haemolymph and are capable of discrimination self and nonself surface, phagocytosis of foreign particles and production of cytotoxic molecules as an antimicrobial agent. The cells lining the digestive tubule participate in moving the food, secreting substances in the lumina, phagocytosis and generation of cytotoxic molecules. Fresh water *Bellamya bengalensis* were exposed to sublethal concentrations of chlorpyrifos for varied span of time in controlled laboratory condition to examine phagocytic response in haemocyte, histopathology and cytotoxic activity in digestive tubule. The tissue pathology demonstrates a state of inflammation which is related to possible disruption of cellular homeostasis. Alteration in phagocytic response of haemocyte challenged with yeast (*Saccharomyces cerevisiae*) and increment of activity of superoxide anion (SOA) along with parallel decrease in the activities of nitric oxide (NO) in digestive tubule appeared to be detrimental for survival of *Bellamya bengalensis* in the chlorpyrifos contaminated environment. Data is indicative of cellular metabolic stress in the edible gastropod that may lead to decline of population size in freshwater aquatic system of West Bengal.

Key words: Chlorpyrifos, *Bellamya bengalensis*, Haemocyte, Digestive tubule

Bellamya bengalensis is a freshwater mollusc widely distributed in the wetland of different states of India. Animal is regularly consumed by human population and serves as a source of dietary protein to human, poultry and fish. Chlorpyrifos is a crystalline organophosphate insecticide used for control insect pest of various agricultural crops [1]. Freshwater natural habitat of the animal faces the risk of pesticide contamination by agricultural runoff during monsoon [2]. Haemocytes, the circulating blood cells of gastropod, function as the immunological effector cells under exposures of toxin and parasites [3]. They are involved in various types of physiological functions such as cell aggregation, self-nonself discrimination; wound repairing and phagocytic responses [4].

Digestive tubule is the principal site of detoxification and multiple metabolic activities of molluscs [5]. The digestive diverticula of gastropod are closely packed together containing secretory basophilic cells. Superoxide anion is reported as a defence molecule against intruding pathogenic microorganisms [6]. Nitric oxide is a vital cytotoxic molecule generated in response to oxidative stress and provides immunological defence to the host by deactivating foreign microorganisms [7]. Information of toxicity of chlorpyrifos in freshwater gastropod of India is scanty. In this present study, cellular modulation of haemocyte, histopathology and cytotoxic activity of digestive tubule were examined under the sub-lethal exposure of chlorpyrifos in controlled laboratory condition. Information will provide a data in understanding the degree of cellular modulation in haemocyte and impairment of digestive tubule function of gastropod in presence of sublethal concentrations of chlorpyrifos and to establish its suitability as a biomarker of aquatic toxicity in contaminated habitat.

* Suman Mukherjee
✉ bssmukherjee@gmail.com

1 Parasitology and Immunobiology Laboratory, Post Graduate Department of Zoology, Bidhannagar College, Eb-2, Sector-1, Saltlake City, Kolkata - 700 064, West Bengal, India

Environmental Toxicology and Pharmacology 87 (2021) 103717

Contents lists available at ScienceDirect

Environmental Toxicology and Pharmacology

journal homepage: www.elsevier.com/locate/etap

Assessment of biochemical, hematological and behavioral biomarkers of *Cyprinus carpio* on exposure to a type-II pyrethroid insecticide Alpha-cypermethrin

Suman Bej [a,b,c], Koushik Ghosh [b], Arnab Chatterjee [c], Nimai Chandra Saha [c,*]

[a] Environmental Biology and Ecotoxicology Laboratory, Post Graduate Department of Zoology, Bidhannagar College, Sector I, Salt Lake City, Kolkata, 700064 West Bengal, India
[b] Aquaculture Laboratory, Department of Zoology, The University of Burdwan, Golapbag, Burdwan, 713 104 West Bengal, India
[c] Fishery and Ecotoxicology Research Laboratory, Department of Zoology, The University of Burdwan, Purba Barddhaman, West Bengal, India

ARTICLE INFO

Edited by Dr. M.D. Coleman

Keywords:
Pyrethroid insecticide
Alpha-cypermethrin toxicity
Cyprinus carpio
Hematology
Biochemical alterations
Integrated biomarker response

ABSTRACT

This study assessed some important physiological biomarkers of freshwater edible fish *Cyprinus carpio* following exposure to 10 % (T1) and 20 % (T2) sublethal concentrations of Alpha-cypermethrin (A-cyp) over a total period of 45 days. Behavioral responses were noticed and Kaplan-Meier survival curves were prepared during acute toxicity study. Total serum protein concentration, total erythrocyte count, hemoglobin, packed cell volume, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, and total leukocytes count were decreased significantly ($p < 0.05$), while the blood glucose, total serum lipid concentration, and clotting time were increased significantly ($p < 0.05$) over control. The most affected fish group and most significantly altered biomarker under toxic stress of A-cyp were identified using integrated biomarker response (IBR). The biomarker response index (BRI) values measured the overall health status of the treated fish and indicated that moderate adverse effects were exerted on the fish group exposed to T2 for 45 days.

1. Introduction

Synthetic pyrethroids have long been dominating the global insecticide market during the evolution of third generation insecticides (Mugni et al., 2013 and Manyilizu, 2019). Type II and I are two distinct classes of synthetic pyrethroids that have been categorized on the basis of their chemical nature and mode of action (Prusty et al., 2015; Ghazouani et al., 2020). The presence of α-cyano group at the α-position is a critical determinant of type II, otherwise it is absent in type I. Alpha-cypermethrin (A-cyp) and cypermethrin (Cyp) are the most common examples of type II synthetic pyrethroids. The α-cyano group makes type II as a more potent toxicant over the type I (non-cyano) pyrethroids (Ecobichon, 1991; Nasuti et al., 2003; Ghazouani et al., 2020). A-cyp ($C_{22}H_{19}Cl_2NO_3$) comprises a racemate of the highly active two cis-isomers [(S)-α-cyano-3-phenoxybenzyl-(1R,3R)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-carboxylate and (R)-α-cyano-3-phenoxybenzyl-(1S,3S)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-carboxylate] out of eight isomers found in Cyp (Prusty et al., 2015). The biological activity of cis-isomers is more potent than trans-isomers, and hence A-cyp is two to three times more toxic than Cyp under field conditions. The reported NOAEL values for A-cyp were also lower than that of Cyp. The α-cyano group of A-cyp exerts its fast action through the persistent opening of Sodium channels allowing a slow influx of Sodium-ions during the membrane depolarization phase of the nerve impulse propagation (Ellenhorn and Barceloux, 1988; Kakko, 2004; Breckenridge et al., 2009). A-cyp also affects gamma-aminobutyric acid (GABA)-receptor, GABA-activated channels, voltage-sensitive calcium channels, and chloride channels (Soderlund, 2010). The typical symptoms of A-cyp poisoning are excitation followed by convulsions, paralysis and ultimately leads to the death of a target organism (Ghazouani et al., 2020). A-cyp is mostly used on cereals, fruits, soybeans, maize, sugar beet, other vegetables, and different minor crops to eradicate sucking and chewing insects belonging to the orders Lepidoptera, Hemiptera, and Coleoptera (Tomlin, 1997). A-cyp has been extensively and commonly (46 %) used insecticide in Indian rural agricultural fields (Banerjee et al., 2014; Kaviraj and Gupta, 2014). It has been reported that only 0.1 % of applied insecticide finally reaches the target pest (Marigoudar et al., 2009). Thus, use of Insecticides, including A-cyp possibly reaches and contaminates different water bodies by drifting from

* Corresponding author.
E-mail addresses: sumanbej.sb@gmail.com (S. Bej), kghoshbu@gmail.com (K. Ghosh), ncsaha@zoo.buruniv.ac.in (N.C

https://doi.org/10.1016/j.etap.2021.103717
Received 10 April 2021; Received in revised form 18 June 2021; Accepted 22 July 2021
Available online 24 July 2021

ELSEVIER

Tissue and Cell

Volume 74, February 2022, 101710

The eye of the tongue sole *Cynoglossus bilineatus* (Lacepède, 1802) (Teleostei: Pleuronectiformes)

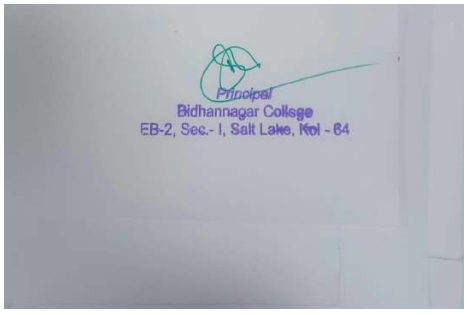
T.C. Nag [a], S. Chakraborti [b], D. Das [c]

[a] Department of Anatomy, All India Institute of Medical Sciences, New Delhi, 110029, India

[b] Department of Zoology, Bidhannagar College, Salt Lake 1, Kolkata, 700064, West Bengal, India

[c] Department of Zoology, Taki Government College, Taki, North 24 Parganas, West Bengal, 743429, India

Received 31 August 2021, Revised 2 December 2021, Accepted 7 December 2021, Available online



Inverse Variational Problem for Nonlinear Dynamical Systems

B.A. Khan[a], S. Chatterjee[b,*], S.G. Ali[c] and B. Talukdar[d]

[a] *Department of Physics, Krishnath College, Berhampore, Murshidabad 742101, India*
[b] *Department of Physics, Bidhannagar College, EB-2, Sector-1, Salt Lake, Kolkata 700064, India*
[c] *Department of Physics, Kazi Nazrul University, Asansol 713303, India*
[d] *Department of Physics, Visva-Bharati University, Santiniketan 731235, India*

Received: 23.09.2021 & Accepted: 10.12.2021

Doi: 10.12693/APhysPolA.141.64 *e-mail: supriya_2k1@rediffmail.com

Two different approaches to solving the inverse problem of the calculus of variation for nonlinear equations are introduced. The first approach is based on an integral representation of the Lagrangian function, while the second one relies on the generalization of Lagrangian symmetry. As an application of the first approach, we initially provide some useful remarks on the Lagrangians of the modified Emden-type equation, and then construct Lagrangian functions for (i) a cubic–quintic Duffing oscillator, (ii) Liénard-type oscillator and (iii) Mathews–Lakshmanan oscillator. Using the second approach, we obtain analytic (Lagrangian) representations for the three velocity-dependent equations, namely, (iv) Abraham–Lorentz oscillator, (v) Helmholtz oscillator and (vi) Van der Pol oscillator. For each of the systems in (i)–(vi) we find the Jacobi integral and thereby provide a method for obtaining the Hamiltonian function.

topics: Lagrangians, Jacobi integrals, Hamiltonians, nonlinear differential equations

1. Introduction

The inverse problem in the calculus of variation involves deciding whether a given system of second-order ordinary differential equations representing dynamical systems is a solution of the Euler–Lagrange equation and eventually finding its Lagrangian representation, if the solution exists [1]. For linear ordinary differential equations, the set of constraints for the existence of Lagrangians is provided by the so-called Helmholtz conditions [2, 3]. The equation of motion of a damped harmonic oscillator

$$\ddot{x}(t) + \gamma\,\dot{x}(t) + \omega^2 x(t) = 0 \tag{1}$$

violates these conditions such that we cannot find a time-independent Lagrangian representation for it. In (1), the over-dots denote the differentiation with respect to t. Here γ represents the frictional coefficient of the medium in which the oscillator of angular frequency ω is embedded. An explicitly time-dependent Lagrangian of the damped system was actually found [4, 5] during 1940's. For this Lagrangian, the canonical momentum is time-dependent. This provides an awkward analytical constraint to use the corresponding Hamiltonian to quantize the system [6]. In 1931, Bateman [7, 8] suggested a very ingenious method to find an explicitly time-independent Lagrangian for the damped harmonic oscillator by doubling the number of the system's degrees of freedom. More specifically, in conjunction with (1), an auxiliary oscillator equation

$$\ddot{y}(t) - \gamma\,\dot{y}(t) + \omega^2 y(t) = 0 \tag{2}$$

was considered to obtain the Lagrangian

$$L = \dot{x}(t)\dot{y}(t) + \frac{\gamma}{2}\Big(x(t)\,\dot{y}(t) - \dot{x}(t)\,y(t)\Big) - \omega^2 x(t)y(t). \tag{3}$$

Physically, the energy drained out from the oscillator in (1) is completely absorbed by that in (2) such that these two oscillators together represent a conservative system. The Euler–Lagrange equation [9] written in terms of $y(t)(x(t))$ gives the equation of motion for $x(t)(y(t))$. Because of this unusual behavior, the Lagrangian (3) is said to provide an indirect analytic (Lagrangian) representation of the system. The canonical quantization of damped harmonic oscillator using the indirect Lagrangian representation has been found to be quite satisfactory [10–12] because the corresponding Hamiltonian is time independent [5].

Traditionally, the Lagrangian function L of the autonomous differential equation is expressed as $L = T - V$, where T and V stand respectively for the kinetic and
represented by the
referred to as star
type of Lagrangian

Journal of Mathematical Chemistry
https://doi.org/10.1007/s10910-022-01336-9

ORIGINAL PAPER

On the exact revival of Morse oscillator wave packets

Supriya Chatterjee[1]

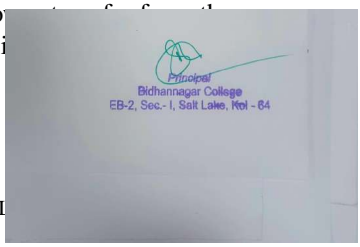
Received: 14 April 2021 / Accepted: 7 February 2022

Abstract
The exact analytic expressions of the autocorrelation function and Husimi distribution function for a Morse oscillator wave packet have been derived and we use them to see the evolution of the wave packet. The dynamics of Morse oscillator wave packets for the dimers ArXe, Be_2 and Li_2 have been discussed. Special emphasis has been given on the revival phenomenon of such wave packets. It is obtained that the exact revivals of wave packets for ArXe, Be_2 and Li_2 do not occur at the revival times (t_{rev}) but at the instances 3.5, 8.5 and 33.5 times and their simple multiple of t_{rev} respectively.

Keywords Morse oscillator · Molecular wave packet · Autocorrelation function · Husimi distribution function · Revival

1 Introduction

The simplest model for studying molecular wave packet dynamics is to consider the Morse oscillator [1]. It is an exactly solvable system and largely used to study rotating vibrational states of diatomic molecules [2]. Due to anharmonicity of the potential, the energy eigenvalues are nonlinear. It causes the initial wave packet to disperse which causes the collapse and after some time the collapsed wave packet gets back its initial form which is called the revival. The revival phenomena are not only theoretically described [3] but also experimentally verified for high-n Rydberg atoms [4], ion traps [5], semiconductor quantum wells [6], cavity QED [7], molecular vibrational states [8–10] etc. Revival of a wave packet tells us many internal information of the system. For the coherent control of a wave packet [8] it is necessary to know time of revival. A single laser pulse creates a wave packet but to study the ionization probability, phase-space localization or shaping the wave packet a time delayed second pulse is applied. Moreover, the po[illegible] ond pulse is maximum when the wave packet is at the i[illegible]



✉ Supriya Chatterjee
supriya_2k1@rediffmail.com

[1] Department of Physics, Bidhannagar College, EB–2, Sector–I, Salt L[illegible]

Published online: 05 March 2022

JSR Publications

Available Online

J. Sci. Res. **14** (2), 513-519 (2022)

JOURNAL OF SCIENTIFIC RESEARCH

www.banglajol.info/index.php/JSR

Classification of Hot Jupiter Population through Statistical Framework

S. Mondal*

Department of Physics, Bidhannagar College, EB-2, Salt Lake, West Bengal, 712311, India

Received 22 December 2021, accepted in final revised form 11 March 2022

Abstract

The recent trend in the discovery of a range of exoplanets opens up a door to evaluate their origin and classification under the light of different planetary attributes. This paper enthusiastically focused on a typical branch of exoplanets, hot Jupiter, and several planetary characteristics were observed to frame the population into substantive categories. In this paper, a statistical framework was also established to understand different planetary formation processes for hot Jupiters. Finally, the relevance of hot Jupiters in search of habitable planets is also discussed briefly.

Keywords: Hot Jupiters; Planetary formation; Star metallicity; Habitable zone.

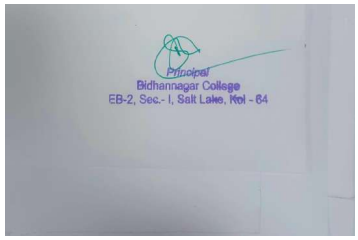
doi: http://dx.doi.org/10.3329/jsr.v14i2.56497 J. Sci. Res. **14** (2), 513-519 (2022)

1. Introduction

It is not far back when the concept of planetary systems except our solar system was the only stuff of theory and informed speculation. As time progresses, the catalog of exoplanets and their parent stars gets longer, and it helps mold different models of planetary formation around complex data. A special class emerges from the large pool of exoplanets due to their intriguing characteristics, inflated size, and proximity to the parent star. They are popular under the name of "Hot Jupiter," as during the first quadrant of their discovery period, most of them were found to have a mass comparable to our solar Jupiter [1]. Due to the propinquity of the parent star (semi-major axis <0.1 AU), Hot Jupiters have a concise orbital period (around a few days only) while our solar system Jupiter has a very long period of ~12 years orbits at ~5 AU from the Sun [2,3].

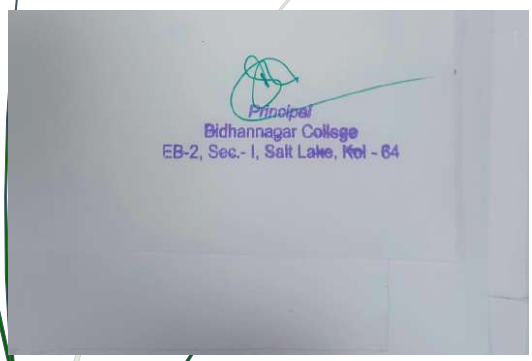
Mayor and Queloz discovered the first hot Jupiter through periodic Doppler shifts caused by the gravitational tug of 51 Pegasi [4]. This technique is biased towards finding hot Jupiters around less massive stars. After two decades since then, there are many more techniques, viz., radial velocity planets and dedicated photometric transits surveys, that have been deployed to detect and probe their physical attributes [5-8]. A group of these planets will have orbital inclinations close enough to edge in so that wide-angle CCD lenses capture the dimness of starlight during their transits in front of its parent star. Stars targeted by ground-based transit surveys are often amenable to radial velocity follow-up

* *Corresponding author*: soumyabrata_mondal@yahoo.in



A Survey on Parasitic Prevalence of Gut in *Heteropneustes fossilis* Collected from Local Market of Kolkata

Suman Mukherjee and Lipika Medda



Research Journal of Agricultural Sciences
An International Journal

P- ISSN: 0976-1675
E- ISSN: 2249-4538

Volume: 13
Issue: 01

Res. Jr. of Agril. Sci. (2022) 13: 173–175

CARAS

Asian Journal of Chemistry; Vol. 34, No. 5 (2022), 1066-1072

ASIAN JOURNAL OF CHEMISTRY

https://doi.org/10.14233/ajchem.2022.23722

MINI REVIEW

Cross-Linked Ionic Polysaccharides: Insights from the Structure to Stimuli-Sensitive Drug Delivery System Applications

TUHIN GHOSH[1,*] and SUMAN MUKHERJEE[2]

[1]Department of Chemistry (UG & PG), Durgapur Government College, Durgapur-713214, India
[2]Department of Zoology (UG & PG), Bidhannagar College, EB-2, Sector-1, Salt Lake City, Kolkata-700064, India

*Corresponding author: E-mail: tuhinghoshbuchem@gmail.com

Received: 8 January 2022; *Accepted*: 26 February 2022; *Published online*: 20 April 2022; AJC-20754

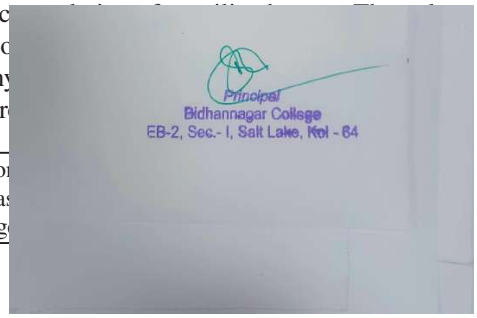
The review provides an insight regarding the state of the art of cross-linked ionic polysaccharides, which are a part of common drug delivery systems, which are involved in the regulation of release of drug in specific required sites. The changes in pH, ion concentration, wavelength, redox potential, temperature, electric and magnetic field intensity are the stimuli sensitive functions, which play a major roles. Due to their high reproducibility and better characterization from natural resources, the polysaccharides remains as a point of interest for compiling many stimuli-responsive drug delivery systems. The hydrogel networks are formed from ready cross-linking of ionic polysaccharides, subject to control of internal and external variables. These hydrogel networks become operative for drug release on-off through complex mechanisms. The polysaccharide-based drug delivery systems are now responsive to different hybrids, composites and grafted polymers with a broad range of stimuli functions.

Keywords: Ionic polysaccharides, Chitosan, Carboxymethyl cellulose, Heparin, Stimuli sensitive, Drug delivery system.

INTRODUCTION

It has been long time since natural polysaccharides, owing to their structural diversities and properties, have contributed immensely to the medical field. The developing nations have adopted the use of polysaccharides replacing the use of costly items widely in advanced diagnosis of a disease. Now-a-days, every effort is being made to convert the discarded wastes into useful materials from renewable sources with added properties. We are focusing here largely on the applications of polysaccharides family. Polysaccharides may be isolated and extracted from marine, plant, animal and synthetic sources [1]. The naturally growing seaweeds are a good source of sulfated polysaccharides, as reported in most of the cases [2]. In many cases, higher plants, edible fruit, bark, fungi and bacterial sources are reported to contain polysaccharides, which were extracted using standard procedures and cheap solvents, thereby discarding the other byproducts in the process. After the extraction process is over, chemical profiling, Smith degradation and linkage pattern determination is mostly done to establish the structure of the extracted polysaccharides from the natural or synthetic sources [3]. The proposed structure is thereafter confirmed from IR, NMR and GC-MS spectroscopic studies, compared to standard monosaccharides [4]. In fact, these polysaccharides may also be synthesized of diverse architecture with desired molecular weight and functional group. It is due to the coupling of the organic chemistry with the polymer science that has led to the formation of several new materials [5].

The polysaccharides and its composite materials were used in the aquatic feeds and agricultural byproducts in the last two decades. With passing time, gradually the synthetic materials have been replaced by these composite polysaccharide materials synthesized with the help of pharmaceutical technology. There has been an increase in search of the new materials using biomedical and pharmaceutical technology produced from daily household waste materials, which in turn would additionally reduce the large ac
saccharides are also
in structure in many
systems. In food pr



Demography India
Vol. 51, No. 2 (2022), pp.64-84 ISSN 0970-454X

Assessment of NSS data on morbidity: Is incidence appropriate for estimating the burden of disease?

Shewli Shabnam*[1] and Nandita Saikia[2]

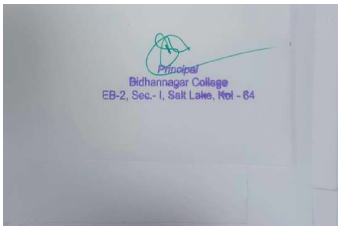
Abstract: The aim of this study is to check the quality of morbidity data in two nationally representative sample surveys and their implication in estimating the burden of disease. We have analysed the reported morbidity data of NSS Round 60 (collected in 2004) and Round 75 (collected in 2017-18). We have checked the internal consistency of data by applying mathematical relationships. We found inconsistency between the reported status of ailment and the duration of ailment and between the life table estimates of the duration of ailment and the implied duration derived by mathematical relationship. The incidence approach is unsuitable in determining Years Lost due to Disability (YLD) using NSS data.

Introduction

According to the Commission on Social Determinants of Health (CSDH), the level of development of any society "can be judged by the quality of its population's health, how fairly health is distributed across the social spectrum, and the degree of protection provided from disadvantage as a result of ill-health" (Commission on Social Determinants of Health, 2008, Para. 3). The fundamental requirement for this kind of analysis is the empirical statistics on health. Conventionally, we use infant mortality rate (IMR), under-five mortality rate (U5MR), and life expectancy at birth to understand the health status of the population. In the 20th century, a steady decline in mortality rates in industrial countries called for a serious re-examination of how we should measure health. It was observed that the increase in life expectancy was primarily caused by the mortality reductions from non-communicable diseases at older ages. Consequently, public health researchers became very concerned about the rise in chronic diseases and emphasised that morbidity conditions should be adequately reflected in health policy and setting priorities. These issues led to the development of "Summary Measures of Population Health (SMPH) that combines both mortality and morbidity data to represent overall population health as a single number" (Field and Gold, 1998, p. 4). Disability-Free Life Expectancy (DFLE), Active Life Expectancy (ALE), Disability-Adjusted Life Year (DALY) are some of the popular SMPH. As the life expectancy in India has reached 70 years and the burden of chronic diseases is also increasing with the growing elderly population, many researchers are using SMPH to depict the health status of India.

Most health measures are based on incidence rates or prevalence rates. While the incidence is the rate at which new events (e.g., ailments or deaths) occur in a population in a defined time period, the prevalence refers to the proportion of existing cases (rather than new cases) at a certain point in time

* Corresponding author
[1] Assistant Professor, Department of Geography, Bidhannagar College, Kolkata -700064, West Bengal, India. Email: shewlijnu@gmail.com
[2] Professor in Public Health and Mortality Studies, International Institute for Population Sciences, Mumbai – 400088, Maharashtra, India. Email: nanditasts@gmail.com



Received: 8 July 2022 | Revised: 5 October 2022 | Accepted: 22 October 2022

DOI: 10.1002/htj.22769

ORIGINAL ARTICLE

HEAT TRANSFER WILEY

Outlining the features of nanoparticle diameter and solid–liquid interfacial layer and Hall current effect on a nanofluid flow configured by a slippery bent surface

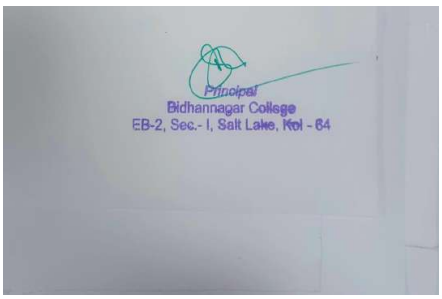
Shib Sankar Giri

Department of Mathematics, Bidhannagar College, Kolkata, West Bengal, India

Correspondence
Shib Sankar Giri, Department of Mathematics, Bidhannagar College, Kolkata, West Bengal 700064, India.
Email: shibsankar.math@gmail.com

Abstract

A study was executed to explore the flow characteristics of an electrically conducted, magnetized nanofluid across a curved stretching surface. This flow is accomplished in water-based nanofluid escorting Aluminum oxide (Al_2O_3) nanoparticles. The novelty of the work is primarily to capture the consequence of solid–liquid interfacial layer and diameter of Aluminum oxide (Al_2O_3) nanoparticles on flow mechanism



toxics

MDPI

Article

Deltamethrin-Induced Respiratory and Behavioral Effects and Adverse Outcome Pathways (AOP) in Short-Term Exposed Mozambique Tilapia, *Oreochromis mossambicus*

Azubuike V. Chukwuka [1], Shubhajit Saha [2,*], Dip Mukherjee [3], Priyajit Banerjee [4], Kishore Dhara [5] and Nimai Chandra Saha [4,*]

[1] National Environmental Standards and Regulations Enforcement Agency (NESREA), Osogbo 234, Osun State, Nigeria
[2] Department of Zoology, Sundarban Hazi Desarat College, Canning 743611, West Bengal, India
[3] Department of Zoology, S.B.S. Government College, Hili 733126, West Bengal, India
[4] Fisheries Ecotoxicology Research Laboratory, Department of Zoology, University of Burdwan, Bardhhaman 713104, West Bengal, India
[5] Directorate of Fisheries, Government of West Bengal, Kolkata 700091, West Bengal, India
* Correspondence: s.saha.bgc.wbsu@gmail.com (S.S.); prof.ncsahavcbu@rediffmail.com (N.C.S.)

Abstract: Disrupted behavior and respiratory distress effects of 96-h acute deltamethrin exposures in adult Mozambique tilapia, *Oreochromis mossambicus*, were investigated using behavioral indices and opercular movement, respectively. Deltamethrin concentrations were found to be associated with toxicological (lethal and sublethal) responses. At 24, 48, 72, and 96 h, the LC50 values and 95% confidence limits were 12.290 (11.174–14.411 µg/L), 12.671 (11.334–15.649 µg/L), 10.172 (9.310–11.193 µg/L), and 8.639 (7.860–9.417 µg/L), respectively. The GUTS-model analysis showed that GUTS-SD (stochastic death) with a narrow tolerance distribution in deltamethrin exposed *O. mossambicus* populations was more sensitive than the GUTS-IT (individual tolerance) model. Prior to death, exposed fish demonstrated concentration-dependent mortality and disturbed behavioral responses, including uncoordinated swim motions, increased mucus secretion, unbalanced and unpredictable swimming patterns, and inactivity. The altered behavioral patterns and increased opercular movement with increased deltamethrin levels and exposure time are strongly suggestive of neurotoxicity and respiratory distress, respectively. Adverse Outcome Pathways (AOPs), describing biological mechanisms and plausible pathways, highlighted oxidative stress and cholinergic effects as intermediate steps linked to respiratory distress and behavioral toxicity.

Keywords: structural homology; in silico analysis; neurotoxicity; behavioral toxicity; respiratory distress

Citation: Chukwuka, A.V.; Saha, S.; Mukherjee, D.; Banerjee, P.; Dhara, K.; Saha, N.C. Deltamethrin-Induced Respiratory and Behavioral Effects and Adverse Outcome Pathways (AOP) in Short-Term Exposed Mozambique Tilapia, *Oreochromis mossambicus*. *Toxics* **2022**, *10*, 701. https://doi.org/10.3390/toxics10110701

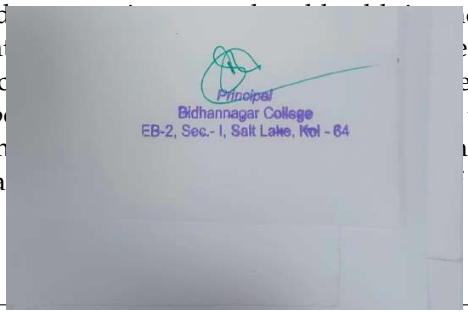
Academic Editors: Josef Velisek, Nuno Ferreira, Hugo Ricardo Monteiro and Tiago Simoes

Received: 19 October 2022
Accepted: 15 November 2022
Published: 17 November 2022

1. Introduction

The increasing demand for pesticides and fertilizers, alongside the rising demand for crops, goods, and services, is a recurrent concern for sustainability and environmental stewardship [1]. While pesticides and fertilizers do provide benefits, their production and use incur costs, including acute and long-term ecological health effects [2]. The sustainable development goal report articulated the need to improve the understanding of current practices and drivers of pesticide and fertilizer use, and identify knowledge gaps regarding environmental and health risks [3]. Due to current management practices, legislation, and policies to minimize ad cts, SDGs specify that the environmental footprint ed [4].

Pyrethroid insecticide and organophosphate insecticides due to their p toxicity to most non-target animals, particularly m armful to all aquatic creatures [5,6]. In particula nontarget aquatic species



Environmental Toxicology and Pharmacology
Volume 96, November 2022, 103983

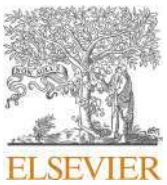
Melatonin ameliorates lipopolysaccharide induced brain inflammation through modulation of oxidative status and diminution of cytokine rush in *Danio rerio*

Mahammed Moniruzzaman [a], Arpan Kumar Maiti [b], Suman Bhusan Chakraborty [a], Ishita Saha [c], Nimai Chandra Saha [d]

[a] Department of Zoology, University of Calcutta, Kolkata 700019, India
[b] Department of Zoology, University of North Bengal, Darjeeling 734013, India
[c] Department of Physiology, Medical College and Hospital, Kolkata, India
[d] Fisheries and Ecotoxicology Research Laboratory Vice Chancellor's Research Group, Department of Zoology, The University of Burdwan, Purba bardhaman, Burdwan 713104, West Bengal, India

Received 5 February 2022, Revised 26 September 2022, Accepted 27 September 2022, Available online 29 September 2022, Version of Record 13 October 2022

Redox Biology 57 (2022) 102487



Contents lists available at ScienceDirect

Redox Biology

journal homepage: www.elsevier.com/locate/redox

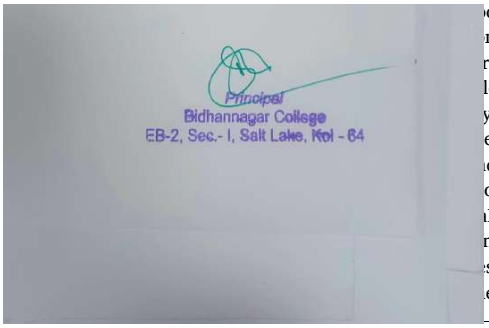
RGS11-CaMKII complex mediated redox control attenuates chemotherapy-induced cardiac fibrosis

Kiran Das [a,h,1], Madhuri Basak [a,1], Tarun Mahata [a], Manish Kumar [a], Dinesh Kumar [a], Sayan Biswas [b], Suvro Chatterjee [c], Mahammed Moniruzzaman [c], Nimai Chandra Saha [c], Kausik Mondal [d], Pranesh Kumar [e], Priyadip Das [f], Adele Stewart [g], Biswanath Maity [a,h,*]

[a] Centre of Biomedical Research, SGPGIMS Campus, Raebareli Road, Lucknow, Uttar Pradesh, 226014, India
[b] Forensic Medicine, College of Medicine and Sagore Dutta Hospital, B.T. Road, Kamarhati, Kolkata, West Bengal, 700058, India
[c] University of Burdwan, Burdwan, West Bengal, 713104, India
[d] Zoology, University of Kalyani, Nadia, West Bengal, 741235, India
[e] Pharmaceutical Sciences, Aryakul College of Pharmacy & Research, Natkur, Aryakul College Road, Lucknow, Uttar Pradesh, 226002, India
[f] Chemistry, SRM Institute of Science and Technology, Kattankulathur, Tamilnadu, 603203, India
[g] Biomedical Science, Charles E. Schmidt College of Medicine, Florida Atlantic University, Jupiter, FL, 33458, USA
[h] Academy of Scientific and Innovative Research (AcSIR), India

ARTICLE INFO

Keywords:
RGS proteins
Chemotherapy
Cardiotoxicity
Oxidative stress
Cell death



ABSTRACT

Dose limiting cardiotoxicity remains a major limiting factor in the clinical use of several cancer chemotherapeutics including anthracyclines and the antimetabolite 5-fluorouracil (5-FU). Prior work has demonstrated that chemotherapeutics increase expression of R7 family regulator of G protein signaling (RGS) protein-binding partner $G\beta_5$, which drives myocyte cytotoxicity. However, though several R7 family members are expressed in heart, the exact role of each protein in chemotherapy driven heart damage remains unclear. Here, we demonstrate that RGS11, downregulated in the human heart following chemotherapy exposure, possesses potent anti-optotic actions, in direct opposition to the actions of fellow R7 family member RGS6. RGS11 forms a direct mplex with the apoptotic kinase CaMKII and stress responsive transcription factor ATF3 and acts to coun-rbalance the ability of CaMKII and ATF3 to trigger oxidative stress, mitochondrial dysfunction, cell death, and lease of the cardiokine neuregulin-1 (NRG1), which mediates pathological intercommunication between yocytes and endothelial cells. Doxorubicin triggers RGS11 depletion in the murine myocardium, and cardiac-ecific OE of RGS11 decreases doxorubicin-induced fibrosis, myocyte hypertrophy, apoptosis, oxidative stress, d cell loss and aids in the maintenance of left ventricular function. Conversely, RGS11 knockdown in heart omotes cardiac fibrosis associated with CaMKII activation and ATF3/NRG1 induction. Indeed, inhibition of MKII largely prevents the fibrotic remodeling resulting from cardiac RGS11 depletion underscoring the nctional importance of the RGS11-CaMKII interaction in the pathogenesis of cardiac fibrosis. These data scribe an entirely new role for RGS11 in heart and identify RGS11 as a potential new target for amelioration of emotherapy-induced cardiotoxicity.

1. Introduction

According to the International Agency for Research on Cancer (IARC), there were 9.5 million deaths from cancer in 2018, numbers expected to rise in the coming decades due to the aging population and increasing prevalence of risk factors for malignant transformation. Irrespective of the specific malignancy, chemotherapy remains a critical component of cancer therapy and has been shown to significantly improve patient survival over a 20-year period [1]. However, the clinical utility of many of these drugs is limited by life-threatening side effects, which include chemotherapy-induced cardiotoxicity characterized by compromised left ventricular function, structural heart damage,

* Corresponding author. Department of Systems Biology Centre of Biomedical Research (CBMR), SGPGI Campus, Raebareli Road, Lucknow, Uttar Pradesh, 226014, India.
E-mail addresses: bmaity@cbmr.res.in, bmaity28@gmail.com (B. Maity).
[1] Equal contribution.

https://doi.org/10.1016/j.redox.2022.102487
Received 10 September 2022; Accepted 20 September 2022
Available online 27 September 2022

Longer-Term Adverse Effects of Selenate Exposures on Hematological and Serum Biochemical Variables in Air-Breathing Fish *Channa punctata* (Bloch, 1973) and Non-air Breathing Fish *Ctenopharyngodon Idella* (Cuvier, 1844): an Integrated Biomarker Response Approach

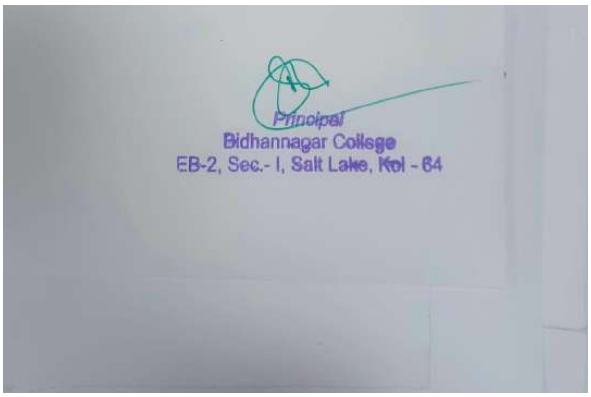
Published: 17 October 2022
Volume 201, pages 3497–3512, (2023) Cite this article

Biological Trace Element Research

Aims and scope →

Submit manuscript →

Shubhajit Saha, Kishore Dhara, Prasenjit Pal, Nimai Chandra Saha, Caterina Faggio ✉ & Azubuike V. Chukwuka



Article

Nitrate-Induced Toxicity and Potential Attenuation of Behavioural and Stress Biomarkers in Tubifex tubifex

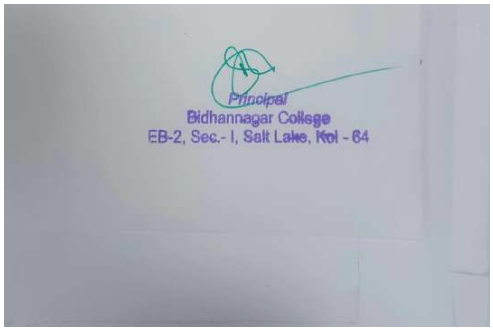
August 2022 · International Journal of Environmental Research 16(4)
August 2022 · 16(4)
DOI:10.1007/s41742-022-00443-4

Authors:

Pramita Garai **Priyajit Banerjee** **Pramita Sharma**

Pradip Mondal **Nimai Chandra Saha**

Caterina Faggio



› Environ Sci Pollut Res Int. 2022 Dec;29(58):87319-87333. doi: 10.1007/s11356-022-21361-0. Epub 2022 Jul 8.

Mechanistic insights to lactic and formic acid toxicity on benthic oligochaete worm Tubifex tubifex

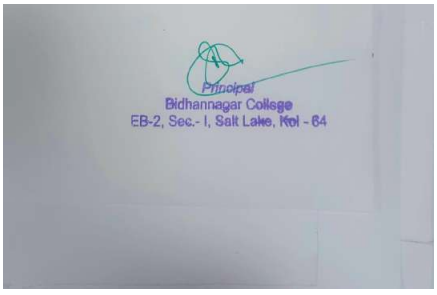
Pramita Garai [# 1], Priyajit Banerjee [# 1], Pramita Sharma [1], Arnab Chatterjee [1], Ritwick Bhattacharya [1], Nimai Chandra Saha [2]

Affiliations – collapse

Affiliations

1 Fisheries and Ecotoxicology Research Laboratory (Vice-Chancellor's Research Group), Department of Zoology, The University of Burdwan, Burdwan, West Bengal, 713104, India.
2 Fisheries and Ecotoxicology Research Laboratory (Vice-Chancellor's Research Group), Department of Zoology, The University of Burdwan, Burdwan, West Bengal, 713104, India. ncsaha@zoo.buruniv.ac.in.
# Contributed equally.

PMID: 35802337 DOI: 10.1007/s11356-022-21361-0



ELSEVIER

Antioxidant enzyme activity and pathophysiological responses in the freshwater walking catfish, *Clarias batrachus* Linn under sub-chronic and chronic exposures to the neonicotinoid, Thiamethoxam®

Dip Mukherjee [a], Shubhajit Saha [b], Azubuike V. Chukwuka [c] ✉, Biswatosh Ghosh [d], Kishore Dhara [e], Nimai Chandra Saha [g], Prasenjit Pal [f], Caterina Faggio [h] ✉

[a] Department of Zoology, S.B.S. Government College, Hili, Dakshin Dinajpur, 733126 West Bengal, India

[b] Department of Zoology, Sundarban Hazi Desarat College, South 24 Parganas, 743 611 West Bengal, India

[c] National Environmental Standards and Regulations Enforcement Agency (NESREA), Osogbo, Nigeria

[d] Post Graduate Department of Zoology, Bidhannagar College, Kolkata 700 064, West Bengal, India

[e] Freshwater Fisheries Research & Training Centre, Directorate of Fisheries, Nadia 741 251,

Asian Journal of Chemistry; Vol. 34, No. 12 (2022), 3391-3398

ASIAN JOURNAL OF CHEMISTRY

https://doi.org/10.14233/ajchem.2022.24053

Chemical Profiling of Crush, Tear, Curl (CTC) Tea Waste of Eastern Sub-Himalayan Regions: An Elemental and Spectroscopic Analysis

SATYAJIT SARKAR[1,2], SOUMIK BARDHAN[3,4], ARINDAM GANGOPADHYAY[5], SHANKHA BANERJEE[4], SANJIB SENAPATI[4], SAURABH CHAKRABORTI[6], SUMIT SAHA[7], MAHIPAL SINGH[8] and MONORANJAN CHOWDHURY[2,*]

[1]Department of Tea Science, University of North Bengal, Raja Rammohunpur, Siliguri-734013, India
[2]Taxonomy of Angiosperms & Biosystematics Laboratory, Department of Botany, University of North Bengal, Raja Rammohunpur, Siliguri-734013, India
[3]Physical Chemistry Section, Department of Chemistry, Jadavpur University, 188, Raja S.C. Mallick Road, Kolkata-700032, India
[4]Department of Biotechnology and B.J.M. School of Biosciences, Indian Institute of Technology Madras, Chennai-600036, India
[5]Department of Chemistry, Rampurhat College, Rampurhat, Birbhum-731224, India
[6]Office of the Principal, Bidhannagar College, EB-2, Sector-I, Salt Lake, Kolkata-700064, India
[7]Department of Chemistry, National Institute of Technology Sikkim, Ravangla-737139, India
[8]Project Director & Director (Research) Additional Charge, Tea Board India, 14, B.T.M. Sarani (Brabourne Road), Kolkata-700001, India

*Corresponding author: E-mail: mchowdhury@nbu.ac.in

Received: 23 September 2022; *Accepted*: 19 November 2022; *Published online*: 25 November 2022; AJC-21071

Tea is not only the most popular beverage in the world but also producing a large quantity untreated wastes product every year. In particular, the tea gardens of eastern Sub-Himalayan region cumulatively produce 15 million kg of crush, tear, curl (CTC)-factory tea waste (FTW) every year, which primarily includes discarded tea leaves, leaf fibers, buds and tender stems of tea plants. Beside that ~ 80% population of Indian subcontinent consume CTC tea regularly at their homes, tea stalls, market, cafe *etc.* and the waste produced from it, is called CTC domestic tea waste (DTW). Thus, not only factory tea waste but also a large quantity of domestic CTC tea waste (DTW) is exposed into the environment regularly. In present study, an attempt has been made for primary screening of the compounds in both the CTC-tea wastes. It has been shown that FTW sample contains greater amount of non-metal elements such as sulfur, calcium, phosphorus and metal elements like potassium and iron compared to DTW sample. Abundance of aromatic compounds has been seen to be higher in FTWs whereas, DTW primarily contains aliphatic compounds. Using Orbitrap-HRLCMS analysis allowed to make accurate predictions about the molecular structures of the likely organic chemicals found in tea trash. Thus, various bioactive organic compounds, micronutrients and trace elements from tea waste were found.

Keywords: Tea waste, CTC-FTW, CTC-DTW, Chemical profiling.

INTRODUCTION

Tea is the most popular beverage in the world. India is the major producer of tea. India mainly produce three types of tea *i.e.* CTC tea, green tea and an orthodox tea [1]. Among those about 70-80% tea belongs to CTC type. Green tea and orthodox tea do not produce any waste during its manufacture except only domestic tea waste (DTW). But in case of CTC tea, it produces large number of factory tea waste (FTW) during its manufacturing. There are about 400 big industrial tea gardens (BTGs) and many small tea growers (STGs) in the Sub-Himalayan Terai and Dooars regions of India, especially in Darjeeling, Kalimpong, Jalpaiguri, Alipuduar and Cooch Behar. BTGs and STGs produce about 52% and 48%, respectively, of total production of tea in North Bengal area of India. Furthermore, they not only produce CTC teas but also produce around 15 million kg of factory tea waste (CTC-FTW) per year. Beside that a large number of tea wastes are produced in the tea shops and domestic consumption of te
tea waste. In India, CTC te
consumption of tea and the
CTC domestic tea waste (

Parasitology International 89 (2022) 102591

Contents lists available at ScienceDirect

Parasitology International

journal homepage: www.elsevier.com/locate/parint

FRB domain of human TOR protein induces compromised proliferation and mitochondrial dysfunction in *L*eishmania*donovani* promastigotes

Sudipta Chakraborty [a,b], Soumyajit Mukherjee [a], Priyam Biswas [a], Alok Ghosh [a], Anirban Siddhanta [a,*]

[a] *Department of Biochemistry, University of Calcutta, India*
[b] *Department of Microbiology, Bidhannagar College, Kolkata, India*

ARTICLE INFO

Keywords:
FRB domain
mTOR
Oxygen consumption
Respiratory complex
Mitochondria
Leishmania donovani

ABSTRACT

Visceral leishmaniasis (VL) or Kala-azar, the second-largest parasitic killer worldwide, is caused by *Leishmania donovani*. The drugs to treat VL are toxic and expensive. Moreover, their indiscriminate use gave rise to resistant strains. The high rate of parasite proliferation within the host macrophage cells causes pathogenesis. In the proliferative pathway, FRB domain of TOR protein is ubiquitously essential. Although orthologues of mTOR protein are reported in trypanosomatids and *Leishmania* but therein depth molecular characterization is yet to be done. Considerable protein sequence homology exists between the TOR of kinetoplastidas and mammals. Interestingly, exogenous human FRB domain was shown to block G1 to S transition in mammalian cancer cells. Thus, we hypothesized that expression of human FRB domain would inhibit the proliferation of *Leishmaniadonovani*. Indeed, promastigotes stably expressing wild type human FRB domain show 4.7 and 1.5 folds less intra- and extra-cellular proliferations than that of untransfected controls. They also manifested 2.65 times lower rate of glucose stimulated oxygen consumption. The activities of all respiratory complexes were compromised in the hFRB expressing promastigotes. In these cells, depolarized mitochondria were 2-fold more than control cells. However, promastigotes expressing its mutant version (Trp^{2027}-Phe) has shown similar characteristics like untransfected cells. Thus, this study reveals greater insights on the conserved role of TOR in the regulation of the respiratory complexes in L. *donovani*. The slow growing variant of FRB expressing promastigotes will have great potential to be exploited as a prophylactic agent against leishmaniasis.

1. Introduction

Visceral Leishmaniasis (VL), a neglected tropical disease caused by *Leishmania donovani,* transmitted by sandfly vectors is considered to be a significant public health problem in 100 countries worldwide [1,2]. The parasite persists and multiplies within the phagosomes of the mammalian host macrophages [3,4]. Detailed understandings of molecular events involved in this proliferative pathway would be helpful for us to develop broadly applicable therapeutic strategies to combat the disease. Mechanistic target of rapamycin (TOR; originally known as mammalian target of rapamycin), an evolutionary conserved member of PI3kinase pathway is one of the important central control points of cell growth and proliferation [5]. This serine/threonine kinase is activated by different nutrients like amino acids and growth factors [6,7]. Rapamycin, a lipophilic macrolide, inhibits mTOR by the formation of a high affinity inhibitory complexwith the FK506-binding protein- 12 (FKBP12) and the FRB (FKBP12 rapamycin binding) domain of TOR [8]. However, this rapamycin sensitive complex controls the protein translational machinery via activation of p70 ribosomal S6 kinase (p70S6K) and inhibition of eIF-4E binding protein 1 (4E-BP1) [9]. Moreover, mTOR controls mitochondrial respiration directly [10], by regulating nuclear transcription of mitochondrial genes involved in oxidative phosphorylation [11] and also forms complex with membrane proteins of mitochondria [12].

FRB domain [11 kDa (aa-2015-2114)] was originally identified as the binding site for FKBP12/ rapamycin complexes but now it has been proved to mediate important TOR functions [8,13,14] most importantly G1 to S cell cycle progression in the mammalian system [15,16].

TOR kinases have been found in *Leishmania major*, *Leishmania donovani* and in other trypanosomatids with the signature FRB domains involved in several cellular functions [17,18,19,20]. *Leishmania major* contains three TOR proteins, two are essential for its survival (LmjTOR1

* Corresponding author at: Department of Biochemistry, University of Calcutta, 35 B.C. Road, Kolkata 700019, India.
E-mail address: asbioc@caluniv.ac.in (A. Siddhanta).

https://doi.org/10.1016/j.parint.2022.102591
Received 10 February 2022; Received in revised form 14 April 2022; Accepted 19 April 2022
Available online 25 April 2022

Article

Architectural Anthropology in Urban Housing Complex: A Spatial Study on the Culture Construct of a Community Design Architecture

Journal of the Anthropological Survey of India
71(2) 167–184, 2022

DOI: 10.1177/2277436X221077340
journals.sagepub.com/home/ans
SAGE

Sankha Priya Guha[1]

Abstract

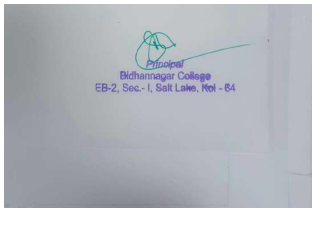
The science and art of architecture skilfully relate parts to a greater whole as well as creates a form, which is uniquely appropriate for the exercise of a specific set of functions. There is no single approach to the study of architecture, but many. Anthropological approach considers buildings as cultural artefacts and can be revealing of the relationship of dwellings to family, social structure and mores. Architectural anthropology is an emerging discipline which has its scope in the interface of physical and cultural spaces of a community. The present study is an empirical attempt to understand the anthropological and phenomenological dimensions of architecture in two urban housing complexes located in Kolkata in India. The key concept to be used in the present study is space both in terms of theoretical discourse and empirical representation. The study do establish the fact that buildings have social lives with physical structure, needs, uniqueness, characters as well as cognitive identity. The social identity of these buildings is drawn from a number of socio-economic variables of the residents guided by time–space determinants.

Keywords

Architecture, culture, space, anthropology, phenomenology

[1] Post-Graduate Department of Anthropology, Bidhannagar College, Kolkata, West Bengal, India

Corresponding author:
Sankha Priya Guha, Post-Graduate Department of Anthropology, Bidhannagar College, Kolkata, West Bengal 700064, India.
E-mail: spgwbes@gmail.com



বোদলেয়ারের তিনটি কবিতার
ফরাসি থেকে অনুবাদ : উদয়শংকর বর্মা

অনুতাপ আর ঘাউড়ুলে ভ্রমণ (Mæsta et errabunda)

আগাথা, আমাকে বলো তো, মাঝে মাঝে তোমার মনটি কি
নোংরা এই শহরের কালো সমুদ্র পেরিয়ে
অন্য কোনও সমুদ্রের সেই উজ্জ্বল উল্লাসের দিকে উড়ে যায়
যা সুনীল ও স্বচ্ছ : যেন কোনও এক গভীর নিষ্পাপ কৌমার্য!
আগাথা, আমাকে বলো তো, মাঝে মাঝে তোমার মনটি কি উড়ে যায় সেখানে?

সমুদ্র, বিশাল সমুদ্র, আমাদের মেহনৎকে দেয় সান্ত্বনা
কোনও এক দানব, উদ্দাম গায়ক তাকে ভরিয়ে তোলে,
দামাল হাওয়ার খ্যাপামো করে তার সঙ্গত।
যেন দোলনায় দোল দেওয়ার দায়িত্ব নেয় সে
বিশাল সমুদ্র আমাদের মেহনৎকে দেয় সান্ত্বনা।

হে পরিবহন, আমাকে নিয়ে চলো,
হে রণতরী, নিয়ে চলো আমাকে
দূরে, বহু দূরে-
এখানকার কাদামাটি চোখের জলে তৈরি
আগাথার বিষণ্ণ হৃদয় যে মাঝে মাঝে বলে-
"অপরাধ থেকে, অনুতাপ থেকে, দুঃখ থেকে
আমাকে সরিয়ে নিয়ে যাও, হে পরিবহন, হে রণতরী", তা কি সত্যি?

ওগো গন্ধবিধুর স্বর্গ, কত দূরে তুমি
নীল আকাশের নীচে যেখানে শুধুই ভালোবাসা আর আনন্দ
যেখানে ভালোবাসার পাত্রপাত্রীরা এক অনন্ত জুটি
যেখানে সারাক্ষণ নির্ভেজাল আনন্দে ডুবে থাকে হৃদয়
গন্ধবিধুর সেই স্বর্গ, ওগো বলো, তুমি কতদূরে?

কিশোর প্রেমের সেই সবুজ স্বর্গ
সেই ছুটোছুটি চারদিকে, গান গাওয়া, চুমু খাওয়া, ফুলের তোড়া
পাহাড় পেরিয়ে আসা বেহালার সুরেলা কম্পন

অশুভ তোমার কোন পথ দিয়ে

উদয়শংকর বর্মা

ইভল বা অশুভের অস্তিত্ব অত্যন্ত পুরনো। প্রাচীন ধর্মশাস্ত্রে এই ইভলের প্রতিনিধি হিসেবে শয়তান বা অসুরদের কথা আছে। মনুষ্যকৃত পাপও ইভল। ব্যাধি ও ত্রিতাপ যন্ত্রণাও ইভল। সুতরাং ইভলের ধারণাটি ব্যাপক, বহুধাবিস্তৃত। ধর্মশাস্ত্র, দর্শনশাস্ত্র ও সাহিত্যের উপরে ইভলের প্রভাব প্রাচীন কাল থেকেই চলে আসছে। কিন্তু আধুনিক কবিতার একেবারে কেন্দ্রে ইভলকে রেখে সৌন্দর্য রচনার সাহস বোদেলেয়ারই প্রথম দেখিয়েছেন। তাঁর কাব্যগ্রন্থটির নামের মধ্যেই সেটা প্রতিফলিত। তাঁর কাব্যগ্রন্থের নাম-'লে ফ্লার দ্য মাল', যার ইংরেজি করলে হয় 'দ্য ফ্লাওয়ার্স অব ইভল'। আর বাংলা করলে 'ইভলের ফুলগুলি'। 'ইভল'এর বাংলা যদি 'অশুভ' করা যায়, তাহলে বিশুদ্ধ বাংলায় বোদলেয়ারের এই কাব্যগ্রন্থটির নাম হয়- 'অশুভ ফুলগুলি'।

খ্রিস্টীয় ধর্ম অনুসারে মানুষ যেদিন থেকে তার স্বাধীন ইচ্ছের দুষ্প্রয়োগ করে ঈশ্বরের বারণ না মেনে নিষিদ্ধ ফল ভক্ষণ করেছে, সেদিনই তার পতন হয়েছে। পাপ হয়েছে। এভাবেই জগতে প্রথম ইভলের সৃষ্টি হয়েছে, আর তাকেই বলা হয়েছে নৈতিক ইভল। এই নৈতিক ইভলের জন্যে ঈশ্বর যে শাস্তি দেন, তাতেই উদ্ভূত হয় প্রাকৃতিক ইভল। ভালো কাজের জন্যে ঈশ্বর মানুষকে অবশ্য পুরস্কারও দিয়ে থাকেন। ফলে মানুষ তার জীবনে পুরস্কার এবং সুখ, শান্তি এবং যন্ত্রণা উভয়ই অর্জন করেন। তখন দেখা দেয় ধর্মীয় ইভল। বোদলেয়ারের কবিতায় এই ধর্মীয় ইভলের পরিচয় অবশ্যই আছে। বিশেষ করে 'আশীর্বাদ'[১], 'অতীত জীবন'[২], বৈপরীত্য'[৩], 'ভ্রমণ'[৪] প্রভৃতি কবিতায়। ধর্মীয় ইভলের ভাবনায় বোদলেয়ার মূলত ক্যাথলিক দার্শনিক জোসেফ দ্য মেস্ত্র দ্বারা অনুপ্রাণিত। দ্য মেস্ত্র'র মতোই বোদলেয়ারেরও মনে হয়েছিল যে, নিয়তির উপরে মানুষের কোনও নিয়ন্ত্রণ নেই। অতএব প্রার্থনার মাধ্যমেই মানুষকে নিজের দুর্বিপাক থেকে মুক্ত হতে হবে। এ কারণে উক্ত প্রতিটি কবিতাতেই পাপ, যন্ত্রণা, কষ্ট ইত্যাদি থেকে পরিত্রাণের কথা বেশ স্পষ্টভাবেই বলা হয়েছে। তাছাড়া দ্য মেস্ত্র যে আদি পাপে বিশ্বাস করতেন ও তা থেকে পরিত্রাণের কথা বলেছিলেন, বোদলেয়ার সেটিকে দেশবাসীর প্রগতি-অনুরাগের বিরুদ্ধে একটি রাজনৈতিক অস্ত্র হিসেবেও ব্যবহার করেছিলেন। কারণ ১৮৪৮ এর গণ বিদ্রোহ সম্পর্কে তাঁর মোহভঙ্গ ঘটেছিল। তাই তিনি তাঁর 'জার্নালে' লিখেছিলেন যে, 'সত্যিকারের সভ্যতার সূত্রটিকে গ্যাসের আবিষ্কার,বাষ্পের প্রয়োগকৌশল কিংবা রিভলভিং টেবিলের

হাংরি জেনারেশন আন্দোলন ও বাংলা কবিতা

উদয় শংকর বর্মা

ভারতের স্বাধীনতা প্রাপ্তি ও বঙ্গবিভাগের তেরো বছর পরে ১৯৬১-৬২ সালে পশ্চিমবঙ্গে সাহিত্যের ক্ষেত্রে একটি সাড়া জাগানো আন্দোলন সংঘটিত হয়। তার নাম হাংরি জেনারেশন আন্দোলন। শুরুর সঙ্গে সঙ্গে সারা বিশ্ব জুড়ে এ আন্দোলনের প্রতিক্রিয়া লক্ষ্য করা গিয়েছিল। অনেকের অভিযোগ এই যে, এই প্রতিক্রিয়ার কারণ মত না সাহিত্যমূলক তার চেয়ে বেশি রাজনৈতিক। যদিও এই আন্দোলনের পথিকৃৎরা কেউই সেভাবে সাহিত্যের সঙ্গে রাজনীতিকে জড়ান নি। কিন্তু মার্কসবাদের এ কথা তো ঠিক যে, তত্ত্ব কোনোকিছুই রাজনীতির বাইরে নয়। আসলে হাংরি জেনারেশনের রাজনীতি এইখানে যে, তা সমাজের প্রচলিত প্রকরণটিকে, সমাজের প্রচলিত অভ্যাসটিকে আঘাত করেছিল। সামাজিক নিয়ম কানুনের তোয়াক্কা না করে ব্যক্তির সর্বাঙ্গীন ইচ্ছে অনিচ্ছাকে শুধু নয় তার গহন দৃষ্টি কোণটিকেও রূঢ়ভাবে প্রচার করেছিল। অতিপূর্বজ 'কল্লোলীয়'দের মত 'হাংরি'রা অবদমনের উন্মোচন করেন নি। (লক্ষণীয়, প্রেমেন্দ্র মিত্রের 'বিকৃত ক্ষুধার ফাঁদে বন্দী মোর ভগবান কাঁদে' বা বুদ্ধদেব বসুর 'বাসনার বাষ্পোচ্ছ্বাসে কেঁদে মরে ক্ষুধিত যৌবন।') হাংরিরা অবদমনকেই স্বীকার করেন নি। তাঁরা হতে চেয়েছিলেন অবদমনমুক্ত সমাজের এক সপ্রাণ প্রতিচ্ছবি। আর শুধু তো যৌনতা নয়, সমাজ, জীবন, সাহিত্য, শিল্প সব কিছু নিয়েই এঁদের ভাবনা ছিল। বাংলা সাহিত্যের আর কোনো আন্দোলন জীবনের এতখানি ব্যাপক প্রেক্ষিত নিয়ে মন্থন করেনি। গোষ্ঠীদ্বন্দ্বের কারণে এই আন্দোলন ভেঙ্গে স্তিমিত হয়ে না পড়লে তা যে কী রূপ নিত তা আজ আর বলা সম্ভব নয়। তবে হাংরি জেনারেশন আন্দোলনের প্রবক্তারা তাঁদের আন্দোলনকে যে তাত্ত্বিক ও সাহিত্যিক রসমূর্তি দান করেছিলেন তা আজও অনন্য।

হাংরি জেনারেশন আন্দোলনের উৎপত্তিকাল হিসেবে দুটি সালের চল আছে। ১৯৬১ ও ১৯৬২। কারণ এই আন্দোলনের দুই পথিকৃৎ মলয় রায়চৌধুরী ও শৈলেশ্বর ঘোষের মধ্যে মতানৈক্য রয়েছে। মলয়ের মতে ১৯৬১ সালে প্রথম হাংরি মেনিফেস্টোটি বার হয়। সেটির মুসাবিদা করেছিলেন তিনি নিজেই এবং সেখানে 'হাংরি জেনারেশন'-এই অভিধাটি গৃহীত হয়েছিল চসারের "In the sowre hungry time" বাকাবন্ধের অনুসরণে। মার্কস এবং অসওয়াল্ড স্পেংলারে নিমজ্জিত মলয়কে চসারের ভাবনাও প্রভাবিত করেছিল বলে স্মৃতিকথায় জানিয়েছেন মলয়। যেহেতু মেনিফেস্টোর প্রথম দিকে তারিখ দেবার চল ছিল

দস্তয়েভ্স্কির উপন্যাস 'দানবেরা'

উদয়শংকর বর্মা

'দানবেরা (Demons)' বা 'শয়তানেরা (The Devils)' বা 'অপদেবতাগ্রস্ত (ঃ Possessed)' দস্তয়েভ্স্কির ষষ্ঠ উপন্যাস। তাঁর স্ত্রী অ্যানার বয়ান থেকে জানা যায় যে, ১৮৬৯ খ্রিস্টাব্দে দস্তয়েভ্স্কি যখন জার্মানীর ড্রেসডেনে স্বেচ্ছাবৃত নির্বাসনে ছিলেন, তখনই এই উপন্যাসটি রচনার কথা তাঁর মাথায় আসে। রাশিয়া থেকে সুদূর জার্মানে বসে দস্তয়েভ্স্কি সে সময় সংবাদপত্রের মাধ্যমে স্বদেশের নানা খবরাখবর পাচ্ছিলেন। সেসবের মধ্যে পেত্রভস্কিয়া অ্যাগ্রিকালচারাল অ্যাকাদেমির ছাত্রছাত্রীদের রাজনৈতিক বিক্ষোভ-আন্দোলনের ব্যাপারটিও ছিল। সমকালীন ওই ছাত্র আন্দোলনকে ভিত্তি করে দস্তয়েভ্স্কি তখন একখানি 'প্যামফ্লেট নভেল' রচনার কথা ভাবছিলেন। কিন্তু ওই বিপ্লবী দলের এক সদস্য ইভান ইভানভ হঠাৎ খুন হয়ে যাওয়ায় দস্তয়েভ্স্কি অত্যন্ত বিচলিত হয়ে পড়েন এবং তাঁর 'প্যামফ্লেট নভেল' তথা পুরোদস্তুর রাজনৈতিক উপন্যাস রচনার পরিকল্পনাটিকে বাতিল করে দেন। স্ত্রাকভকে লেখা এক চিঠিতে দস্তয়েভ্স্কি জানান যে, স্তাভ্রোগিনকে কেন্দ্রীয় চরিত্র করে বিশুদ্ধ 'প্যামফ্লেট নভেলে'র বদলে তিনি এবারে অন্য ভাবধারার কোনও উপন্যাস রচনা করবেন। তাই তাঁর উপন্যাসের মুখ্য চরিত্রটি সেভাবে কোনও রাজনৈতিক ব্যক্তিত্ব হবেন না। হয়ত এ জন্যেই 'দানবেরা' উপন্যাসের নায়ক পিয়োর্ত্র স্তেপানোভিচকে না ভেবে নিকোলাই স্তাভ্রোগিনকে বেছে নিয়েছিলেন দস্তয়েভ্স্কি, যাকে একজন নিষ্ক্রিয় রাজনৈতিক কর্মী ও দুরাচারী বলাই সঙ্গত। হয়ত তিনি এরকম ভেবেছিলেন বলেই তাঁর পূর্ববর্তী উপন্যাস 'আহাম্মক (The Idiot)' ও পূর্বপরিকল্পিত 'নাস্তিক্যবাদ (Atheism)' ও 'এক মহাপাতকের কাহিনী (The story of a great Sinner)' উপন্যাসের ভাববস্তুকে এই নতুন উপন্যাসটির মধ্যে গ্রহণ করেছিলেন।

এতদ্সত্ত্বেও 'দানবেরা' উপন্যাসটিতে রাজনীতির আবর্তচক্র ছিলই। যে জ্বলজ্যান্ত রাজনৈতিক হত্যাকে অবলম্বন করে উপন্যাসটি রচিত হয়েছিল, তার ঐতিহাসিক ও সমাজতাত্ত্বিক গুরুত্ব রাশিয়ায় ছিল অপরিসীম। বামপন্থী বিপ্লবী দলের সদস্য ইভানভ ১৮৬৯ খ্রিস্টাব্দে মস্কোয় খুন হয়েছিলেন। ইভানভ ছিলেন একজন তরুণ ছাত্র। তাঁর দলেরই চার সদস্য তাঁকে খুন করেছিলেন। তাঁদের সন্দেহ ছিল যে, ইভানভ তাঁদের রাজনৈতিক কর্মকাণ্ডের খবরাখবর সরকারী কর্তৃপক্ষের কাছে পাচার করে দিচ্ছেন। যে চারজন ইভানভকে খুন করেছিলেন, তাঁদের নেতৃত্ব দিয়েছিলেন সেগেই নেচায়েভ। তিনি

দস্তেইভ্স্কির ভয়ঙ্কর দানবেরা

ওরহান পামুক

আমার মতে দানবেরা (Demons) পৃথিবীর সর্বকালের সেরা একখানি রাজনৈতিক উপন্যাস। বইটি প্রথম যখন পড়ি, তখন আমার বয়স ছিল কুড়ি। বইটির প্রভাব সম্পর্কে আমি এটাই বলতে পরি যে, বইটি পড়ে আমি বিমূঢ়, বিস্মিত ও আতঙ্কিত হয়ে পড়েছিলুম এবং বইটির গুরুত্ব অনুধাবন করতে পেরেছিলুম। অন্য কোনও উপন্যাস তখন আমাকে এত গভীরভাবে আলোড়িত করে নি, অন্য কোনও কাহিনী মানবাত্মার যন্ত্রণাদীর্ণ অভিজ্ঞতার সঙ্গে এভাবে আমাকে পরিচয় করিয়ে দেয়নি। ক্ষমতার জন্যে মানুষের উন্মাদনা, অন্যের প্রতি ক্ষমাশীলতা, নিজেকে ও অন্যকে প্রবঞ্চিত করার সামর্থ্য, ঘৃণার প্রতি অনুরক্তি, বিশ্বাসের জন্যে প্রয়োজন বোধ, পবিত্র ও অপবিত্র বিষয়গুলোর প্রতি আকর্ষণ : এ সমস্ত কিছুর যা আমাকে আহত করেছিল তা এই যে, দস্তেইভ্স্কি এই গুণগুলিকে সংমিশ্রিতভাবে এবং রাজনীতি, প্রতারণা ও মৃত্যুর সাধারণ তালগোল পাকানো বৃত্তান্তে স্থিত দেখতে পেয়েছিলেন। নিজের সর্বাতিশায়ী প্রজ্ঞা যে দ্রুততার এ উপন্যাসটি আমাদের মধ্যে ছড়িয়ে দিয়েছিল, আমি সেটির প্রশংসা করেছিলুম। সাহিত্যের এটাই হয়ত প্রাথমিক গুণ : মহৎ উপন্যাসগুলো দ্রুত আমাদের একটা ঘোরের ভেতরে টেনে নেয়, সেই একই দ্রুততায় তাদের নায়কেরাও ধাবিত হয় নানা জটিল বিষয়ের আবর্তে। আমি দস্তেইভ্স্কি র ভবিষ্যদ্রষ্টাসুলভ কণ্ঠস্বরে যে আগ্রহ নিয়ে আস্থা রাখতুম, সেই আগ্রহ নিয়েই আস্থা রাখতুম তাঁর চরিত্রগুলোর উপরে, তাদের স্বীকারোক্তির নেশাগ্রস্ততাকে।

বইটি আমার চিত্তে কেন অতো ভীতির সঞ্চার করেছিল, তা নির্ণয় করা ছিল বেশ কঠিন। আত্মহত্যার দৃশ্যটিতে (মোমবাতি নিভে যাওয়া এবং অন্ধকারে পাশের ঘরের দৃশ্যমান অন্যান্য নানা ঘটনার সমাবেশে) এবং আতঙ্কসঞ্জাত বন্যতলবী হত্যাকাণ্ডের হিংস্রতায় বিশেষভাবে বিচলিত হয়েছিলুম আমি। যে গতিতে উপন্যাসের নায়কেরা তাদের গভীর ভাবনা ও ক্ষুদ্র আঞ্চলিক জীবনযাত্রার মধ্যে চলাচল করছিল এবং যে সাহসিকতা দস্তেইভ্স্কি তাদের মধ্যে লক্ষ্য না করে নিজের মধ্যেই লক্ষ্য করছিলেন, সে ব্যাপারটিই সম্ভবত আমাকে নাড়া দিয়েছিল। এ উপন্যাসটি যখন আমরা পাঠ করি মনে হয় যেন, প্রাত্যহিক জীবনের ক্ষুদ্রাতিক্ষুদ্র ঘটনাগুলোও চরিত্রগুলির গভীর ভাবনার সঙ্গে বাঁধা পড়ে গিয়েছে এবং এ ধরনের সম্পর্ক দেখে আমরা বাতুলগ্রস্তদের সেই ভয় ধরানো

একজন হাস্যাস্পদ মানুষের স্বপ্ন

দস্তয়েভস্কি

আমি একজন হাস্যাস্পদ মানুষ। আজকাল লোক আমাকে পাগল বলে। যদি তা না হয়ে আমি ওদের চোখে আগের মতোই হাস্যাস্পদ হয়ে থাকতুম, তাহলে সেটা আমার পক্ষে এক ধরণের পদোন্নতি হিসেবে গণ্য হতো। কিন্তু ও নিয়ে আর আমার কোনও ক্ষোভ নেই। ওরা সকলেই এখন আমার প্রিয়। এমনকি যখন ওরা আমাকে নিয়ে হাসাহাসি করে, তখনও ওরা আমার বিশেষ আপন হয়ে ওঠে। আলাদা কোনও ব্যক্তি হিসেবে নয়, ওদের প্রতি আমার ভালোবাসার মধ্যে দিয়ে ওদের হাস্যোচ্ছলতায় আমিও যোগদান করতে পারি, যদি না ওদের দিকে তাকিয়ে খুব বিমর্ষ বোধ করি। হ্যাঁ, বিমর্ষ। কেননা, সত্য কী, সেটা ওরা জানে না। অথচ আমি তা জানি। হায়, একমাত্র সেই ব্যক্তিটি হয়ে ওঠা কী নির্মম, সত্য কী, তা যে জানে। কিন্তু ওরা সেটা বুঝতে পারবে না। না, না ওরা সেটা বুঝতে পারবে না।

আমাকে হাস্যাস্পদ লাগত বলে আগে আমি খুব ভয়ে ভয়ে থাকতুম। আমাকে যে শুধু ওরকম লাগত তাই না; আসলে ওরকমই তো ছিলুম। সব সময়ই আমি হাস্যাস্পদ ছিলুম আর আমি তা জানতুম, সম্ভবত জন্মাবধিই জানতুম। মোটামুটি সাত বছর বয়স থেকেই জানতুম যে, আমি হাস্যাস্পদ। তারপর স্কুলে ভর্তি হলুম, বিশ্ববিদ্যালয়ে পড়াশুনো করলুম, আর আপনারা জানেন, যত বেশি পড়াশুনো করলুম, ততো বেশি করে বুঝতে পারলুম যে, আমি হাস্যাস্পদ। শেষ পর্যন্ত এমন হলো যে, বিশ্ববিদ্যালয়ে যতটুকু জ্ঞান আহরণ করলুম, যত বেশি তার গভীরে প্রবেশ করলুম, ততই বিশ্ববিদ্যালয়ের সেই আহৃত জ্ঞানের অঙ্গ হয়ে উঠল এটা প্রমাণিত করা যে, আমি হাস্যাস্পদ। জ্ঞানের দিক থেকে যা অর্জন করলুম জীবনের ক্ষেত্রেও তাই ঘটলো। ফলে পরবর্তী বছরগুলিতে ওই চেতনাটিই আমার মধ্যে পরিপুষ্ট হলো এবং আমার ভিতরে এই ধারণাটিকে প্রবল করে তুলল যে, সব দিক থেকেই আমার চেহারাটি হাস্য উদ্রেককারী। সবাই আমাকে উপহাস করত এবং তা করত সব সময়। কিন্তু ওদের একজনও জানত না বা ভাবতেও পারত না যে, পৃথিবীতে অন্য সকলের বাইরে আর একজনও যদি কেউ জানত যে, আমি হাস্যাস্পদ, সেই মানুষটি আমি নিজেই। কিন্তু আমার প্রবলতম ক্ষোভ এটাই যে, সেটা ওরা জানত না। তবে এর জন্যে আমি নিজেও দায়ী ছিলুম। কারণ, আমি এত দাম্ভিক ছিলুম যে, কোনও কারণেই কখনও কারও কাছে সেটা (আমার নিজেকে জানার ব্যাপারটা) স্বীকার করিনি। এই দম্ভ অনেক বছর ধরে আমার ভিতরে গড়ে উঠেছিল। আর যদি তেমনটা ঘটত অর্থাৎ আদৌ যদি

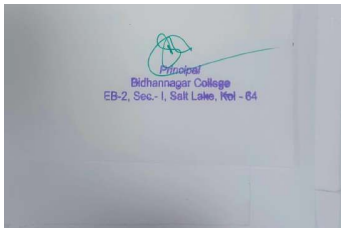
ELSEVIER
Journal of the Indian Chemical Society
Volume 99, Issue 4, April 2022, 100401

Synthesis and structure of vanadium (IV) single-stranded dihelicate involving multi-ring nitrogen-heterocyclic ligand

Tirtha Pada Majhi [a], Simon J. Teat [b], Nabanita Kundu [c]

[a] Department of Chemistry, Bidhannagar College, EB-2, Sector-I, Salt Lake, Kolkata, 700064, India
[b] Advanced Light Source, Lawrence Berkeley National Laboratory, 1 Cyclotron Road, Mail Stop 2-400, Berkeley, CA, 94720, United States
[c] Department of Chemistry, Lady Brabourne College, P-1/2, Suhrawardy Avenue, Kolkata, 700017, India

Received 26 December 2021, Revised 10 February 2022, Accepted 25 February 2022, Available online 4 March 2022, Version of Record 7 March 2022.



ChemistrySelect

Research Article
doi.org/10.1002/slct.202200729

Chemistry Europe
European Chemical Societies Publishing

www.chemistryselect.org

Biological Chemistry & Chemical Biology

A New Benzimidazolium Ion-Based "Turn Off" Fluorescent Compound for Detection of Fe^{3+} Ion and Its Application towards Antimicrobial, Antibiofilm and Cell Imaging Study

Susanta Kumar Manna,*[a] Sudipta Chakraborty,[b] Arup Kumar Adak,[a] and Shubhankar Samanta[a]

A novel water soluble fluorescent compound methylated polycyclic benzimidazolium ion **4** based on benzimidazolium ion (85% yield) for the response of Fe^{3+} has been demonstrated for the first time due to its excellent photophysical properties. The molecule is highly sensitive and selective towards Fe^{3+}. A dramatic fluorescence switch on-off-on has been observed during interchange from Fe^{3+} to EDTAand the detection limit is 15.8 nM (3σ method) for Fe^{3+} ions. The compound **4** exhibits excellent antimicrobial and anti-biofilm activities against *E.cloacae and S.aureus.* Cell imaging and mammalian cell cytotoxicity were also investigated. The synthesized molecule exhibits selective activity toward gram-positive bacteria than gram-negative ones among six different bacterial species.

Introduction

Iron is the second most abundant metal, after Aluminium in the earth's crust. It is the most important transition element for the living systems. It plays an important role in enzyme catalysis, cellular metabolism, and as an oxygen carrier in hemoglobin and a cofactor in many enzymatic reactions.[1] However, both the deficiency and overload of iron in a human body induces the occurrence of many diseases such as anemia, liver and kidney damages, diabetes and heart diseases.[2] Several analytical methods including atomic absorption spectroscopy, electrochemical method, inductively coupled plasma mass spectrometry, inductively coupled plasma atomic emission spectrometry, have been developed for detection of several metal ions in water including Fe^{3+}.[3] However, those methods are usually high priced, time consuming, or need complicated sample preparation process.[4] Thus, seeking a simple and low-cost method is very important for the identification and monitoring of Fe^{3+} ions from the biological, environmental, and industrial samples.Recently, fluorescent chemosensors have been considered as one kind of promising materials for metal ions sensing through the change of fluorescence.[5] Additionally, different types of small-molecule fluorescence sensors have been commonly used to detect Fe^{3+} ions because of changing their fluorescence signal in response to chemical reactions or variations in their adjacent environment.[6] These sensors are designed by covalently joining binding sites with many kinds of signaling units such as BODIPY, fluorescein, rhodamine, coumarin, benzimidazole, etc.[7] Among all these, the benzimidazole, being one of the ideal structure for detecting analytes/metal ions due to its brilliant photophysical properties, remarkable long-wavelength emission, high molar extinction coefficient, and fluorescence quantum yields.

The benzimidazole nucleus and its derivatives are ubiquitous in nature and important due to their physiochemical properties[8] and biological activities especially analgesic,[9] antitumor,[10] cytotoxic activities.[11] Benzimidazole units and N-alkylated Benzimidazole/ N-alkylated Benzimidazolium ions are the core structure of a range of clinical medicines/natural product[12,13] albendazole,[12a] AKT inhibitor-iv,[14] Telmisartan[15] (Micardis),Nk109,[16] Nitidine[16] Berberine[17] (Figure 1)

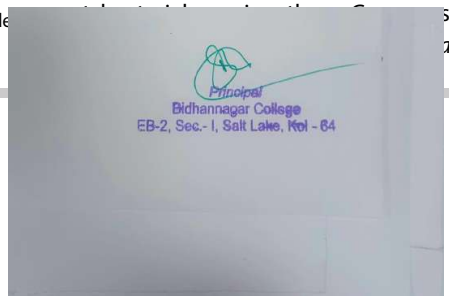
Previously we have reported an easy synthesis of polycyclic benzimidazole[18] which shows interesting photophysical properties. We have also reported the synthesis of an ionic compound pyridopyrimidinium ion[19] and we find its interesting photophysical and biological properties. Therefore, we are inspired and wish to prepare the ionic derivatives of the N-heterocycle i.e, polycyclic benzimidazole. Herein we report the methylation of a pentacyclic benzimidazole and transform it into an ionic one which is more polar and water-soluble. Furthermore, these compounds are highly fluorescent. In addition to this interesting fluorescent switch on-off-on- study an extensive antimicrobial study has been demonstrated.

In addition to this in the biological point of view scientists are searching for a molecule which will show anti-microbial and anti-biofilm activity. This molecule is highly effective to fulfilling the above mentioned both properties.

In the present work, we have determined the antibacterial activity of a novel benzimidazole compound against six different [illegible] positive: *Enterococcus faeca-* [illegible] *aphylococcus aureus* and

[a] *Dr. S. K. Manna, Dr. A. K. Adak, Dr. S. Samanta*
Department of Chemistry, Bidhannagar College,
Kolkata- 700064, India
E-mail: smanna19@gmail.com
[b] *S. Chakraborty*
Department of Microbiology, Bidhannagar College,
Kolkata- 700064, India

Supporting information for this article is available on the WWW unde
https://doi.org/10.1002/slct.202200729



Asian Journal of Chemistry; Vol. 34, No. 7 (2022), 1633-1638

ASIAN JOURNAL OF CHEMISTRY

https://doi.org/10.14233/ajchem.2022.23735

MINI-REVIEW

Study of Protein Structures under the Influence of Imidazolium Based Ionic Liquids

PRITHA MANDAL[1] and ANISUR R. MOLLA[2,*]

[1]Department of Chemistry, Krishnagar Government College, Krishnagar-741101, India
[2]Department of Chemistry, Bidhannagar College, Salt Lake, Kolkata-700064, India

*Corresponding author: E-mail: anisur.chem@gmail.com

Received: 20 January 2022; *Accepted*: 9 April 2022; *Published online*: 15 June 2022; AJC-20833

Ionic liquids are nowadays extremely popular in the advanced research field of many disciplines including chemistry, chemical engineering, material science, biology and pharmaceuticals. Unique physico-chemical properties of the ionic liquids such as low vapor pressure, stability, large liquid range, broad solubility and easy modification of structures are responsible for its vast application. Imidazolium based ionic liquids are one of the most widely used ionic liquids and theses are extensively studied in the field of protein research. In this mini-review, imidazolium ionic liquid induced effect on the structure and function of protein molecules are discussed.

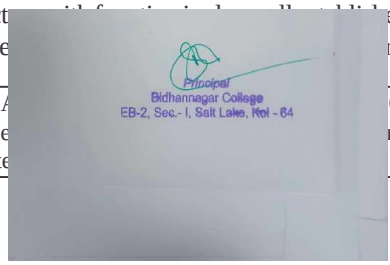
Keywords: Ionic liquid, Imidazolium, Protein structure, Disaggregation.

INTRODUCTION

Ionic liquid (IL) was first prepared over a century ago in the year 1914 by German chemist, Paul Walden [1]. But the ionic liquids (ILs) became widely popular among the scientific community only in the beginning of the current century and these have been extensively utilized in various hot research topic of chemistry as well as in multidisciplinary research areas including chemistry, chemical engineering, material science and biology [2-6]. Normally liquids consist of neutral molecules and various weak intermolecular attractive forces (*e.g.* hydrogen bonding, dipolar interaction, van der Waal's forces, *etc*.) operates among the molecules. On the other hand, ionic compounds have high melting point because of strong inter-ionic attraction and those are solid at room temperature. In contrast to those, there exists another type of chemicals which are ionic in nature, yet liquid at room temperature and these are called 'ionic liquids". By definition, ionic liquids are ionic compounds which melts at temperature below the boiling point of water (100 ºC) [3]. In other words, ionic liquids can be described as "low temperature molten salts". Fig. 1 represents some of the common cations and anions, which combine to form an ionic liquid. It is evident that in case of ionic liquids the cation is always an organic ion and the counterpart may be an organic or inorganic anions. Due to the large size mismatch between the bulky cation and the smaller anion, packing of lattice in these salts is not as great as in many inorganic salts and hence melting point of these salts are much lower [7]. In the growing context of "green chemistry", ionic liquids turned up as promising alternative to the traditional volatile organic solvents because of its unique physico-chemical properties such as negligible vapour pressure, non-flammability, high thermal stability, large liquid range, broad solubility, moisture and air compatibility [8]. In addition, these properties can be tuned as per requirement by modifying the constituent ions. Thus, ionic liquids emerged as a popular choice in the last decades based on its 'green' and 'designer' properties [2,4].

In chemistry, ionic liquids are vastly employed in various chemical reactions in the form of reagents, solvents or catalysts [6]. Apart from that, ionic liquids are also used in the field of analytical chemistry, electrochemistry, polymer chemistry and most importantly these are frequently reported for various biological applications [2]. Ionic liquids are extensively studied for its biocompatibility and its application in pharmaceutical chemistry, enzyme activity and protein stability [9-11].

Importance of proteins are well known and relationship of its struct[illegible]ed. Each protein has unique [illegible]ry structure and



Journal of the Indian Chemical Society 99 (2022) 100401

Contents lists available at ScienceDirect

Journal of the Indian Chemical Society

journal homepage: www.journals.elsevier.com/journal-of-the-indian-chemical-society

Synthesis and structure of vanadium (IV) single-stranded dihelicate involving multi-ring nitrogen-heterocyclic ligand

Tirtha Pada Majhi [a], Simon J. Teat [b], Nabanita Kundu [c,*]

[a] Department of Chemistry, Bidhannagar College, EB-2, Sector-I, Salt Lake, Kolkata, 700064, India
[b] Advanced Light Source, Lawrence Berkeley National Laboratory, 1 Cyclotron Road, Mail Stop 2-400, Berkeley, CA, 94720, United States
[c] Department of Chemistry, Lady Brabourne College, P-1/2, Suhrawardy Avenue, Kolkata, 700017, India

ARTICLE INFO

Keywords:
N-heterocyclic ligand
Dihelicate
Single stranded
X-ray diffraction
anion−π interactions
Non-classical H-Bonding

ABSTRACT

1 The single stranded-helicate Vanadium(IV) complex $[V_2O_2Cl_4(L)(H_2O)_2]$ (1) involving heterocyclic bis-bidentate ligand viz. 3,3′-dipyridine-2-yl-[1.1′]bi[imidazo[1,5-*a*]pyridineyl] (L) with biological relevance is prepared and characterized by X-ray diffraction analysis. The compound lacks molecular center of symmetry where coordination environments around V(1) and V(2) centres are distorted octahedral (V···V# separation of 5.827 Å). Structure of the compound in the solid state structure shows anion−π interactions, classical and C_{arene}-H—anion non-classical H-bonding interactions. These interactions play significant roles in shaping the extended structure of this molecule.

1. Introduction

The programmed self-assembly of discrete helicates has been the topic of extensive research over the last few decades [1–4] because of their aesthetic appeal as well as biomimetic relevance [1a-c,3]. The basic principles of self-organization and molecular recognition [2] can be understood by the basic mechanistic and energetic findings obtained from study of formation, properties and structure of the helicates. Such studies are important for the rational designing of complex architectures [1,3a,5]. Among various types of ligands that are particularly shown to be suitable for the formation of different types of helical compounds, polypyridine derivatives dominate [1b-c, 6–9]. Many transition metals with polypyridine ligands produce dihelicates. Dihelical chemistry is mostly dominated by double stranded compounds of the types M_2L_2 and triple stranded compounds of the types M_2L_3 where L is a bis-bidentate ligand [1b-c,10]. Relatively rare are single-stranded dihelical complexes involving a single ligand coordinating two metal centres in a helical structure [11].

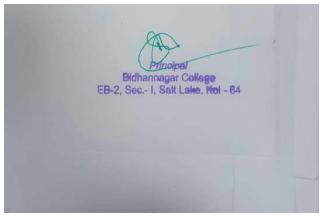
Furthermore, there are other potential features associated with the metal complexes of polypyridine type ligands. Being π-electron deficient, such heteroaromatics in favorable circumstances display moderate to strong interactions with various anions [12]. Such type of non-covalent interactions are specially relevant for the design of molecular receptors [12a,12c,12g,12m,13] and transporters [14] which would be of prime importance for environmental [12a,15], medicinal and biological applications [12a,12k,13a,13b,16] as well as in catalysis [17].

Recently supramolecular chemistry has unveiled that non-conventional H-bonds, such as (a) C–H … X (X = O, N, F, Cl) (b) X–H … π (X = N, O, C, Si & π = double, triple or aromatic) (c) X–H …..M (M as acceptors, M = Pt, Pd, Cu & X = N, O), M-H …..H (M as donors, M = Os, Ir), (d) M ….(H–C) (agostic interactions), (e) X–H …...H-M (X = C, N, O, S, dihydrogen bonding) often play crucial structural and biological roles [18]. Detailed theoretical studies and experimental evidences on such weak interactions may provide valuable informations for the development of effective systems capable of recognizing different molecules through non-covalent interactions.

We have synthesized [19,20] a π-electron-deficient *N*-heterocyclic ligand (L) having two biologically relevant [21] imidazo[1,5-a]pyridine parts. The ligand L can act as a bis-bidentate ligand, and its Cu(II) compound provides a unique example of valence tautomerism in solution [20]. Herein, we report the synthesis of a oxovanadium(IV) complex (**1**) with the *N*-heterocyclic electron deficient ligand (L). The compound has single stranded dihelical structure. X-ray diffraction analysis has been done to analyze the compound.

* Corresponding author.
E-mail address: nabanita.kundu@ladybrabourne.com (N. Kundu).

https://doi.org/10.1016/j.jics.2022.100401
Received 26 December 2021; Received in revised form 10 February 2022; Accepted 25 February 2022
Available online 4 March 2022



Issue 17, 2022

Previous Article | Next Article

From the journal:
New Journal of Chemistry

Transition metal-free advanced synthetic approaches for isoindolinones and their fused analogues

Check for updates

Shubhankar Samanta, *[a] Sk Asraf Ali, [a] Anirban Bera, [a] Soumen Giri [b] and Khokan Samanta [c]

Author affiliations

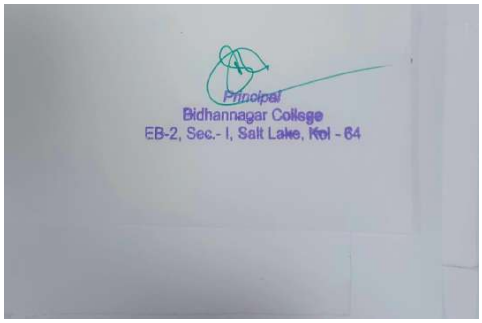
* Corresponding authors

[a] Department of Chemistry, Bidhannagar College, Kolkata 700064, India

E-mail: chemshubha@gmail.com

Fax: +91 33 2337 4782

Tel: +91 9775550193



NJC

ROYAL SOCIETY OF CHEMISTRY

PAPER

View Article Online
View Journal | View Issue

Cite this: *New J. Chem.*, 2022, **46**, 11685

Neat synthesis of isothiazole compounds, and studies on their synthetic applications and photophysical properties†

Anirban Bera, [ab] Prasanta Patra, [c] Abulkalam Azad, [a] Sk Asraf Ali, [a] Susanta Kumar Manna, [a] Amit Saha *[b] and Shubhankar Samanta *[a]

Received 21st April 2022,
Accepted 12th May 2022

DOI: 10.1039/d2nj01962k

rsc.li/njc

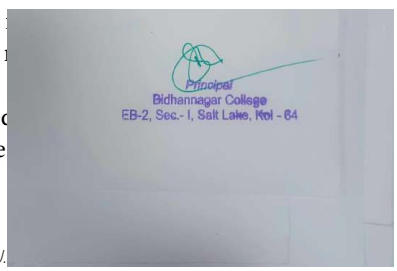
Ammonium thiocyanate-promoted simple, rapid and eco-friendly neat synthesis of isothiazoles is developed for the first time. It is noteworthy that an instantaneous valuable synthetic route of β-enaminones is also documented during the mechanistic investigation of isothiazole formation. A detailed mechanistic explanation of the isothiazole formation reaction is clearly explained by the control experiments. NBS-promoted aromatisation of isothiazole derivatives and photophysical properties of an isothiazole-pyrene hybrid molecule have been investigated.

Introduction

Nitrogen (*N*) and sulfur (*S*) are the main constituents of alkaloids and hence five membered heterocyclic compounds containing those heteroatoms, *i.e.* thiazoles, are very common in Nature.[1] Although their isomeric compounds,[2a] isothiazoles, are rarely found in Nature (*e.g.* brassilexin, sinalexin *etc.*), they are highly important due to their pharmacological interest in biological science (Fig. 1).[2] Substituted isothiazoles and their fused derivatives are well known in drug discovery due to their significant biological activities, such as analgesic, antipyretic, fungicidal, and herbicidal properties.[3] Monocyclic isothiazole skeletons, such as sulfasomizole and denotivir, display antibacterial and antiviral properties, respectively (Fig. 1).[4] Isothiazolonaphthoquinone, aulosirazole, isolated from blue-green algae exhibited tumor-selective cytotoxicity (Fig. 1).[5] Another quinone-embedded isothiazole pronqodine A, regulates prostaglandin release from human synovial sarcoma cells (Fig. 1). The antipsychotic drug zipracidone containing a *d*-fused isothiazole (brand name Geodon) is used to treat schizophrenia and bipolar disorder (Fig. 1).[6] Isothiazole scaffolds have emissive properties when they are attached with ribonucleoside purine mimics or a pyridine nucleus. Highly electron-rich polyfunctional isothiazoles have exceptional importance in the construction of metal complexes of different types, in particular, valuable organometallic frameworks and functional materials.[7]

The broad spectrum of pharmaceutical use and low natural abundance of the isothiozole moiety have inspired synthetic chemists to prepare such molecules decorated with valuable functionalities.[8] Modern preparative methods for the isothiazole compounds include *S*-nitrosation of *o*-mercaptoacylphenones followed by intramolecular aza-Wittig reaction,[9a] transition metal-free oxidative cyclization using amidines and elemental sulfur,[9b] and cyclization of aryl *tert*-butyl sulfoxides with an *ortho*-sulfinamidomethyl group in the presence of NBS/acid.[9c] Two independent groups reported the synthesis of 4,5-diaryl isothiazoles and *d*-fused isothiazole from β-halo vinyl aldehyde using ammonium thiocyanate in an acetone medium and NaSCN/urea in the presence of microwave irradiation, respectively.[10] However, these procedures suffer from drawbacks such as longer reaction times, tedious workups, harsh reaction conditions, lower yields, and use of special microwave techniques to synthesize the isothiazole molecules. Therefore, the development of more economic and environmentally benign procedures that can avoid or reduce the use of volatile organic solvents without imposing longer reaction times is not only attractive, but has also become essential to organic synthesis. Although many common heterocyclic compounds have been synthesized following the neat approach, but synthesis of isothiazoles under solvent-free conditions has not been reported to date.

In continuation of our reaction technology,[11] we solvent-free rapid synthetic nium thiocyanate-promoted from β-halo vinyl aldehyde



[a] *Department of Chemistry, Bidhannagar College, Kolkata, 700064, India. E-mail: chemshubha@gmail.com; Fax: +9133 2337 4782; Tel: +919775550193*
[b] *Department of Chemistry, Jadavpur University, Kolkata, 700032, India*
[c] *Jhargram Raj College, Jhargram, West Bengal, 721507, India*

† Electronic supplementary information (ESI) available. CCDC 2117809. For ESI and crystallographic data in CIF or other electronic format see DOI: https://doi.org/10.1039/d2nj01962k

ChemistrySelect

Research Article
doi.org/10.1002/slct.202201412

Chen Euro
European Societies

www.chemistryselect.o

Structural Exploration and Protein Binding Efficiencies of Binuclear Dioxidomolybdenum(VI) Complexes Constructed from ONO Chelator and Linear N- N Ditopic Spacer

Oiendrilla Sarkar,[a] Malini Roy,[a] Debanjana Biswal,[a] Nikhil Ranjan Pramanik,*[b] Suvendu Paul,[c] Michael G. B. Drew,[d] and Syamal Chakrabarti*[a]

This communication describes the syntheses, spectroscopic characterizations and crystal structures of two binuclear dioxidomolybdenum(VI) complexes **1** and **2** of general formula $[MoO_2L]_2$(N- N) with ONO donor ligands obtained by the condensation of benzoyl acetone with salicylhydrazide (H_2L^1) and anthranylhydrazide (H_2L^2) and spacer 1,2-bis(4-pyridyl)ethene (bpe). The crystal structures of these complexes have been solved by single crystal X-ray crystallography. Both the complexes **1** and **2** are centrosymmetric and each Mo centre exhibits a distorted octahedral geometry. The complexes give rise to 3D supramolecular architectures with the formation of cavities *via* hydrogen bonding and C- H···π stacking interactions. Extensive DFT calculations are carried out to compare the structural parameters of the complexes with the expe imental data and energy of frontier molecular orbitals are al calculated. The intermolecular interactions in the cryst structures are also studied by the Hirshfeld surface analysis. Th redox behaviour of complexes has been examined by cyc voltammetry. The binding affinity and binding mode of th complexes towards BSA has been explored by absorption an fluorescence titration method. Both the complexes exhib fluorescence resonance energy transfer from protein to th complexes. The molecular docking investigations are al carried out to get a deeper insight into the binding mech nism.

Introduction

Molybdenum is one of the versatile elements in the periodic table spanning oxidation states (II) to (VI) as well as its coordination number varying from 4 to 6. Molybdenum(VI) complexes using aroylhydrazone as tridentate ONO donor ligands have been extensively studied due to the presence of similar molybdenum environments in metalloenzymes.[1–7] Molybdenum in such complexes exhibit significant biological applications including antifungal,[8] antibacterial,[9] antitumor[10] and antiviral[11] activities. The complexes found their significa applications in catalytic activities in several oxidation reactio in both industrial and biological field.[12–14] The neutral N- bidentate linker molecules are often used due to their high affinity to transition metal ions and the complexes give ri interesting pillared layered supramolecular archirectures lea ing to the formation of cavities to entrap the guest molecul In this regard, *trans*-1,2-bis(4-pyridyl)ethene, being an excelle bridging ligand, has been widely used for the construction binuclear complexes.

Hydrogen bonding and other non-covalent interactio play an important role in constructing supramolecular archite tures of the binuclear molybdenum(VI) complexes[15] wi differing dimensional natures and intermolecular interactions. has received much attention in research field due to structural e ai in selective ilt drug deliv ons through e ewo and π···π are involving s ai keen inter ds a channels inte generally ved actions w porous materials.

Hirshfeld surface analysis is an im tant approach analyze the intermolecular interactions operating within th crystal structures. The fingerprint plots further provide th percentage of contribution of individual intermolecular inte

[a] O. Sarkar, M. Roy, Dr. D. Biswal, Prof. S. Chakrabarti
Department of Chemistry
University College of Science
92, Acharya Prafulla Chandra Road,
Kolkata:700009, West Bengal, IndiaTel: +91- 033–2350-8386
fax: +91-033-2351-9755
E-mail: schakrabarti2014@gmail.com
[b] Dr. N. Ranjan Pramanik
Department of Chemistry
Bidhannagar College
EB-2, Sector-1, Salt Lake, Kolkata: 700064, IndiaTel: +91- 033–2337-4389
fax: +91-033-2337-4782
E-mail: nr_pramanik@yahoo.co.in
[c] Dr. S. Paul
Department of Chemistry
BITS-Pilani Hyderabad Campus
Shameerpet, Hyderabad-
500078, Telangana, India
[d] Prof. M. G. B. Drew
Department of Chemistry
The University of Reading
Whiteknights, Reading RG66AD, UK

Asian Journal of Chemistry; Vol. 34, No. 11 (2022), 2965-2968

ASIAN JOURNAL OF CHEMISTRY

https://doi.org/10.14233/ajchem.2022.23988

Synthesis and Structure of Polymeric Copper(I) Compound with Single-Stranded Dihelicate Units involving Multiring Nitrogen-Heterocyclic Ligand

TIRTHA PADA MAJHI[1] and NABANITA KUNDU[2,*]

[1]Department of Chemistry, Bidhannagar College, EB-2, Sector-I, Salt Lake, Kolkata-700064, India
[2]Department of Chemistry, Lady Brabourne College, P-1/2, Suhrawardy Avenue, Kolkata-700017, India

*Corresponding author: E-mail: nabanita.kundu@ladybrabourne.com

Received: 4 July 2022; *Accepted*: 18 September 2022; *Published online*: 19 October 2022; AJC-21014

The polymeric copper(I) complex $[Cu_2(L)I_2]$ (**1**) containing a new biologically relevant heterocyclic bis-bidentate ligand *viz*. 3,3′-dipyridine-2-yl-[1.1′]bi[imidazo[1,5-*a*]pyridineyl] (L) was synthesized and characterized by single-crystal X-ray diffraction analysis. The molecule lacks molecular center of symmetry where coordination environments around both Cu(1) and Cu(2) are distorted tetrahedral (Cu···Cu[#] separation of 3.5 Å). Compound in its solid-state structure shows π-π non-covalent interactions as well as C_{arene}-H---anion non-classical hydrogen bonding interactions that play dominant roles in shaping the extended structure of the molecule.

Keywords: Polymeric complex, Dihelicate units, N-Heterocyclic ligand, Non-covalent interactions, Hydrogen bonding.

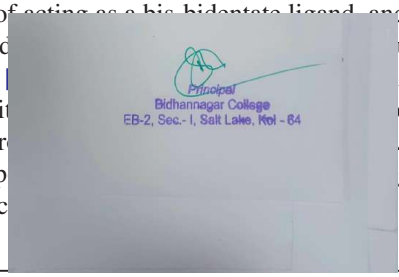
INTRODUCTION

The programmed self-assembly of discrete helicates has been the topic of extensive research over the last few decades [1-8] because of their biomimetic relevance and aesthetic appeal [1,2,7]. Also the basic mechanistic and energetic findings provided by the study of formation, structure and properties of helicates help to understand the fundamental principles of molecular recognition and self-organization [4-6], which are important for the rational design of more complex architectures [1-3,7,9]. Among the various classes of ligands that are shown to be suitable for the construction of various types of helicates, polypyridines are particularly numerous [2,10-13]. Many transition metals with such ligands produce dihelicates. For dihelicates, double and triple stranded complexes of the types M_2L_2 and M_2L_3, where L is a bis-bidentate ligand, are particularly common [1,14]. Much less common are single-stranded dihelicates where a single ligand coordinates to two non-bridged metal ions in a helical motif [15].

Non-covalent interactions involving π-systems have been extensively studied in recent years [16]. Such interactions play a crucial role in many frontline areas of contemporary science, from molecular biology to crystal engineering [17,18]. For example, face to face π-stacking interactions involving aryl rings of nucleobase pairs are important for the stability of DNA double helix [19,19].

Recently, supramolecular chemistry has unveiled that non-conventional H-bonds, such as (a) C-H...X (X = O, N, F, Cl, Br, I), (b) X-H...π (X=N, O, C, Si & π = double, triple or aromatic), (c) X-H.....M (M as acceptors, M=Pt, Pd, Cu & X=N, O), M-H.....H (M as donors, M = Os, Ir) often play crucial structural and biological roles [20]. The theoretical and experi-mental studies on such interactions may lead to the develop-ment of novel approaches for the design of effective systems capable of exhibiting noncovalent recognition properties at molecular level.

A π-electron-deficient *N*-heterocyclic compound, *viz*. 3,3′-dipyridin-2-yl[1,1′]bi[imidazo[1,5-*a*] pyridinyl] (L) containing a pair of biologically relevant [21] imidazo[1,5-*a*]pyridine moieties were recently synthesized [22,23]. Ligand L is redox-active and capable of acting as a bis-bidentate ligand, and its copper(II) compound[illegible] uto-merism in solution [illegible] eric Cu(I) compound wi[illegible] of a nitrogen-rich electr[illegible]) is reported. The comp[illegible] gle-crystal X-ray diffrac[illegible]



EurJOC
European Journal of Organic Chemistry

Research Article
doi.org/10.1002/ejoc.202201188

Chem Europ
European Societies

www.eurjoc.o

Organocatalytic Approach for the Synthesis and Biological Studies of Naphthalene Fluorescent Probe through Hydrogen Transfer Reaction

Madan Sau,[a] Sapana Dubey,[a] Jigyansa Sahoo,[b] Gokarneswar Sahoo,[b] Pragya Trivedi,[c] Avijit Jana,*[c] Subhankar Samanta,*[d] and Tapas Das*[a]

Herein we report an organocatalytic synthesis of highly fluorescent naphthalene derivatives through hydrogen atom transfer featuring neat and mild reaction conditions under air with high substrate tolerance along with atom economy by the unprecedented use of DBU, where oxidation and reducti occurred in one-pot. Synthesized compounds are utilized photophysical studies, cytotoxic studies and cell imagi studies of colon cancer cell line CT26.

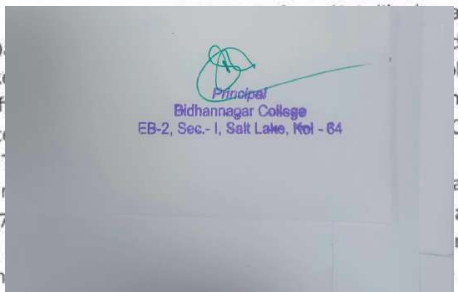
Introduction

Hydrogen transfer reaction is one of the most benign approaches for reducing ketones or imines and oxidizing alcohols or amines. The actual mechanism of hydrogen transfer reaction relies on the type of catalyst being involved, the nature of the substrates employed, and reaction conditions.[1,2] Widely used substrates in these reactions are carbonyl, imines, alkynes, and alkenes. Complexes of weaker Lewis acid transition metals such as Rh, Ru, Ir have a stronger tendency to form metal-hydride bonds and are widely used as catalysts in hydrogen transfer reactions by utilizing alcohol hydrogenation sources.[3] In all these methods external hydride donor is needed for the catalytic cycle.[4,7] J. F. Quinn and co-workers reported transfer hydrogenation reaction for the reduction of alkenes and de-protection of benzyl ethers using carboxybenzyl, 4-cyclohex-adiene as the hydrogen source in presence of Pd/C catalyst.[8] The use of extra reagents in the catalytic transformation which are hazardous to the environment including the presence of toxic transition metals cause irreparable damage to o ecosystem. Consequently, researchers are trying to avoid the toxic conditions with the help of non-transition metal catalyz transfer hydrogenation. Recently A. K. Kabi et al. describ transition-metal-free redox-economical approach for transf hydrogenation cascade reaction between nitroarenes a amines or alcohols using KO^{t}Bu and Et_3SiH as reagents.[9] He also Et_3SiH is used as an external hydride source for t reaction. In this monograph, we want to describe transitio metal free eco-friendly redox approach for transfer hydr genation with no external hydride source. The organo-catalyt transition metal-free approach has been enormously used f various organic transformations in the past two decades asymmetric synthesis.[10,12] DBU has been used as an organ catalyst for the consumption and chemical transformation toxic CO_2.[13] Hydrogen transfer using DBU is rare in literature far of our knowledge is concerned (Scheme 1).

We have developed an efficient organo-catalytic solve free approach for the synthesis of naphthalene fluoresce probe via Hydrogen transfer in an atom economic fashion. Tl synthesized compounds have good fluorescent properties a have been used for imaging of colon cancer cell line CT26 wi conjoint studies into the cytotoxic activities.

Results and Discussion

During apth len-1-yl) d DE was tak lver and dif nat presenc O a TMG in able the r as tl entries 7 ns tl base in 6 a reaction 13). On the other hand, DBU, in presence of W- or DM afforded the desired product successfully at room temperatu



[a] M. Sau, S. Dubey, Dr. T. Das
Department of Chemistry,
National Institute of Technology Jamshedpur,
Jamshedpur, 831014 India
E-mail: tapas.chem@nitjsr.ac.in
[b] J. Sahoo, Dr. G. Sahoo
Organocatalysis and Synthesis Laboratory,
Department of Chemistry,
National Institute of Technology Rourkela,
Orissa, 769008 India
E-mail: „sahoog@nitrkl.ac.in
[c] P. Trivedi, Dr. A. Jana
Department of Organic Synthesis & Process Chemistry,
CSIR-Indian Institute of Chemical Technology,
Hyderabad, 500007, India
E-mail: janaavijit2@gmail.com
[d] Dr. S. Samanta
Department of Chemistry,
Bidhannagar college,
West Bengal State University,
Kolkata, India
E-mail: chemshubha@gmail.com

Supporting information for this article is available on the WWW under https://doi.org/10.1002/ejoc.202201188

Physica Scripta

PAPER

Information theoretic approach to effects of spin–orbit coupling in quasi-one-dimensional Bose–Einstein condensates

Golam Ali Sekh[5,1], Benoy Talukdar[2], Supriya Chatterjee[3] and Basir Ahamed Khan[4]

Published 20 October 2022 • © 2022 IOP Publishing Ltd

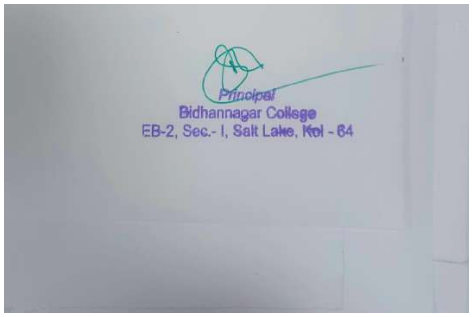
Physica Scripta, Volume 97, Number 11

Citation Golam Ali Sekh *et al* 2022 *Phys. Scr.* **97** 115404

DOI 10.1088/1402-4896/ac9933

References ▾ Open science ▾

▲ Hide article and author information



J. Indian Anthrop. Soc. 58 (1): 3-45(2023)

Journal of the Indian Anthropological Society(ISSN 0019-4387)

Quaternary Sediments and Prehistoric Cultural Remains of Dulung River Valley, Eastern India: A Report

SHUBHRAKANTI BAUL[1] AND KRISHNENDU POLLEY[2]

[1]Department of Anthropology, West Bengal State University, Barasat, Kolkata 700126, West Bengal, India

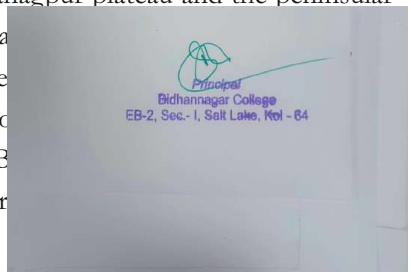
[2]Department of Anthropology, Bidhannagar College, Kolkata 700064, West Bengal, India.

Abstract: The present article is an outcome of three years of exploration in the Dulung river valley of Eastern India. It is comprised of detailed reporting of 28 newly discovered prehistoric sites in this region. In the course of exploration, discovered archaeological and geological sites were mapped and their relative locations were recorded and analysed by using various GIS tools. In each site, the context of the exposed archaeological materials was recorded along with natural and artificially exposed Quaternary sedimentary sections in and around them. In this article, discovered prehistoric sites have been described along with their cultural materials, relative locations, geomorphological contexts and litho-stratigraphic features. Preliminary analyses of the recovered artifacts were done in the laboratory and some of their results have been presented in this article also. Field observation of the present study reveals that Lower Palaeolithic artifacts were mainly found from the ferricrete deposits and Microlithic artifacts were found from calcrete bearing silt deposits of the study area. This study establishes the Dulung river valley as one of the several important geographical and environmental places of eastern India where prehistoric man's activity took place atleast since the early-middle Pleistocene.

Key Words: Quaternary Sediments; Lithostratigraphy; Lower Palaeolithic; Microlithic; Dulung River Valley; Eastern India.

INTRODUCTION

The eastern part of India geomorphologically includes part of the coast of the Bay of Bengal, basins of eastward flowing rivers, extensions of the Chotanagpur plateau and the peninsular shield. This region is very rich in Stone Age sites, the cultura
Palaeolithic to Neolithic times. This is the region that evince
Age site in the country (Bose and Sen, 1948) and where one c
country lies (Basak *et al.*, 2014; Basak and Srivastava, 2017; B
extension of the Chotanagpur plateau is dissected by many r



Article

"Understanding Context rather than Component": An Assessment of Mayurbhanj Palaeoliths from a Geo-Archaeological Perspective

The Oriental Anthropologist
23(1) 12–36, 2023

DOI: 10.1177/0972558X231154154
journals.sagepub.com/home/oan
Sage

Krishnendu Polley[1], Kartick Chakraborty[1] and Shubhrakanti Baul[2]

Abstract

The first Lower Palaeolithic (Acheulean) sites ever excavated in India are located in the Burhabalang river valley of the Mayurbahnj district of Orissa. It reveals that the Mayurbhanj Acheulean site complex has been under the scanner of prehistoric archaeologists for a long period. However, it is unfortunate to say that, despite being studied for nearly one century by several scholars, the implementiferous beds of the Burhabalang River valley have not been studied in detail till now. The present article brings forward an attempt to fathom the nature and the mode of origin of the Acheulean artifact-bearing beds of the Burhabalang river valley near Baripada town of Orissa. In this study approach of geo-archaeology is adopted to study and compare physical features like various geomorphological and lithological attributes of several Acheulean sites of this region. Besides, an attempt is made to understand the nature of occurrence of Acheulean artifact bearing-beds of this region and the mo these implementiferous beds too. Results of this study revea Acheulean artifacts bearing ferricrete horizons of the Burhabal were deposited some time during the middle Pleistocene, und of a much more humid monsoonal climate. Perhaps prehistor Acheulean artifacts roamed in the river valleys of this region when deposition of ferruginous sedimentation or ferricrete was taking place. During the later time under the influence of a much drier climate ferruginous duricrust developed at

[1]Department of Anthropology, Bidhannagar College, Salt Lake City, Kolkata, West Bengal, India

[2]West Bengal State University, Kolkata, West Bengal, India

Corresponding author:
Krishnendu Polley, Department of Anthropology, Bidhannagar College, EB-2, SEC-1, Salt Lake City, Kolkata, West Bengal 700064, India.
E-mail: krishnendu.polley@gmail.com

ফরাসি সাহিত্যের ইতিহাস

উদয়শংকর বর্মা

আঠারো শতক

আলোকপ্রাপ্তির যুগ

পটভূমি

ইতিহাসের প্রেক্ষিত

সতেরো শতকের দ্বিতীয়ার্ধের ফরাসি সাহিত্যে রাজা, রাজপুরুষ ও রাজসভার ব্যাপক প্রভাব ছিল। ওই সাহিত্য একদিকে ছিল ধর্মকেন্দ্রিক অন্য দিকে ধ্রুপদী ঘরানার। আঠেরো শতকের ফরাসি সাহিত্য ওই তিনটি প্রভাব থেকেই প্রায় বেরিয়ে এসেছিল। তবে নতুন ধারার এই সাহিত্য মহৎ শিল্পবোধের চেয়ে সমকালীন উগ্র মতবাদকে বেশি প্রশ্রয় দিয়েছিল। সাহিত্যের বিষয় ও ভাবনাকে প্রভাবিত করেছিল নানা ধরনের রাজনৈতিক হিসেবনিকেশ, সমালোচনা, বিজ্ঞান ও সংশয়বাদী দার্শনিক চিন্তাধারাগুলি। বস্তুত ১৬৯৯ খ্রিস্টাব্দে রাসিনের মৃত্যুর পরই ফ্রান্সে নতুন সাহিত্য ও সমালোচনা-রীতির উদ্ভব হয়েছে। ঘনিয়ে এসেছে সতেরো শতকের সমাপ্তি। ১৭০৪ খ্রিস্টাব্দে আতোয়ান গালোঁ ফরাসি ভাষায় *সহস্র এক আরব্য রজনীর* প্রথম চার খণ্ডের অনুবাদ প্রকাশ করেছিলেন। সম্ভবত আতোয়ান ওয়াতোও এই সময়ই তাঁর বিখ্যাত চিত্রকর্মগুলি অঙ্কণ করেছিলেন।

লক্ষণীয় যে, আঠেরো শতকের গোড়ায় ১৭১৫ খ্রিস্টাব্দের দিকে চতুর্দশ লুই মারা যাওয়ার বেশ আগে থেকেই ফ্রান্সের রাষ্ট্রীয় ব্যবস্থায় ভাঙন দেখা দিয়েছিল। যুদ্ধ, দুর্ভিক্ষ, রাষ্ট্রীয় ঋণ, রাজস্বের অস্বাভাবিক বৃদ্ধি ইত্যাদি সবই সম্রাটের মাহাত্ম্যকে ক্ষুণ্ণ করেছিল। নঁতের অনুশাসনের পুনঃপ্রবর্তন প্রটেস্টানদের পুনরায় দেশ থেকে বিতারনের ব্যবস্থা করেছিল। যে *পোর্ট রয়্যাল* নৈতিক বিশ্বাসের একটা আশ্রয়স্থল হয়ে উঠেছিল, তার বিনষ্টি ঘটেছিল। ইউজেনিটাস বুল অর্থাৎ পোপের অনুশাসন চার্চের আধ্যাত্মিক উপাদানগুলোকে ছাঁটাই করে ফেলেছিল। ইতিমধ্যে ইউরোপে বিজ্ঞানের লক্ষণীয় অগ্রগতি ঘটে গেছে। ফলে, ধর্মীয় শূন্যতার স্থানটিকে বিজ্ঞান দখল করে নিয়েছিল। ১৭১৫ খ্রিস্টাব্দে চতুর্দশ লুই মারা যাওয়ার পর ফ্রান্সের শাসনতন্ত্র ভেঙে পড়তে শুরু করেছিল। বস্তুত ১৭১৫ খ্রিস্টাব্দ থেকে ১৭২৩ খ্রিস্টাব্দ পর্যন্ত অধ্যায়টি ছিল ছিল ফ্রান্সের কাছে একটা যুগসন্ধির কাল। কারণ ১৭১৫য় যখন পঞ্চদশ লুই (জন্ম ১৭১০ খ্রিস্টাব্দ) সম্রাটের পদে অভিষিক্ত হন, তখন তাঁর বয়স ছিল মাত্রই পাঁচ বছর। তাঁর তেরো বছর বয়স না হওয়া পর্যন্ত দেশ চালাতেন এবং মুশায়েরা

Environmental and Experimental Biology (2022) 20: 205–218
http://doi.org/10.22364/eeb.20.19

Original Paper

Insights into the core bacterial consortia of root endophytes in two cultivated varieties of rice in West Bengal

ISSN 2255-9582

Subhadipa Sengupta[1]*, Pankaj K. Singh[2], Sayak Ganguli[3]

[1]Bidhannagar College, Post Graduate Department of Botany, EB-2, Sector-1, Salt Lake, Kolkata 700064, India
[2]Hawkesbury Institute for the Environment, Western Sydney University, Penrith NSW-2753, Australia
[3]St. Xavier's College (Autonomous), Department of Biotechnology, Kolkata 700016, India

*Corresponding author, E-mail: bansubha@gmail.com

Abstract

Root endophytes are considered to be one of the potent environment-friendly substitutes for chemical fertilizers, as they possess an ability to induce crosstalk inside the hosts for growth promotion, nitrogen fixation, phosphate solubilization and iron sequestration. This study aimed to explore and evaluate the key root endophytic bacterial consortia of two widely cultivated varieties of rice (*Oryza sativa* L.), cv. 'Saraswati' (OS01) and cv. 'Kunti' (OS04). Detailed comparative metagenome data were generated for endophytes of OS01 and OS04 and the species richness was calculated. OS01 showed higher endophyte species richness than OS04, with alpha diversity values of 3.10 and 2.40, respectively. *Bacillus, Magnetospirillum, Methanocystis, Desulfomicrobium* and *Pantoea* were identified as common endophyte members for both cultivars. *Solibacillus, Paenibacillus, Candidatus*, and *Melospira* were unique members of OS01, and *Herbaspirillum, Pandoraea, Anabaenopsis* for OS04. Considerable occurrence of nitrogen fixing bacteria and methanogenic bacteria in the cultivars confirmed biological nitrogen fixation, which can contribute to plant development. Core homeotic pathways of amino acid biosynthesis and carbon metabolism were also reflected in endophytes from both cultivars, indicating a supportive environment for microorganisms. Sulfur metabolism pathways were likewise predicted to be active in the niche under study, which may be attributed as a response to arsenic stress. Furthermore, the most abundant genera identified may potentially serve as crucial consortium candidates for host plant development and contribute to better yield in a sustainable manner.

Key words: bacterial diversity, metagenome, microbial consortia, plant growth, rice root endophytes.
Abbreviations: OTUs, operational taxonomic units.

Introduction

Rice (*Oryza sativa* L.) is the most widely grown staple food for over half the world's population. Fifty percent of the Asian population depends on rice for their dietary calorie supply. Therefore, rice production is critical for global food security (Muthayya et al. 2014). West Bengal is the largest source of rice production across India. However, the production faces significant threat from a large number of pathogenic organisms, nematodes, fungi, insects and virus. It was projected that up to 40% of the annual rice production is lost due to the rice-specific infectious diseases (Oerke, Dehne 2004). Further, high temperature, drought, salinity, submergence, nutrient deficiencies etc. also adversely affect rice productivity (Wani, Sah 2014). The availability of chemical fertilizers also limits rice production on a global scale. To achieve the targeted requirement of 321 million tons of rice, it is predicted that 28.8 million tons of chemical fertilizers will be required globally per year (Mahdi et al. 2010). However, the global chemical fertilizer production capacity is 21.6 million tons per year. Thus, a shortage of 7.2 million tons of chemical fertilizers have to be met either by altering cropping cycles or by adopting alternative agricultural strategies. In addition, inappropriate fertilization patterns and excessive use of nitrogen fertilizers have resulted in substantial nitrogen loss through ammonia leaching (Cameron et al. 2013; Ma et al. 2019). Hence, in this scenario, use of biofertilizers seems to be more appropriate approach to not only to counter the need for the scarcity of chemical fertilizer but also to maintain soil health and fertility in a sustainable way.

Endophytes have been found in almost all plant tissues studied (Gaiero et al. 2013; Hardoim et al. 2015; Xia et al 2022). They perform a key function by accelerating mineral uptake by crops and en… …ous minerals (Sturz et al. 20… …tes also produce phytoho… …or antibacterial agents tha… …ant development, seed ger… …nd

Journal of Asia-Pacific Biodiversity 16 (2023) 174–183

Contents lists available at ScienceDirect

Journal of Asia-Pacific Biodiversity

journal homepage: http://www.elsevier.com/locate/japb

Original Article

The floral associates of fireflies (Coleoptera: Lampyridae: Luciolinae) as recorded in two eastern Indian states with reference to their display plants

Srinjana Ghosh [a,*], Santanu Saha [b], Susanta Kumar Chakraborty [c]

[a] Post Graduate Department of Zoology, Bethune College, 181, Bidhan Sarani, Kolkata 700006, West Bengal, India
[b] Post Graduate Department of Botany, Bidhannagar College, Salt Lake, Kolkata, 700064, West Bengal, India
[c] Department of Zoology, Vidyasagar University, Midnapore 721102, West Bengal, India

ARTICLE INFO

Article history:
Received 23 January 2023
Received in revised form
5 March 2023
Accepted 6 March 2023
Available online 12 April 2023

Keywords:
conservation
courtship display
display plants
Indian fireflies

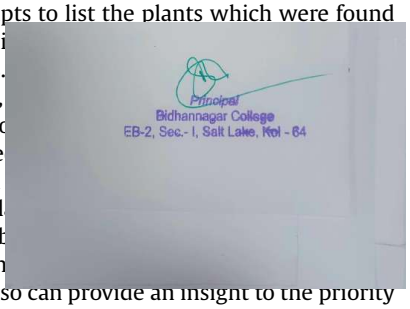
ABSTRACT

The association of fireflies to local plants was observed at twenty-eight randomly selected sites throughout eight different ecoregions in two eastern Indian states of Odisha and West Bengal, between March 2017 to February 2022. Seven firefly species, belonging to four genera, utilized fifty-six different plant species under twenty-five families. Maximum plant species preferred by them belonged to Fabaceae (11). Display plant based net sweeping counts from different plants varied significantly (at $p \leq 0.05$, $t = 7.6$); the same was noticed for the visual field count (at $p \leq 0.05$, $t = 9.61$). Counts from different height ranges varied significantly (at $p \leq 0.05$, $t = 4.1$). The number of families ($t = 5.22$, $p = 0.002$) and species ($t = 3.97$, $p = 0.007$) of associated plants visited by different firefly species also varied significantly. A combined sampling methodology involving both display plant-based net sweeping counts and visual field count had resulted in a significant difference ($t = 3.21$, $p = 0.01$, $df = 8$) between the male and female abundance on display plants. The upper leaf-surface was maximally utilized (54%) by the adult males for perching, while the undersurface (26%) was well utilized for their luminescent courtship displays. Information regarding associated and display plants will facilitate their conservation at the native habitat.

Introduction

Fireflies depend on different plants in various aspects throughout the stages of their lifecycle. For example, display plantss (DPs) offer a suitable platform for courtship flashing, parts of vegetation also offer sites for mating, oviposition, larval development, etc. Fireflies, those are known to be as plant sap eaters or nectarivores, often derive nutritional support from plants (Wahida et al. 2018). Some of the plants host the prey species (particularly the gastropod snails) of the carnivorous larvae of fireflies (Jusoh et al. 2010; Jaikla et al. 2020). Studies on firefly display trees conducted by various researchers over last several decades, particularly in Southeast Asia have shown that the association and interactions between plants and fireflies are generally species specific and distinctive in the cases of male and female individuals and even throughout their different life stages (Jusoh et al. 2010; Faust and Faust 2014; Jaikla et al. 2020). Among the different methodologies applied by researchers for monitoring the display plant utilization by fireflies, visual counting methods (visual field count (VFC)) (Jusoh et al. 2010; Evans et al. 2018) and the display plant based net sweeping (DPN) (Nada and Kirton 2004) are considered to be quite common and effective.

The present work attempts to list the plants which were found to be associated and utili
throughout the study sites.
dance (male: female ratios),
plants by local populations
of both the above-mentione
overall abundance as well
dividuals occupying the pl
2020). This research may b
regarding the trend of colon
any particular ecozone. It also can provide an insight to the priority fixation for the conservation of this faunal asset.



* Corresponding author. Tel.: +91 79 8057 9965; ORCID.: 0000-0003-4501-0037
E-mail address: srinjanaghosh15@gmail.com (S Ghosh)

Peer review under responsibility of National Science Museum of Korea (NSMK) and Korea National Arboretum (KNA).

https://doi.org/10.1016/j.japb.2023.03.008

Defence Life Science Journal, Vol. 8, No. 2, April 2023, pp. 170-182, DOI : 10.14429/dlsj.8.18431

Biofilm Formation in Acute and Chronic Infections with Special Emphasis on Common Chronic and Nosocomial Infections

Parama Das Gupta, Upal Das Ghosh and Rini Roy*

Department of Microbiology, Bidhannagar College, Kolkata- 700 064, India
**E-mail: for_rini_roy@yahoo.co.in*

ABSTRACT

Biofilm is defined as a community of microorganisms that are adhered to living or non-living solid surfaces and embedded in a common, self-made matrix, comprising of exopolysaccharide material. The role of biofilm in chronic diseases deserves special importance as these extracellular polymeric materials developed with quorum sensing support both the primary criteria of infection development namely adhesion and colonisation. Due to their structural and physiological changes, microorganisms present in the biofilm are difficult to treat or eradicate. The presence of a protective layer of extracellular polymers, changes in metabolic activity or a high rate of mutation make them tolerant or resistant to conventional treatment. The persistence of pathogenic microorganisms mostly renders biofilm to be associated with several acute and chronic infections and various nosocomial or healthcare-related infections. Furthermore, cancer development may also result due to biofilm formation. Biofilm may contribute to inflammation. This study deals with molecular aspects of biofilm formation and its role in different disease formations.

Keywords: Biofilm; Signal transduction; Diseases; Cancer; Inflammation

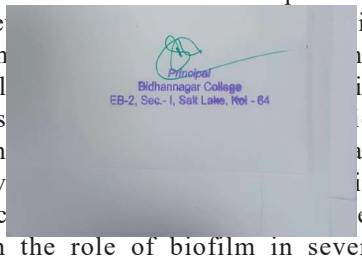
1. INTRODUCTION

About 40-80 % of bacteria in nature establish a stable and firm attachment for colonisation over a solid surface or tissues that leads to the formation of a microconsortia, scientifically termed as biofilm.[1] Biofilm is defined as a microbial community that is adhered to various living or non-living solid surfaces and embedded in a self-made matrix commonly made up of polysaccharides like alginate, proteins like fibrin and extracellular DNAs.[2] Though the first report of biofilm was published in 1683 by Antonie Von Leeuwenhoek, but it gets its importance in the medical field only after 1970 when Neils Hoiby first observed a relation between the etiological agent of persistent infection and bacterial biofilm in cystic fibrosis patients.[3]

It is well documented that the establishment of biofilms follows a few sequential steps which involve pellicle formation, initial adhesion, and attachment of bacteria, colonisation and maturation of bacteria. Biofilm confers numerous advantages to bacterial species including resistance to antibiotics, combat against host defences etc. During the transformation from the free-floating planktonic stage to the static biofilm stage, several physiological and molecular changes occur in the bacterial cell. The production of extracellular polymeric substances, expression of several genes that encode proteins make bacterial cells resistant to antimicrobials. The expression of several genes (like ndvB in Pseudomonasaeruginosa) that encode proteins make bacterial cells resistant to antimicrobials.[4]

The presence of persistent cells in a biofilm also makes them recalcitrant to antimicrobials and protects them from host defences.[5,6] This recalcitrant nature of biofilm makes them difficult to remove from infection sites and makes them responsible for the development of several chronic infections.[6] Cystic fibrosis, bacterial vaginosis, inflammatory bowel disease, chronic wound infections etc. are some chronic infections that are associated with the development of bacterial biofilm within the infected tissues.

The role of bacterial biofilm in the development of cancer is a relatively ne ies showed that intense m ed by multi-species biofil ive penetration and diseas on of immunologic respon ve been identified as piv ing and developing colorec ew specifically focuses on the role of biofilm in several common chronic diseases as well as in cancer development.



Received : 14 August 2022, Revised : 30 December 2022
Accepted : 17 January 2023, Online published : 07 June 2023

J Nutr Health Aging.2023;27(5):314-328
Published online April 28, 2023, https://doi.org/10.1007/s12603-023-1912-1

Review

Understanding the Impact of Obesity on Ageing in the Radiance of DNA Metabolism

S.G. Chowdhury[1], S. Misra[2], P. Karmakar[1]

1. Department of Life Science and Biotechnology, Jadavpur University, Kolkata, India; 2. PG Department of Microbiology, Bidhannagar College, EB-2 Sector-1, Saltlake, Kolkata, India

Corresponding Author: Parimal Karmakar, Department of Life Science and Biotechnology, Jadavpur University, Kolkata-700032, India. Email: pkarmakar_28@yahoo.co.in

Abstract

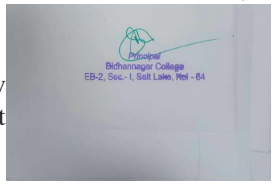
Ageing is a multi-factorial phenomenon which is considered as a major risk factor for the development of neurodegeneration, osteoporosis, cardiovascular disease, dementia, cancer, and other chronic diseases. Phenotypically, ageing is related with a combination of molecular, cellular, and physiological levels like genomic and epi-genomic alterations, loss of proteostasis, deregulation of cellular and subcellular function and mitochondrial dysfunction. Though, no single molecular mechanism accounts for the functional decline of different organ systems in older humans but accumulation of DNA damage or mutations is a dominant theory which contributes largely to the development of ageing and age-related diseases. However, mechanistic, and hierarchical order of these features of ageing has not been clarified yet. Scientific community now focus on the effect of obesity on accelerated ageing process. Obesity is a complex chronic disease that affects multiple organs and tissues. It can not only lead to various health conditions such as diabetes, cancer, and cardiovascular disease but also can decrease life expectancy which shows similar phenotype of ageing. Higher loads of DNA damage were also observed in the genome of obese people. Thus, inability of DNA damage repair may contribute to both ageing and obesity apart from cancer predisposition. The present review emphasizes on the involvement of molecular phenomenon of DNA metabolism in development of obesity and how it accelerates ageing in mammals.

Key words: Ageing, oxidative stress, obesity, DNA damage, DNA repair pathway.

Abbreviations: ADAM17: A disintegrin and metalloproteinase 17; ADRB2: Adrenergic beta 2 receptor; ALDH1A1: Aldehyde dehydrogenase 1 family member A1; ALOX5AP: Arachidonate 5-lipoxygenase activating protein; AMPK: AMP-activated protein kinase; BER: base excision repair; BIRC1: Baculoviral IAP repeat-containing protein 1; BLM: bloom syndrome; BMI: body mass index; BRCA1: Breast cancer type 1; CD36: Cluster of differentiation 36; CDK: cyclin-dependent kinase; COX2: Cyclooxygenase 2; CR: calorie restriction; CREB: cAMP responsive element-binding factor; CS: Cockayne syndrome; CVD: cardiovascular disease; DNA-PK: DNA-dependent protein kinase; DNA-PKcs: DNA-PK catalytic subunits; DSBs: double-strand breaks; ERCC: excision repair cross complementation group; FMI: Fat mass index; FOXO: Forkhead box protein O; HIF-1: hypoxia-inducible factor 1; HMGB1: high mobility group box 1; HR: Homologous recombination; H2AX: H2A histone family member X; JAK/STAT: Janus kinase/signal transducers and activators of transcription; LIAS: Lipoic acid synthetase; LPO: Lipid peroxidation; LRP1: Low density lipoprotein receptor-related protein 1; MCP-1: Monocyte chemoattractant protein-1; MDM2: Murine double minute 2; MEF: Mouse Embryonic Fibroblast; MLH: mutL homolog; MMR: mismatch repair; MSH: mutS homolog; NEIL: Nei endonuclease VIII-like; NER: nucleotide excision repair; NF-κB: nuclear factor kappa B; NHEJ: non-homologous end joining; NOX: NADPH oxidase; NRF2: Nuclear factor erythroid 2-related factor 2; OGG1: 8-oxoguanine glycosylase; OGT: O-linked N-acetylglucosamine transferase; PARP: Poly (ADP-ribose) polymerase; PI3K: phosphatidylinositol 3-kinase; POT1: protection of telomere 1; PPARBP: Peroxisome proliferator activated receptor binding protein; PTEN: phosphatase and tensin homolog deleted on chromosome 10; RAP1: repressor activator protein 1; ROS: reactive oxygen species; SASP: senescence-associated secretory phenotype; SIRT: Sirtuin; SSBs: single-strand breaks; TIN2: TRF1-interacting nuclear protein 2; TL: telomere length; TMD: Transmucosal muscular dystrophy; TPP1: protection of telomeres 1; TRF1: telomeric repeat binding factor 1; TRF2: telomeric repeat binding factor 2; T2DM: type 2 diabetes mellitus; USP48: Ubiquitin specific peptidase 48; VEGF: vascular endothelial growth factor; WAT: white adipose tissue; WRN: Werner syndrome RecQ like; XP: xeroderma pigmentosum; XRCC: X-ray repair cross-complementing protein; 8-oxoG: 8-oxoguanine; 53BP1: p53 binding protein 1.

Introduction

Ageing is a complicated biological phenomenon that results in a cumulative loss of physiological integrity. This process is characterized by various features at the physiological, molecular, and cellular level. It is caused by the accumulation of cellular damage and is triggered by various factors such as genomic and epi-genomic alterations, telomere attrition, cellular senescence, mitochondrial dysfunction, and loss of proteostasis, as well as various cellular dysfunction and chronic inflammation (1). These hallmarks are interrelated to the proposed health hallmarks, which include the maintenance of homeostasis and the ability to respond adequately to stress. Some of these hallmarks are also known to affect the regulation of various cellular functions. Although it is possible that ageing involves damage to various cellular components, it is believed that instability of the genome is one of the factors that contribute to the development of this process (2). The stability and integrity of the DNA are constantly challenged by various external factors such as chemical, biological, and physical agents (3). In
factors like hydrolytic reactions, ROS,
mistakes can also contribute to the dev
instability (4). Lack of proper maint



Received November 17, 2022
Accepted for publication March 22, 2023

Medical Oncology (2023) 40:119
https://doi.org/10.1007/s12032-023-01985-z

ORIGINAL PAPER

Phospho PTEN mediated dephosphorylation of mitotic kinase PLK1 and Aurora Kinase A prevents aneuploidy and preserves genomic stability

Ginia Ghosh[1] · Sandip Misra[2] · Rachayeeta Ray[1] · Sougata Ghosh Chowdhury[1] · Parimal Karmakar[1]

Received: 19 January 2023 / Accepted: 23 February 2023

Abstract

PTEN, dual phosphatase tumor suppressor protein, is found to be frequently mutated in various cancers. Post-translational modification of PTEN is important for its sub-cellular localization and catalytic functions. But how these modifications affect cytological damage and aneuploidy is not studied in detail. We focus on the role of phosphatase activity along with C-terminal phosphorylation of PTEN in perspective of cytological damage like micronucleus, nuclear bud, and nuclear bridge formation. Our data suggest that wild-type PTEN, but not phospho-mutant PTEN significantly reduces cytological damage in PTEN null PC3 cells. In case of phosphatase-dead PTEN, cytological damage markers are increased during 24 h recovery after DNA damage. When we use phosphorylation and phosphatase-dead dual mutant PTEN, the extent of different cytological DNA damage parameters are similar to phosphatase-dead PTEN. We also find that both of those activities are essential for maintaining chromosome numbers. PTEN null cells exhibit significantly aberrant γ-tubulin pole formation during metaphase. Interestingly, we observed that p-PTEN localized to spindle poles along with PLK1 and Aurora Kinase A. Further depletion of phosphorylation and phosphatase activity of PTEN increases the expression of p-Aurora Kinase A (T288) and p-PLK1 (T210), compared to cells expressing wild-type PTEN. Again, wild-type PTEN but not phosphorylation-dead mutant is able to physically interact with PLK1 and Aurora Kinase A. Thus, our study suggests that the phosphorylation-dependent interaction of PTEN with PLK1 and Aurora Kinase A causes dephosphorylation of those mitotic kinases and by lowering their hyperphosphorylation status, PTEN prevents aberrant chromosome segregation in metaphase.

Keywords Aneuploidy · Spindle pole · Micronucleus · PTEN · Aurora Kinase · Polo-like kinase

Introduction

PTEN (Phosphatase and Tensin homolog deleted on chromosome 10) is frequently mutated in a variety of malignancies, including prostate cancer, breast cancer, endometrial cancer, and glioblastoma [1–3]. It is a dual protein and lipid phosphatase, whose classical function is to negatively regulate the oncogenic PI3K/Akt pathway [4, 5]. PTEN has recently been identified as a DNA repair protein. Bestowing several studies PTEN null cells shows genomic instability and abnormal chromosomal characteristic like chromosomal breakage, telomere fusion, nucleoplasmic bridge formation, etc. [6]. Significant pool of PTEN localizes to the nucleus/chromatin and plays vital functions in the maintenance of genomic stability and chromatin architecture [6]. PTEN inhibits genomic instability by a variety of functions, including regulation of spindle assembly checkpoint (SAC) [7, 8], controlling cell cycle checkpoints [9], homologous recombination (HR) repair [10], and replication fork stability [11]. According to the findings, PTEN stabilizes the MAD2 protein, a component of the MCC complex, and protects it from ubiquitin-mediated degradation [12]. This results in the prevention of unregulated chromatin segregation and aneuploidy during the metaphase of cell division [13–15].

Number of reports sugg
tions of PTEN may be attr
modulations, including pho
tion, sumoylation [17], ac

✉ Parimal Karmakar
pkarmakar_28@yahoo.co.in

1 Department of Life Science and Biotechnology, Jadavpur University, Kolkata, West Bengal, India

2 Department of Microbiology, Bidhannagar College, Salt Lake, Kolkata, West Bengal, India

Published online: 17 March 2023

Mutation Research - Fundamental and Molecular Mechanisms of Mutagenesis 825 (2022) 111800

Contents lists available at ScienceDirect

Mutation Research - Fundamental and Molecular Mechanisms of Mutagenesis

journal homepage: www.elsevier.com/locate/mut

Both phosphorylation and phosphatase activity of PTEN are required to prevent replication fork progression during stress by inducing heterochromatin

Sandip Misra [b], Sougata Ghosh Chowdhury [a], Ginia Ghosh [a], Ananda Mukherjee [c], Parimal Karmakar [a,*]

[a] Department of Life Science and Biotechnology, Jadavpur University, Kolkata, India
[b] PG Department of Microbiology, Bidhannagar College, EB-2 Sector-1, Saltlake, Kolkata, India
[c] Rajiv Gandhi Centre for Biotechnology,Thiruvananthapuram 695 014, Kerala, India

ARTICLE INFO

Keywords:
PTEN
Phosphorylation
Phosphatase activity
Replication
Heterochromatin

ABSTRACT

PTEN is a tumor suppressor protein frequently altered in various cancers. PTEN-null cells have a characteristic of rapid proliferation with an unstable genome. Replication stress is one of the causes of the accumulation of genomic instability if not sensed by the cellular signaling. Though PTEN-null cells have shown to be impaired in replication progression and stalled fork recovery, the association between the catalytic function of PTEN regulated by posttranslational modulation and cellular response to replication stress has not been studied explicitly. To understand molecular mechanism, we find that PTEN-null cells display unrestrained replication fork progression with accumulation of damaged DNA after treatment with aphidicolin which can be rescued by ectopic expression of full-length PTEN, as evident from DNA fiber assay. Moreover, the C-terminal phosphorylation (Ser 380, Thr 382/383) of PTEN is essential for its chromatin association and sensing replication stress that, in response, induce cell cycle arrest. Further, we observed that PTEN induces HP1α expression and H3K9me3 foci formation in a C-terminal phosphorylation-dependent manner. However, phosphatase dead PTEN cannot sense replication stress though it can be associated with chromatin. Together, our results suggest that DNA replication perturbation by aphidicolin enables chromatin association of PTEN through C-terminal phosphorylation, induces heterochromatin formation by stabilizing and up-regulating H3K9me3 foci and augments CHK1 activation. Thereby, PTEN prevents DNA replication fork elongation and simultaneously causes G1-S phase cell cycle arrest to limit cell proliferation in stress conditions. Thus PTEN act as stress sensing protein during replication arrest to maintain genomic stability.

1. Introduction

Understanding the function of PTEN associated with its various tumor suppressor activities has been gaining interest since the last decades. PTEN is mutated or inactivated in many tumor lineages, including glioblastoma, breast, prostate, hepatocellular carcinoma, melanoma, and endometrium carcinoma [1–8]. PTEN promotes its tumor suppressor activity by functioning not only in the cytoplasm by down regulating PI3K-Akt pathway but also in the nucleus by guiding and preserving genomic stability [9]. It emerges as guardian of the genome by controlling multiple cellular obligatory pathways including cell cycle regulation at both G1 and G2 checkpoint [10,14–16], maintenance of heterochromatin structure through stabilizing HP1α and histone H1 [12,13], HR repair [10,11], proper chromosome segregation [17,18] and DNA replication progression [19–21]. It has been found that PTEN null cells are well adapted to overcome intra-S-phase checkpoint and exhibit premature S-phase exit compared to wild-type cells [19]. Aberrant DNA replication and early S-phase exit render genomic instability in daughter cells and are considered to be potential reasons for promoting malignancy.

Cancer cells acquire aggressive proliferative potential by deregulation of replication origin activation resulting over replicated, fragile, or un-replicated DNA accumulation leading to genomic instability [22]. Any form of DNA damage in the S-phase causes replication stress and has

* Corresponding author.
E-mail address: pkarmakar_28@yahoo.co.in (P. Karmakar).

https://doi.org/10.1016/j.mrfmmm.2022.111800
Received 15 March 2022; Received in revised form 26 August 2022; Accepted 9 September 2022
Available online 19 September 2022

DOI: 10.21917/ijme.2023.0255

INTRINSIC RESTRAINING FACTORS IN PRECISE EXTRATERRESTRIAL RADIO SIGNAL RECEPTION

Soumyabrata Mondal
Department of Physics, Bidhannagar College, India

Abstract

In electromagnetic signal reception Gabor uncertainty is one of the fundamental concepts. A finite limitation has been noticed while we are receiving Jovian busts and analyzing it at our observatory set at Bidhannagar College. Due to time-frequency restriction there is more than 0.1 μs uncertainty in recording Jovian signal through Radio Jove Project or by spectrum analyzer. It also noted precise observation is largely limited by time synchronization through client computer and instrumental selection circuit choice. It challenges this backlash is hidden into modern days signal reception procedure.

Keywords:

Uncertainty, Radio Signal, Jovian Burst, Spectrum Analyzer

1. INTRODUCTION

We have crossed a long way in science and technology field throughout our civilised era. Despite our tremendous progress, we are still behind in time, namely for reception of galactic and extragalactic radio signals [1]-[2].

After the discovery of radio bursts from Jupiter, careful analysis of extraterrestrial signal to understand the cause behind. Most of the observed radio waves from Jupiter are polarized. Information wrapped in Jovian signal consists of meteorological conditions of Jupiter and about the medium in space between Jupiter and Earth through which signal travels. Polarized radio waves implied that Jupiter had a very intense magnetic field and when charged particles move through that magnetic field their paths are distorted. The particles are accelerated and move in spirals around magnetic field lines towards either the north or the south pole. Accelerated charged particles emit radiation in radio frequency range depending up on their energy. and called cyclotron emission. In our endeavour to receive Jovian radio emissions we need to know about the source of the radio signal as well as actually when it was detected. The time correlation is very important to distinguish Jovian bursts from ordinary radio frequency interference [3].

2. CONSTRAINS IN PRECISE DETECTION

Two major points may be considered for precise detection of radio signals from extra-terrestrial sources. They may be categorised as: Instrumental limitation and Time-frequency uncertainty.

2.1 INSTRUMENTAL LIMITATION

Data quality is a major criterion in any signal processing module [4]-[5]. Accuracy over precision is carrying more importance in our observation. A typical personal computer uses a quartz crystal oscillator for timestamp which is sensitive to temperature and drifts with time. So, we need to synchronize it regularly. During this synchronization an estimation of time to communicate with reference and the time taken to process the request and response by reference plays a crucial role in updating computer clock. A few ms errors in assumptions accumulate to a second in result. We assume general PC quartz crystal has tolerance about 20 ppm when averaged over 1 day. At the end of a 24-hr time, the clock could diverge by ~ 1.8 second. To some extent a PC clock is seems to be responsible for its own accuracy. The Network Time Protocol (NTP) is widely used for synchronizing PC clocks by exchanging messages between a time server and client PC containing information about time offsets and delays. We may consider that time in local computer consists of real time and a symmetric offset δ. Computer sends a request to a time server with local time stamp ($T_{in}+\delta$). Server receives it at time T and responses it which get processed by client with time stamp ($T_f+\delta$). From observed relation

$$(T_{in} + \delta) < T < (T_f + \delta) \tag{1}$$

Client computer evaluates symmetric time offset.

$$\delta = T - (T_{in} + T_f)/2 \tag{2}$$

NTP can provide synchronization at the sub-tens of millisecond level. Sub-microsecond level precision can be achieved by using Precision Time Protocol (PTP), which is based on Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems standard [6].

3. TIME-FREQUENCY UNCERTAINTY

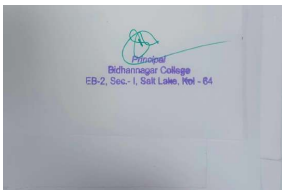
According to uncertainty principal energy of any function and its Fourier transform cannot be simultaneously localized [7]. Hence there is no suitable technique that can simultaneously localized a Jovian signal in both the time and frequency domain. When we analyse the signal received for a long window, we can have a good frequency resolution at the cost of temporal resolution. It causes a drop in accuracy. Let the signal and its Fourier transformation (FT) are respectively denoted by $s(t)$ and $s(\omega)$ in $L_2(\Re)$; where, $L_2(\Re)$ is Hilbert space of all integrable signals in real domain [8]. Here,

$$s(t) = \int_{-\infty}^{+\infty} s(\omega)^{j2\pi\omega t}\, d\omega \tag{3}$$

and from Plancherel's theorem

$$s(\omega) = \int_{-\infty}^{+\infty} s(t)^{-j2\pi\omega t}\, dt \tag{4}$$

In our problem, we assume Jovian signal as either continuous or pulse shaped for an adjustable length of time. Using the usual notations, we have,



SMMR
STATISTICAL METHODS IN MEDICAL RESEARCH

Original Research Article

Multi-arm covariate adjusted response adaptive designs for ordinal outcome clinical trials

Statistical Methods in Medical Research
1–12

DOI: 10.1177/09622802221133558
journals.sagepub.com/home/smm
SAGE

Soumyadeep Das[1], Rahul Bhattacharya[2] and Atanu Biswas[3]

Abstract

Covariate adjusted response adaptive designs are developed with ordinal categorical responses for phase III clinical trial involving multiple treatments. Stochastic ordering principle is used to order the treatments according to effectiveness and consequently allocation functions are developed by combining the cumulative odds ratios suitably. The performance of the proposed designs is investigated through relevant exact as well as large sample measures. To investigate the performance in a real situation, a real clinical trial involving lung cancer patients is further redesigned using the proposed allocation design.

Keywords

Covariate adjusted response adaptive design, ordinal categorical responses, cumulative odds ratio, proportional odds model.

1 Introduction

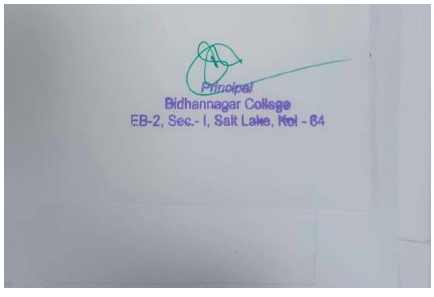
Clinical trials are carefully conducted research studies to find out the treatments that work best on subjects with a certain disease. Among the several phases of a clinical trial, phase III comprises of the large scale evaluation of treatments and hence is a crucial phase. In phase III of the clinical trial, the patients enter sequentially into the trial and assigned one of the available treatments. Complete randomization (CR) is the widely used allocation design in this regard for its simplicity and statistical performance (e.g. higher power). But from a critic's viewpoint, CR lacks individual ethics as it is blind to treatment performances and hence does not skew the allocation towards the better performing treatments. On the other hand, response adaptive randomization (RAR) uses the available allocation and response information of the patients to update the allocation probabilities so that treatments doing better are used more often.[1,2] Thus a RAR is more desirable as it compromises collective ethics (identifying a true difference in treatment effectiveness with high statistical power) with individual ethics (maximum number of patients are treated by the superior treatments eventually).

Depending on the nature of the trial, often the responses of the patients are measured in ordinal categorical scale. For example, the response of a rheumatoid arthritis[3] patient can be any of the following: nil, mild, moderate, and severe. As another example, the responses in cancer trial may be either of the ordinal categories: death, progressive disease to complete remission. Ordinal responses are also reported in trauma[4] and sports related knee injury[5] trials. Another example of ordinal outcomes is the WHO Clinical Progression Scale, which is a 11-point scale (0: not infected to 10: dead) and is advantageous for the use in an emerging infectious disease epidemic. In a very recent article on the final report of the Remdesivir trial with Covid-19 patients,[6] though the primary outcome is length of recovery time, but the patient response was measured in an ordinal eight point scale. Although these real trials used fixed allocation designs, but development and advantage of RAR in this context can be found in the works of Bandyopadhyay and Biswas,[7,8] Biswas et al.,[9] Biswas et al.,[10–12] and Das et al.,[13] among others.

Although these developments assumed homogeneity of patients, but in reality, they may differ with respect to covariates like age, sex and health conditions. So, adapting covariate information into the design phase of the trial is desirable to

[1]Department of Statistics, Bidhannagar Government College, Kolkata, India
[2]Department of Statistics, University of Calcutta, Kolkata, India
[3]Applied Statistics Unit, Indian Statistical Institute, Kolkata, India

Corresponding author:
Rahul Bhattacharya, Department of Statistics, University of Calcutta, Kolkata 700019, India.
Email: rahul_bhattya@yahoo.com



Journal of Coordination Chemistry >
Volume 76, 2023 - Issue 3-4

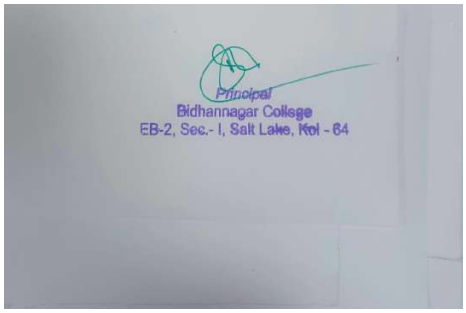
Articles

Protein binding studies and antioxidant activities of two mononuclear dioxomolybdenum(VI) complexes with 2-(3-methyl-5-phenyl pyrazol-1-yl) benzthiazole

Malini Roy, Oiendrilla Sarkar, **Nikhil Ranjan Pramanik**, Somanjana Khatua, Krishnendu Acharya & **Syamal Chakrabarti**

Pages 503-518 | Received 22 Oct 2022, Accepted 09 Feb 2023, Published online: 28 Feb 2023

Cite this article https://doi.org/10.1080/00958972.2023.2183359 Check for updates

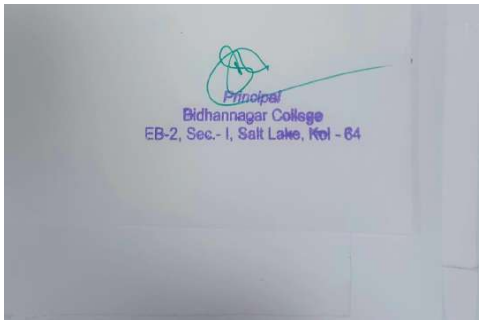


Synthesis of Multifused Pyrrolo[1,2-*a*]quinoline Systems by Tandem Aza-Michael–Aldol Reactions and Their Application to Molecular Sensing Studies

Anirban Bera, Sk Abulkalam Azad, Prasanta Patra, Nayim Sepay, Rathin Jana, Tapas Das, Amit Saha*, and Shubhankar Samanta*

Cite this: *J. Org. Chem.* 2023, 88, 9, 5622−5638
Publication Date: March 30, 2023
https://doi.org/10.1021/acs.joc.3c00109

The Journal of Organic Chemistry



New Journal of Chemistry

Recent developments in the solvent-free synthesis of heterocycles

Nilabrata Dey,†[a] Arabinda Mandal,†[a] Rathin Jana,[b] Anirban Bera,[a] Sk Abulkalam Azad,[a] Soumen Giri,*[c] Mohammed Ikbal*[d] and Shubhankar Samanta*[a]

Author affiliations

* Corresponding authors

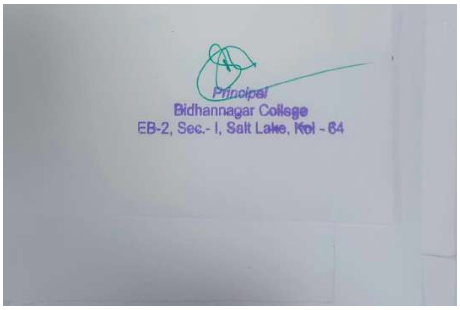
[a] Department of Chemistry, Bidhannagar College, Kolkata 700064, India

E-mail: chemshubha@gmail.com

Fax: +91 33 2337 4782

Tel: +91 9775550193

[b] Department of chemistry, Shahid Matangini Hazra Govt. General Degree College for Women, West Bengal, India



Issue 14, 2023

Previous Article | Next Article

From the journal:
New Journal of Chemistry

Recent synthetic journey on pyrrole-fused compounds

Check for updates

Chandana Pramanik,[ab] Paritosh Barik,[a] Sk Asraf Ali,[a] Dipti Sovamayee Nayak,[c] Mohammed Ikbal,[d] Arabinda Mandal,[a] Rathin Jana,[e] Soumen Giri *[c] and Shubhankar Samanta *[a]

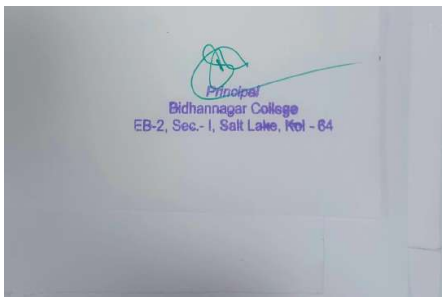
Author affiliations

* Corresponding authors

[a] Department of Chemistry, Bidhannagar College, Kolkata 700064, India

E-mail: chemshubha@gmail.com

Fax: +9 13 3233 74782



Asian Journal of Chemistry; Vol. 35, No. 4 (2023), 969-976

ASIAN JOURNAL OF CHEMISTRY

https://doi.org/10.14233/ajchem.2023.27587

Copper(II) Catalyzed Oxidation of Aliphatic Thiols (Thioglycolic Acid and 2-Mercaptoethanol) by Heteroleptic Co(III)-Bound Superoxo Complex

A. MANDAL

Department of Chemistry, Bidhannagar College, Kolkata-700064, India

Corresponding author: E-mail: arabindaju@rediffmail.com

Received: 27 January 2023; *Accepted*: 2 March 2023; *Published online*: 30 March 2023; AJC-21197

In aqueous acid media (0.02-0.06 M), two aliphatic thiols (RSH) *viz*. thioglycolic acid (TGA) and mercapto ethanol (MERCAP) were oxidized by heteroleptic metal bound superoxo complex, $[(dien)(en)Co^{III}(O_2)Co^{III}(en)(dien)]^{5+}$ (**1**) (en = ethylenediamine, $NH_2CH_2CH_2NH_2$ and dien = diethylenetriamime, $NH_2(CH_2)_2NH(CH_2)_2NH_2$) to the corresponding disulphides. Complex **1** is reduced to its corresponding peroxo complex, $[(dien)(en)Co^{III}(O_2)Co^{III}(en)(dien)]^{4+}$ (**2**) in these reactions. The oxidation of both thiols were dramatically catalyzed by the presence of Cu^{2+} ion. The observed rate constant k_o was found to be proportional to $[RSH]^2$ and $[Cu]_T^2$ (where $[Cu]_T$ is the analytical concentration of Cu^{2+}). The rate of reaction decreases with increasing ionic strength (I) of the reaction media and k_o is also proportional to $[H^+]^{2-}$. The experimental observation suggests that a 1:2 anionic complex formed between Cu^{2+} and RSH participates in the redox cycle.

Keywords: Thiols, Thioglycolic acid, Mercapto ethanol, Superoxide, Redox reaction, Kinetics.

INTRODUCTION

Thiols are ubiquitously distributed in aerobic life forms and have multifaceted functions, including a pivotal role in antioxidant activity [1-7]. Among them aliphatic thiols are susceptible to oxidation by many oxidizing agents and lead to disulphides, sulphoxide and so forth, depending on the thermodynamic strength of the oxidant [8-13]. Thioredoxins are small proteins that demonstrate a wide range of redox activities in plants and animals, all involving their two redox active sulfhydryl groups. In biological systems, thiols are oxidized by flavins, cytochromes and dehydroascorbic acid to control the cellular redox potential and prevent oxidative damage [14-16]. Often trace metal ions, particularly Cu^{2+} ion, catalyze such reactions [17,18]. Even ubiquitous Cu^{2+} ions present as impurities in the solution affect the redox kinetics of these thiol molecules [19].

The present work deals with the Cu(II)-catalyzed oxidation of two thiols, *viz*. thioglycolic acid (TGA, $HSCH_2COOH$) and 2-mercaptoethanol (MERCAP, $HSCH_2CH_2OH$) (a paradigm for aliphatic thiols), in aqueous acidic media with heteroleptic cobalt(III) bound superoxide complex, $[(en)(dien)Co^{III}(O_2)-Co^{III}(en)(dien)](ClO_4)_5$ (**1**, en = $NH_2CH_2CH_2NH_2$ and dien = $NH_2(CH_2)_2NH(CH_2)_2NH_2$). Even in presence of externally small amount of added Cu^{2+} ions (0.1-9.0 μM), the oxidation reactions for the thiols are overwhelmingly fast in comparison to the uncatalyzed path, details kinetics of which was reported earlier [20].

EXPERIMENTAL

Cobalt(II) nitrate, ethylenediamine, diethylenetriamine, 2-mercaptoethanol, thioglycolic acid, sodium perchlorate, and copper(II) acetate were procured from Sigma-Aldrich, USA and used without further purification. All the experimental solutions were prepared with freshly fetched Milli Q-water. Deuterium o) were also used w er was standardized

Prepara eroxo-[*bis*(ethylen lt(III)] perchlorate, [(**1**) was synthesized erature procedure [2 V-VIS absorption b alue of molar extinction coefficient, ε at 708 nm (ε in mol^{-1} dm^3 cm^{-1}; found 1171; reported 1210 [22]) suggests a more than 96%

ELSEVIER

Journal of Organometallic Chemistry

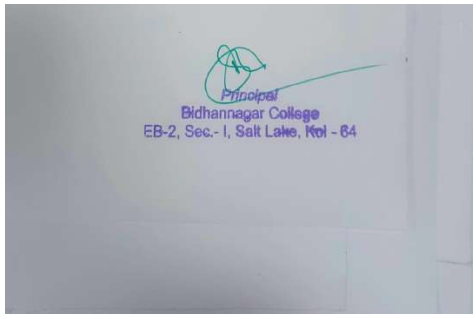
Volume 983, 1 January 2023, 122556

In silico investigation of organometallic complexes for identification of RNase A inhibitor

Nayim Sepay [a], Arabinda Mandal [b], Aratrika Chakraborty [a]

[a] Department of Chemistry, Lady Brabourne College, P-1/2 Suhrawardy Avenue, Kolkata 700017, India

[b] Department of Chemistry, Bidhannagar College, Kolkata 700064, India.



ChemistrySelect

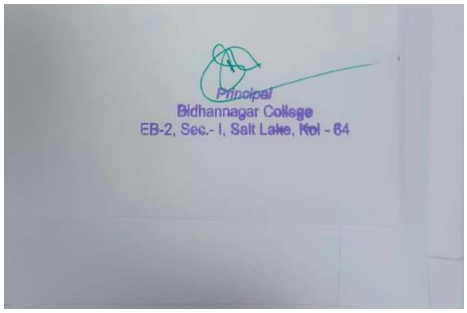
Chemistry Europe
European Chemical Societies Publishing

Review

A Detailed Review on *C*-Fused Furan/3,4-Fused Furan Analog and its Potential Applications

Susanta Kumar Manna, Soumen Giri, Sampa Mondal, Rabindra Nath Sana, Aroop Kumar Samal, Arabinda Mandal

First published: 03 January 2023 | https://doi.org/10.1002/slct.202203150 | Citations: 2



Original scientific paper
DOI: /10.5513/JCEA01/24.2.3656
Journal of Central European Agriculture, 2023, 24(2), p.552-569

Trends and determinants of post-integration agricultural transformation in Poland and Bulgaria

Tina BARMA (✉)

West Bengal State University, Faculty of Department of Economics, Bidhannagar College, India

✉ Corresponding author: tina.barma@gmail.com

Received: June 14, 2022; accepted: January 25, 2023

ABSTRACT

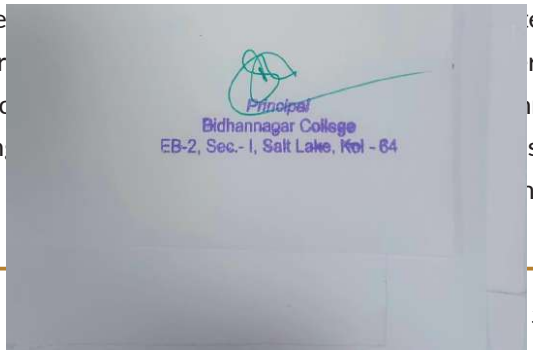
Agricultural transformation in Poland and Bulgaria, both characterized by unique farm structures compared to the old EU, has been a policy challenge for the Common Agricultural Policy (CAP) even before integration. Eurostat and Comtrade data over 2000 to 2016/2017 have been used to analyse agricultural restructuring at farm level, relating it to growth trends in agro-processing units and eventually to competitiveness in agricultural exports and trade specialization. CAP payment instruments, especially DPs have influenced farm restructuring, farming practices and income in both Poland and Bulgaria. Distinctive farm structures have evolved that have caused polarization and influenced productivity. Large farms are the main beneficiaries of farm aids and this polarization continues in the agro-industry sector as well. Multinational agro-firms, though insignificant in number are found to monopolise agro-based production in almost all the food processing sub-sectors in both the member countries. In terms of trade competitiveness indices, export specialization of agri-commodities has reduced in both members over 2000-2017, shares of processed commodities in exports with specialization have increased for Poland while Bulgaria has gained in medium-processing capabilities. For policy implications, small farms need to form producer groups and coordinate with small producers to increase both farm and firm level productivity. The subsidiarity principle of new CAP can be utilized by member states to facilitate this.

Keywords: farm study, agricultural policy, agro-industry performance, export competitiveness

INTRODUCTION

Post-war land policies and a market-economy based transition dynamics have curved distinctive transformational paths for the agricultural structures of the New Member States (NMSs) that joined the EU in 2004 and 2007. Assessing the synchronisation of the agricultural structural changes in the integrating countries with the evolving CAP policy designs and instruments have been the focus of a large section of literature. The present study endeavours to add a few more insights to this by understanding the trends and determinants of the changes in the agricultural product chain- beginning with the production stage involving the farm and farming practises, then to the consumption stage involving the agricultural enterprises and concluding with an assessment of the competitiveness of agricultural trade patterns. In this context, post-integration agricultural transformations in two NMSs, namely Poland and Bulgaria have been studied as country cases. Possessing distinctly different farming structures compared to the largescale EU farms, the NMSs, despite their size differences, were characterised by apparently similar pre-integration farm structures and agro-enterprise patterns.

The history of land ownership strongly influenced changes in their farm organisational patterns, both during the transition period and afterwards. In Poland, agricultural practices were extremely traditional, often labele erized by far re not restric rough leasin s of 1 ha or nsition



Journal of Stress Physiology & Biochemistry, Vol. 19, No. 3, 2023, pp. 143-151 ISSN 1997-0838

ORIGINAL ARTICLE

Phagocytic response and phenoloxidase activity of the hemocytes of *Bellamya bengalensis* exposed to synthetic fenvalerate.

Suman Mukherjee [1] and Chiranjib Mandal* [2]

[1] *Post Graduate Dept. of Zoology, Bidhannagar College EB-2, Sector-1, Salt lake City, Kolkata-700064, WestBengal, India.*

[2] *Department of Biological Science and Environmental Studies Ghatakpur Swamiji Vidyapith High School (H.S) Village and P.O.-Ghatakpur, Dist-South 24 Parganas, West Bengal, India.*

*E-Mail: **chiranjib.san@gmail.com**

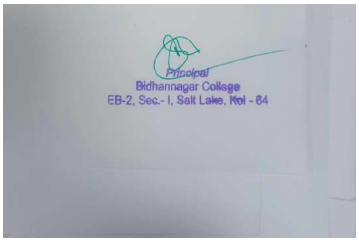
Received March 30, 2023

Background: *Bellamya bengalensis*is an important bioresource of the freshwater ecosystem of India. This edible mollusc is filter feeder, indigenous diet of human, poultry and fishery. Natural habitat of this freshwater gastropod mollusc bears the risk of contamination by agricultural pesticide fenvalerate, a synthetic type II pyrethroid. Hemocytes are the immuno effector cells of molluscs which are affected by environmental toxins or pathogenic microorganisms. Hemocytes perform various types of immunological functions such as phagocytosis, cytotoxic response etc.

Results: Experimental exposure of fenvalerate resulted in impairment of phagocytic efficacy and alteration in the generation of phenoloxidase in *B. bengalensis.*

Conclusion: The alteration of phagocytic response and generation of phenoloxidase of hemocytes, exposed to experimental concentrations of fenvalerate under static laboratory condition have been determined to establish as biomarker of aquatic toxicity in toxin contaminated natural habitat.

Key words: Fenvalerate, Mollusc, Phagocytosis, Phenoloxidase



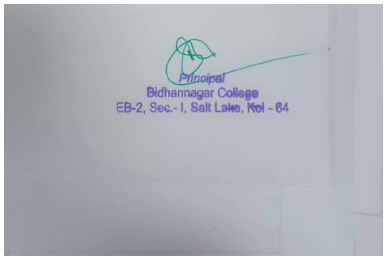
Acta Ecologica Sinica
Volume 43, Issue 3, June 2023, Pages 452-458

Decadal loss of above-ground biomass and subsequent potential CO_2 emission from the Sundarbans mangrove ecosystem, India

Nilanjan Das [a], Ayan Mondal [a], Nimai Chandra Saha [b], Santu Ghosh [a], Sudipto Mandal [a]

[a] Ecology and Environmental Modelling Laboratory, Department of Environmental Science, The University of Burdwan, Burdwan 713104, India
[b] Fishery and Ecotoxicology Laboratory, VC's Research Group, Department of Zoology, The University of Burdwan, Burdwan 713104, India

Received 20 August 2021, Revised 10 November 2021, Accepted 14 November 2021, Available online 25 November 2021, Version of Record 21 April 2023.



Comment > Int Arch Allergy Immunol. 2023;184(2):161-170. doi: 10.1159/000526707. Epub 2022 Nov 7.

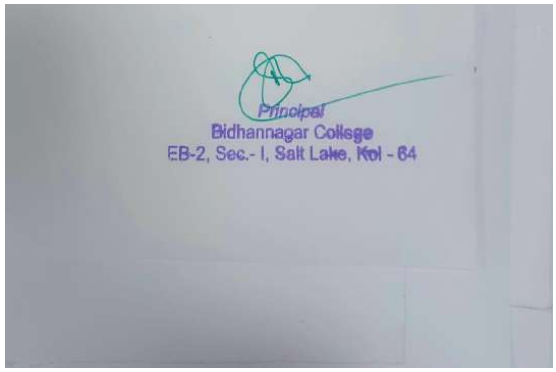
Assessment of Co-Sensitization between Pollen and Food Allergen Sources among Bengali Population, West Bengal, India

Arghya Laha [1], Saibal Moitra [2], Himani Biswas [3], Nimai Chandra Saha [4], Sanjoy Podder [1]

Affiliations – collapse

Affiliations

1 Department of Zoology, The University of Burdwan, Bardhaman, India.
2 Apollo Multispecialty Hospital, Kolkata, India.
3 Department of Zoology, Krishnagar Government College, Krishnagar, India.
4 The University of Burdwan, Bardhaman, India.



Science of The Total Environment
Volume 876, 10 June 2023, 162739

Behavioral toxicity, histopathological alterations and oxidative stress in *Tubifex tubifex* exposed to aromatic carboxylic acids- acetic acid and benzoic acid: A comparative time-dependent toxicity assessment

Pramita Sharma [a], Pramita Garai [a], Priyajit Banerjee [a], Shubhajit Saha [b], Azubuike V. Chukwuka [c], Soumendranath Chatterjee [d], Nimai Chandra Saha [a] ✉, Caterina Faggio [e] ✉

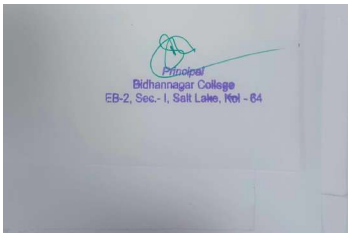
[a] Fishery and Ecotoxicology Research Laboratory (Vice-Chancellor's Research Group), Department of Zoology, The University of Burdwan, Burdwan, West Bengal, India
[b] Department of Zoology, Sundarban Hazi Desarat College, Pathankhali, South 24, Parganas 743611, West Bengal, India
[c] National Environmental Standards and Regulations Enforcement Agency, Osogbo, Osun State, Nigeria
[d] Parasitology & Microbiology Research Laboratory, Department of Zoology, The University of Burdwan, Burdwan, West Bengal 713 104, India

Water Air Soil Pollut (2023) 234:333
https://doi.org/10.1007/s11270-023-06260-5

A critical review on the effect of nitrate pollution in aquatic invertebrates and fish

Priyajit Banerjee · Pramita Garai · Nimai Chandra Saha · Shubhajit Saha · Pramita Sharma · Arpan Kumar Maiti

Received: 14 September 2022 / Accepted: 21 March 2023



Triazophos-induced Respiratory and Behavioral Effects and Development of Adverse Outcome Pathway (AOP) for short-term Exposed Freshwater Snail, *Bellamya Bengalensis*

Published: 12 May 2023

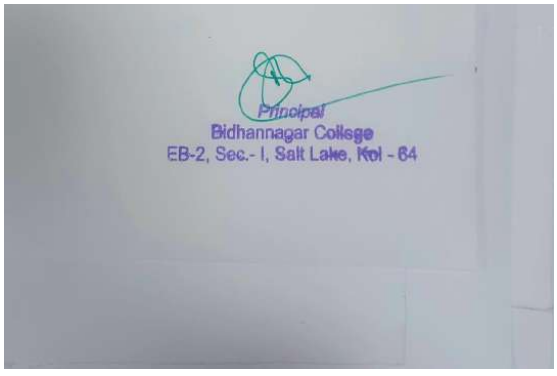
Volume 110, article number 94, (2023) Cite this article

Bulletin of Environmental Contamination and Toxicology

Aims and scope →

Submit manuscript →

Shubhajit Saha, Priyajit Banerjee, Nimai Chandra Saha & Azubuike V. Chukwuka



ELSEVIER

Science of The Total Environment
Volume 874, 20 May 2023, 162328

Abiotic factors and heavy metals defining eco-physiological niche in fish

Mahammed Moniruzzaman [a e], Urbi Datta [b], Nimai Chandra Saha [c], Amiya Ranjan Bhowmick [b], Joyita Mukherjee [d]

[a] Department of Zoology, University of Calcutta, Kolkata 700019, India
[b] Department of Mathematics, Institute of Chemical Technology, Mumbai, India
[c] Department of Zoology, The University of Burdwan, Burdwan, West Bengal, India
[d] Department of Zoology, Krishna Chandra College, Hetampur, Birbhum, West Bengal, India
[e] Estuarine and Coastal Studies Foundation, Howrah, West Bengal, India

Received 9 July 2022, Revised 6 February 2023, Accepted 15 February 2023, Available online 28 February 2023, Version of Record 8 March 2023.

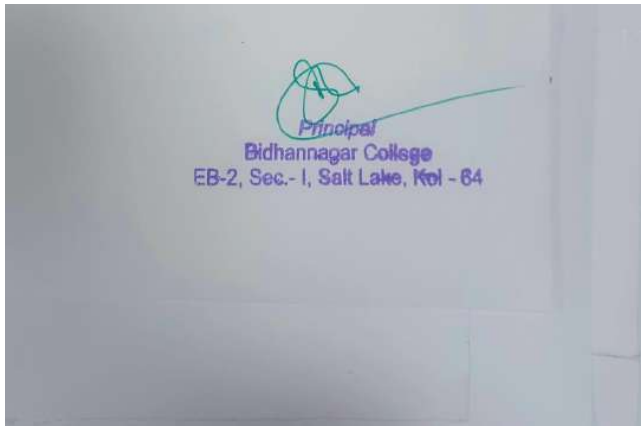
What do these dates mean?

Comparative Biochemistry and Physiology Part C: Toxicology & Pharmacology
Volume 264, February 2023, 109511

Sub-lethal acute effects of environmental concentrations of inorganic mercury on hematological and biochemical parameters in walking catfish, *Clarias batrachus*

Shubhajit Saha [a], Kishore Dhara [b], Azubuike V. Chukwuka [c] ✉, Prasenjit Pal [d], Nimai Chandra Saha [e], Caterina Faggio [f] ✉

[a] Department of Zoology, Sundarban Hazi Desarat College, Pathankhali, South 24 Parganas, 743611, West Bengal, India
[b] Freshwater Fisheries Research & Training Centre, Directorate of Fisheries, Kulia, Kalyani, Nadia 741 235, West Bengal, India
[c] National Environmental Standards and Regulations Enforcement Agency, Osogbo, Osun State, Nigeria
[d] College of Fisheries, Central Agricultural University (I), Lembucherra, Tripura 799210, India
[e] Fishery and Ecotoxicology Research Laboratory, Department of Zoology, University of Burdwan, Purba Barddhaman, West Bengal, India
[f] Department of Chemical, Biological, Pharmaceutical, and Environmental Sciences, University of Messina, Messina, Italy



Integrated multi-biomarker responses in Mozambique tilapia, Oreochromis mossambicus under acute and chronic Diazinon® exposures

Chemistry and Ecology (IF 1.3 Submission Guide >) **Pub Date: 2023-02-14** , DOI:10.1080/02757540.2023.2178649

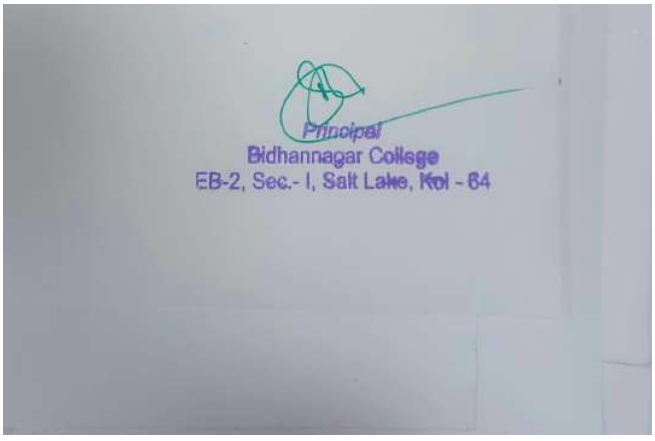
Shubhajit Saha [1] , Nimai Chandra Saha [1] , Arnab Chatterjee [1] , Priyajit Banerjee [1] , Pramita Garai [1] , Pramita Sharma [1] , Lipika Patnaik [2] , Susri Nayak [2] , Kishore Dhara [3] , Azubuike V. Chukwuka [4] , Caterina Faggio [5]

Affiliations

1. Fishery and Ecotoxicology Research Laboratory, Department of Zoology, The University of Burdwan, Burdwan, India
2. Environmental Science Research Laboratory, Department of Zoology, Ravenshaw University, Cuttack, India
3. Fisheries Research & Training Centre, Directorate of Fisheries, Kalyani, India
4. National Environmental Standards and Regulations Enforcement Agency (NESREA), Osogbo, Nigeria
5. Department of Chemical, Biological, Pharmaceutical, and Environmental Sciences, University of Messina, Messina, Italy

ABSTRACT

The pesticide ecosystem impacts are very diverse, and depending on their persistence could exert their intrinsic toxicity within an acute to a chronic timeframe. This study examined the toxic effects of Diazinon on haematological and biochemical endpoints in *Oreochromis mossambicus* after chronic exposure. After a prior range fining test, fishes were exposed to predetermined diazinon concentrations (T1-0.906 mg/L) and (T2-1.812 mg/L) and sampled after 28 days for toxicity endpoints. In Diazinon-exposed fish, haemoglobin content, Total Red Blood Cells, Total White Blood Cells, and MCH levels were substantially lower ($p < 0.05$) than in the control fish group. The total blood glucose concentrations in treated fish were substantially greater ($p < 0.05$) than in the control group, whereas serum protein concentrations were significantly lower ($p < 0.05$). Observation for most biomarkers revealed patterns of decreasing values with increasing toxicant concentration and



water

MDPI

Article

Biochemical and Pathophysiological Responses in *Capoeta capoeta* under Lethal and Sub-Lethal Exposures of Silver Nanoparticles

Dariush Azadikhah [1], Ahmad Mohamadi Yalsuyi [2], Shubhajit Saha [3], Nimai Chandra Saha [3] and Caterina Faggio [4,*]

[1] Department of Pathobiology, Faculty of Veterinary Medicine, Urmia Branch, Islamic Azad University, Urmia 57561-51818, Iran
[2] Department of Fisheries Sciences, Gorgan University of Agricultural Science and Natural Resources, Gorgan 49138-15739, Iran
[3] Ecotoxicology Research Laboratory, Department of Zoology, University of Burdwan, Burdwan 713104, West Bengal, India
[4] Department of Chemical, Biological, Pharmaceutical and Environmental Sciences, University of Messina, Viale Ferdinando Stagno D'Alcontres 31, 98166 Messina, Italy
* Correspondence: cfaggio@unime.it

Abstract: The increasing use of nano-based products raises concerns regarding potential risks related to their manufacturing, transportation, waste disposal, and management operations. We used the riverine carp, *Capoeta capoeta*, as an aquatic animal model to demonstrate the acute toxicity of silver nanoparticles (Ag-NPs). This study focuses on acute toxicity first, and then integrates the findings through histopathology, hematological, and biochemical testing of lethal and sub-lethal Ag-NPs exposures. Red blood corpuscles (RBC), white blood corpuscles (WBC), hematocrit, and total serum glucose levels were significantly lower in Ag-NPs-exposed fish than in control fish. Total serum protein, triglycerides, cholesterol, and albumin were all significantly greater in exposed fish. This research focused on the impacts of Ag-NPs on gills and liver tissue, and it was found that the level of injury escalated as the concentration of Ag NPs increased. Epithelial lifting of secondary lamellas (ELSL), epithelial hypertrophy (EH) of secondary lamellae (SL), leukocyte infiltration (LI), and bottom hyperplasia (BH) were all detected in Ag-NPs-exposed fish. In Ag-NPs-treated liver cross-sections of *Capoeta capoeta*, macrophage aggregates (MA), fatty liver (FL), sinusoid dilatation (SD), and necrosis (N) were identified. Ag-NPs dosages, according to biomarker representations, elicit stress-specific biochemical and physiological effects, compromising the general overall health status of aquatic animals. The gradients of toxic responses across exposure concentrations and portrayals of disrupted fish health with increasing silver nanoparticle exposure time indicate a reduced physiological ability for surviving in the wild.

Keywords: silver nanoparticles (Ag-NPs); *Capoeta capoeta*; acute toxicity test; hematological alterations; biochemical endpoints; histopathological biomarkers

Citation: Azadikhah, D.; Yalsuyi, A.M.; Saha, S.; Saha, N.C.; Faggio, C. Biochemical and Pathophysiological Responses in *Capoeta capoeta* under Lethal and Sub-Lethal Exposures of Silver Nanoparticles. *Water* **2023**, *15*, 585. https://doi.org/10.3390/w15030585

Academic Editor: Lihui An

Received: 2 December 2022
Revised: 23 January 2023
Accepted: 30 January 2023
Published: 2 February 2023

1. Introduction

Nanoparticles have been in high demand in the metal industry, biological science, and other fields in recent years [1–5]. I household appliances [6]. They are widely manufa 00 tons [7]. Six-hundred and twenty-two businesse ducts for a variety of uses [8]. Only 435 nanoprodu of overall output, with 320 tons annually [7,8]. Th articles on living beings and the environment is l covers the quantitative assessment of the severity portion to