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Name of the teacher:Dr. Kaustav Dutta Chowdhury

Title of paper: Combinational Impact of Chelerythrine and s-allyl Cystine on Melanoma Liver Metastasis: an in vivo Analysis

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Combinational Impact of Chelerythrine and S-Allyl Cystine on *Metastasis melanoma* of liver : An *In vivo* Analysis

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ABSTRACT

Metastatic melanoma, the highly fatal and aggressive disease, has yet to any effectual remedies. Several evidences suggested delicate responsibility of oxidative/cytotoxic stress in the modulation of tumor microenvironment leading to metastasis. Therefore, conditioning of reactive oxygen species in tumour and its adjacent arena may play a guardian role for restricting metastatic melanoma. Well-known active biocomponents like S-allyl Cysteine and Chelerythrine as nontoxic dietary phytochemicals are recently documented as potential anti-tumorigenic and anti-inflammatory therapeutics but their role in metastatic melanoma still remains elusive. Therefore, present study was carried out to investigate the efficacy of S-allyl Cysteine and Chelerythrine against metastatic melanoma to the hepatic tissue. Status of liver function was estimated by performing ALT, AST, GGT and ALKP assay. ROS accumulation was determined by estimating the altered DCF fluorescence in hepatic tissue lysates. GSH and TBARS content were measured as a marker of anti-oxidant and cytotoxicity level after the treatment. Analysis on the marker proteins like Caspases, CytochromeC, BCl_2, Bax, VEGF, MMP9 and NF-κβ depicted the triggering of p-p53 nuclear translocation and significant increase in Bax expression that in-turn induced CytochromeC-Caspase9-Caspase3 apoptotic axis after drug administration. Data also illustrated notable reduction in tumor nodules at liver along-with normalization of liver function as demarcated by the level of biomarkers in the treated groups. Restoration of enzymatic and non-enzymatic anti-oxidants as well as suppression of VEGF and MMP9 expression as an effect of attenuated NFkb nuclear localization by S-allyl Cysteine and Chelerythrine effectively delimited extracellular matrix remodeling as well as angiogenesis, two major prerequisites for metastasis. Combinatorial administration of S-allyl Cysteine and Chelerythrine further portrayed better efficacy in metastatic tumor regression and tissue restoration by sustaining ROS/antioxidant balance and stabilization of p53 through its phosphorylation, that can be considered as future directives for the development of novel remedial strategy against metastatic melanoma in liver.

KEY WORDS: METASTATIC MELANOMA, ROS, ANTIOXIDANT, S-ALLYL CYSTEINE, CHELERYTHRINE.

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INTRODUCTION

Melanoma, a predominant skin cancer, originates from melanocyte. Surgical removal followed by popular therapies with chemo/radiation-based drugs can cure primary melanomas. Due to its high aggressive nature and lack of complete effective therapeutic strategy, it can able to metastasize into local as well as distant organ following invasion and this in turn reduces the chances

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Review article

Various theranostics and immunization strategies based on nanotechnology against Covid-19 pandemic: An interdisciplinary view

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ABSTRACT

COVID-19 pandemic is still a major risk to human civilization. Besides the global immunization policy, more than five lac new cases are documented everyday. Some countries newly implement partial/complete nationwid lockdown to mitigate recurrent community spreading. To avoid the new modified stain of SARS-CoV-2 spreading, some countries imposed any restriction on the movement of the citizens within or outside the country. Effective economical point of care diagnostic and therapeutic strategy is vigorously required to mitigate viral spread. Besides struggling with repurposed medicines, new engineered materials with multiple unique efficacies and specific antiviral potency against SARS-CoV-2 infection may be fruitful to save more lives. Nanotechnology-based engineering strategy sophisticated medicine with specific, effective and nonhazardous delivery mechanism for available repurposed antivirals as well as remedial for associated diseases due to malfeasance in immuno-system *e.g.* hypercytokinaemia, acute respiratory distress syndrome. This review will talk about gloomy but critical areas for nanoscientists to intervene and will showcase about the different laboratory diagnostic, prognostic strategies and their mode of actions. In addition, we speak about SARS-CoV-2 pathophysiology, pathogenicity and host specific interation with special emphasis on altered immuno-system and also perceptualized, copious ways to design prophylactic nanomedicines and next-generation vaccines based on recent findings.

1. Introduction

It is very much true to say reality is stranger than fiction. We had studied a lot on global pandemics in novels, popular cultures, classics and most importantly in scientific journals and books [1]. Our entire generation is experiencing, documenting and victimizing in this devastating planetary massacre and earnestly waiting for a cure. Besides developing self-immunity through adaptive immunity or vaccination [2], a stable and valid therapeutic curative approach may give some hope in this primal morbid situation [3]. This pneumonic disease is well documented as the fifth pandemic after the 1918th Spanish flu, caused by H1N1 influenza A virus [4]. World Health Organization was briefing on a flare-up of unknown pneumatic flu cases in a cluster of operating dealers and vendors of Hunan Seafood market at Wuhan city, Hubei, China on the very last day of 2019 [5]. It is a city of 11 million people- a densely populated, economic and cultural hub with international airport and other well-managed connective transportations [6]. These patients were coming with fever, malaise, dry cough and dyspnea [7]. 59 cases were noted on 5th January and no one was died among them [8]. But the scenario was changed to ferocity after ten days, WHO broadcasted 282 confirmed cases among them, 4 persons in Japan, South Korea and Thailand [9] along with six death, 51 severely ill and 12 were in critical care unit in Wuhan [10]. It was primarily termed as Wuhan pneumonia by the press. This errhine virus was characterized on 7thJanuary [11], 10th January viral RNA was sequenced through NGS [12] and was published on 12th January [13]. On that day, WHO declared causative contagion is a new strain of coronavirus and temporarily coined this virus as a novel coronavirus (2019-nCov) and the pernicious malady is officially named as coronavirus disease 2019 (COVID-19) on 12 February 2020 [15]. On second March 2020, International Committee

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Vibrational resonance in a bistable van der Pol–Mathieu–Duffing oscillator

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ABSTRACT

In this paper, we study the nonlinear response of a bistable van der Pol–Mathieu–Duffing (VMD) oscillator under the influence of two periodic excitations of widely different frequencies. We have shown that by systematically modulating the strength of the high-frequency drive as well as the strength of the parametric oscillation, a symmetrically oscillating bistable potential can be converted to a symmetrically oscillating monostable potential. In addition to this effect, the strength of the fast drive modifies the damping as well, allowing us to define a threshold value of this strength at which a supercritical Hopf bifurcation occurs. All analytical results have shown to be numerically consistent.

1. Introduction

The response of specific nonlinear systems to a weak signal enhanced by the presence of fast harmonic signal drive has been the central motivation behind all studies concerning vibrational resonance (VR) for the last two decades. After originally proposed by McClintock and Landa [1], a profusion of investigations have been carried out theoretically [2,3], numerically [4] and experimentally [5,6] with the special prominence given to nonlinear potentials [7–16] in the backdrop of VR. Parametrically excited oscillators belong to such a family of nonlinear oscillators, which have been used extensively for the realization of various physical systems in science and engineering [17–22]. The response of a parametric oscillator, whether stable or unstable under the action of biharmonic forces, requires special attention. Although extensive research has been pursued on the response of a high-frequency excited parametric oscillator [23–28], studies of VR with slowly excited parametric oscillators have not, to the best of our knowledge, prominently come to focus [29,30]. We further note that in addition to the time dependence of the natural frequency of a parametric oscillator, if the system operates in a spatially nonlinear dissipative medium, then the response of the system to an additive combination of external low and high-frequency drives is an interesting problem in its own right.

In this paper, we consider van der Pol–Mathieu–Duffing(VMD) oscillator, a typical parametric oscillator with nonlinear damping and two externally acting forcing terms with two widely different frequencies. The intrinsic property of self-excitation of a van der Pol oscillator combines with the parametric excitation allow us to study a more general class of parametric oscillators. Applications of this model can be found directly in various MEMS devices [31,32]. A thorough investigation of non-trivial effects of the high-frequency drive affecting the stability of the slow dynamics through modification of some governing parameters have been considered in recent times [33–36]. However, the nonlinear response of VMD under multiple external forcing with different orders of strength and frequency has remained less explored and is one of our motivation in this paper. In Section 2, the framework of the model and the justifications are described. In Sections 3–5, the detailed mathematical techniques followed by numerical simulations are given. Finally, this article is concluded in Section 6.

2. The model

The typical mathematical model of a VMD oscillator consists of a nonlinear damping term, an oscillatory stiffness and a nonlinear stiffness controlled by two external forcing drives with widely different frequencies. The rationale behind such an arrangement of terms in the context of VR has discussed in the Introduction. The dynamical equation is given by

$$\ddot{x} + \gamma(x^2 - 1)\dot{x} + \omega_0^2(1 + h\cos\omega_p t)x + \alpha x^3 = c\cos\omega t + g\cos\Omega t \tag{2.1}$$

where $h\cos\omega_p t$ is the parametric excitation with strength h and $c\cos\omega t$ and $g\cos\Omega t$ are the slow and fast frequency drive respectively with $\Omega \gg \omega$. As we consider the parametric excitation to be small, without loss of generality we can set $\omega_p = 2\omega$ and the reason behind this particular chosen value is clarified in the following paragraph. Now depending on the sign of ω_0^2 and α, three potential structures may arise viz. (a) single well ($\omega_0^2 > 0$, $\alpha > 0$) (b) double well ($\omega_0^2 < 0$, $\alpha > 0$) and (c) double hump ($\omega_0^2 > 0$, $\alpha < 0$). Our model here describes the

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dynamics of a VDM oscillator under a time dependent double well potential,

$$\ddot{x} + \gamma(x^2 - 1)\dot{x} - \omega_0^2(1 + h\cos\omega_p t)x + \alpha x^3 = c\cos\omega t + g\cos\Omega t \tag{2.2}$$

Therefore the oscillator is on the crest of a double well and is in an unstable equilibrium provided the excitation strength h is confined to the domain $-1 < h < 1$. The effect of the high-frequency drive ($g\cos\omega t$) is to redress the double well potential into a single well,thus effectively changing the stability concerning the slow-motion of the oscillator [14,29]. In this paper, we shall show that this high-forcing drive changes the potential structure through an effective modification of the natural stiffness and reshapes the damping function reflected in the slow dynamics of the original system (2.2). Our theoretical study regarding the combined role of the excitation forcing h and the excitation frequencies ω_p and Ω in delicately amending the oscillation frequency and the damping term satisfactorily complies with the numerical results. In order to notice the resonant response to the slow

Now f being a fast variable, one can assume that $f, f \gg f, f^2, f^3$ etc, and by invoking this assumption in Eq. (3.4) and then solving it in a self-consistent way [15], by taking only the linear terms, we can arrive at the equation

$$\ddot{f} - \gamma\dot{f} = gB\cos(\Omega t + \eta) \tag{3.8}$$

The amplitude factor of Eq. (3.8) has the form

$$B = \sqrt{(1 + A\cos\beta)^2 + (A\sin\beta)^2} \tag{3.9}$$

where the dimensionless amplitude factor reads

$$A = \frac{\omega_0^2}{\Omega\sqrt{\Omega^2 + \gamma^2}}, \tag{3.10}$$

along with this, the newly introduced phase factors

$$\beta = -\tan^{-1}\left(\frac{\gamma}{\Omega}\right) \tag{3.11}$$

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Exploring the Issues and Problems faced by Hearing Aid User among Senior Citizen

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Abstract: Hearing Loss is generally related to senior citizens as an age-related ailment. The problem further increases when people tend to avoid the problem rather than looking for solution. In India, we have around 104 million Elderly populations as par the last census of 2011.

Senior citizens though they have retired from the daily outside job but they need to have certain levels of activity at home and at times outdoor. Hearing inability does come in as ahindrance to communicate. They find themselves cornered and difficult to express their thoughts, ideas and opinion. The inability creates an aura of depression. Hearing Aids do provide certain solutions to this problem. Obviously, the natural effect does get compromised with an artificial support. But Hearing aid proper identification, diagnosis and usage plays the key role in its outcome. Many of them have the opinion Hearing does helps them to communicate with their family members, watching television, listening music, talking with relatives and friends in cell phone, communicating in the busy street, market, railway station, post offices, Bank etc

While there are group of persons who feel Hearing aid is not so handy and does solves the hearing impairment. More, awareness and proper counselling in Hearing Aid use will go in a long way in increasing the impact of Hearing aid.May be there are scope of future studies which reveals the joy of hearing with Hearing Aid w.r.t to senior citizens. Though there has been digital disruption creating new heights of technological innovation but it needs to be seen do Senior citizens enjoy using Hearing Aid.

Key words: Senior Citizen, Hearing Aids, Quality of Life, Hearing Impairment

Introduction

Senior citizens are the persons belonging to above 60 years. In case of Government institutions especially in Hospitals and Academics the age limit has been extended up to 65 years. The development of Technology has boosted the spirit of the elderly citizen of our country. It is said in occasionally that you can retire from work but not from life.[15] The spirit, energy, enthusiasm that exists during the working age slowly evaporates once you retire from your work. In this study we have tried to have a conceptual study of the literatures we have reviewed to understand what leads to this impact on quality of life and how far Hearing Aids are able to provide a solution to the problem.

According to Population Census 2011 there are nearly 104 million elderly persons (aged 60 years or above) in India; 53 million females and 51 million males. A report released by the United Nations Population Fund and HelpAge India suggests that the number of elderly persons is expected to grow to 173 million by 2026.[1]

We do find the average life expectancy has increased. Earlier 65-70 was the normal age limit but thanks to the development of medical science the life expectancy has increased. We do find people working even in mid-70 s. Obviously it all depends as to how one maintains their health parameters and required health advices as suggested by Doctors. For example, Morning and Evening Walk are one of the likely requirements to stay fit and maintain a good body metabolism. Today, the Yoga which was done ages back by our Rishi's and Guru's way back in Ramayana Age does finds a very high requisite in todays world. Yoga and Pranayama are practised by all ages and does provide a ready solution to many chronic and congenital diseases.

Objective of the Study

Old Age senior citizens does suffer from many health-related issues. They do face hearing problem as one of the barriers. Hearing Aid has come up as one of the solutions to the Hearing problem. In this study we would be exploring the fact how far the Hearing Aid has been able to cover the problems. The problems if we define would be communication issues, finding difficulty to have a conversation with a group of people, understanding speech in a noisy environment etc.

There had been different studies on this aspect. Different researchers have come up with different view point. Obviously, sophistication of technology had helped in the development of Hearing aid. The Hearing aids

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Analysis of Growth and Identifications of the Determinants of Crime against Women: Insight from India

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Title of paper: Quenching effect of oscillating potential on anisotropic resonant transmission through a phosphorene electrostatic barrier

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Quenching effect of oscillating potential on anisotropic resonant transmission through a phosphorene electrostatic barrier

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The anisotropy in resonant tunneling transport through an electrostatic barrier in monolayer black phosphorus either in presence or in absence of an oscillating potential is studied. Non-perturbative Floquet theory is applied to solve the time dependent problem and the results obtained are discussed thoroughly. The resonance spectra in field free transmission are Lorentzian in nature although the width of the resonance for the barrier along the zigzag (Γ–Y) direction is too thinner than that for the armchair (Γ–X) one. Resonant transmission is suppressed for both the cases by the application of oscillating potential that produces small oscillations in the transmission around the resonant energy particularly at low frequency range. Sharp asymmetric Fano resonances are noted in the transmission spectrum along the armchair direction while a distinct line shape resonance is noted for the zigzag direction at higher frequency of the oscillating potential. Even after the angular average, the conductance along the Γ–X direction retains the characteristic Fano features that could be observed experimentally. The present results are supposed to suggest that the phosphorene electrostatic barrier could be used successfully as switching devices and nano detectors.

The ubiquity of resonances in the quantum transport phenomena cannot be overemphasized. The quantum resonant tunneling processes through single or multiple potential barriers using different recently discovered two dimensional (2D) materials[1–3] have drawn significant attention in fundamental research as well as in the field of nano science and high speed electronics. For a successful design of devices based on photonics and optical nano technology demands a deep understanding in the resonance phenomena of different kinds. Specifically, the physics of Fano resonance[4] plays the key role in photonics and many other optical phenomena[5]. The Fano resonance (FR) occurs when a discrete quantum state interferes with a continuum band of states and is manifested as an asymmetric line shape profile in the transmission spectrum indicating a sharp transition from the total transmission to reflection. This attractive feature plays a significant role for many switching and sensor devices in the field of opto-electronics and photonics[6]. One of the most technologically potential candidates as a tunneling material is the monolayer phosphorene (usually referred as black phosphorus) mainly because of its unique electronic and opto electronic properties[7,8], in particular, the most basic striking feature being its high on/off ratio and high carrier mobility at room temperature and atmospheric pressure, the most desirable property for the progress of nano science. The electronic structure of phosphorene guided by weak Van-der-Waals interaction exhibits an anisotropic puckered honeycomb structure (due to sp^3 hybridization) having a finite layer dependent band gap originating due to relatively strong spin orbit interaction[9–11]. This finite band gap of phosphorene has made it particularly suitable for different switching devices, unlike the graphene. The structural anisotropy[12–15] along the armchair and zigzag directions of phosphorene, e.g., the puckered arrangement in the former, where the low energy massive quantum particles obey Dirac like linear spectrum, while, a bilayer structure in the latter obeying Schrödinger like quadratic spectrum, has made the material much more favorable than many other recently observed 2D materials for the next generation electronic and opto electronic world. In particular, the aforesaid unique anisotropic electronic structure makes phosphorene very attractive for fundamental research as well as for many technological applications[16], e.g., transistor, detectors and sensors etc.

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Understanding the factors responsible for selection of Hearing Aid for Senior Citizens

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Abstract

Hearing impairment is one of the most common disabilities. The problem relates to communication and socialization challenges. Increase in human longevity would increase the cases of hearing loss in elderly citizens. This impacts the overall personality of a person. People generally get demotivated and introvert. In severe cases people develop suicidal tendencies and loose the interest to stay alive. A major challenge of audiological rehabilitation has been to encourage those who have fitted hearing aids to use them. The aim of the present study is to describe hearing-aid use among older adults and to identify motivational factors associated with hearing-aid use. Suggesting that these factors are important and should be emphasized in rehabilitation programmes.In looking across the literature, we have identified five main factors which can determine whether or not someone would get a hearing aid: - Self-reported hearing loss, stigma, degree of hearing loss, personality or psychological factors, and cost of hearing aids. Different factors affecting the usefulness of hearing aids can be investigated in two stages. The first is the stage before receiving hearing aids when a person looks for help and receives hearing aid and the second stage after receiving the hearing aid when the person has used the hearing aid and reports his or her satisfaction. The factors affecting the receiving stage are the amount of hearing loss, problems experienced by the person, the patient's motives and expectations, personality traits, auditory counseling, and economic issues. However, after receiving a hearing aid, factors such as other non-auditory abilities, hearing loss, age, duration of hearing aid use, hearing aids characteristics, disabilities, attitudes, and personality traits affect the satisfaction of the patient.

Keywords: hearing-aid use, older adults, accepted need, follow-up support, rehabilitation, hearing loss

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Title of paper: Activity of ROCKII not ROCKI promotes pulmonary metastasis of melanoma cells via modulating Smad2/3-MMP9 and FAK-Src-VEGF signalling.

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Activity of ROCKII not ROCKI promotes pulmonary metastasis of melanoma cells via modulating Smad2/3-MMP9 and FAK-Src-VEGF signalling

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ABSTRACT

Rho-associated coiled-coil kinase (ROCK) inhibition decreases tumourogenic growth, proliferation and angiogenesis. Multifaceted evidences are there about the role of ROCK in cancer progression, but isoform specific analysis in secondary pulmonary melanoma is still unaddressed. This study explored the operating function of ROCK in the metastasis of B16F10 mice melanoma cell line. Inhibition by KD-025 indicated dual wielding role of ROCKII as it is associated with the regulation of MMP9 activity responsible for extra-cellular matrix (ECM) degradation as well as angiogenic invasion as an effect of Src-FAK-STAT3 interaction dependent VEGF switching. We found the assisting role of ROCKII, not ROCKI in nuclear localization of Smads that effectively increased MMP9 expression and activity ($p < 0.01$). This cleaved the protein components of ECM thereby played a crucial role in tissue remodeling at secondary site during establishment of metastatic tumour. ROCKII phosphorylation at Ser[1366] as an activation of the same was imprinted essential for oncogenic molecular bagatelle leading to histo-architectural change of pulmonary tissue with extracellular matrix degradation as a consequence of invasion. Direct correlation of pROCKIISer[1366] with MMP9 as well as VEGF expression in vivo studies cue to demonstrate the importance of pROCKIISer[1366] inhibition in the context of angiogenesis, and metastasis suggesting ROCKII signaling as a possible target for the treatment of secondary lung cancer specially in metastatic melanoma.

1. Introduction

Melanoma is a type of cutaneous neoplasia which is originated from the pigment-producing cells known as melanocytes [1]. Disease primarily develops in the skin but may rarely occur in the nose, eyes and sometimes inside the body such as in the mouth, throat even in the intestine [2]. It is known for its aggressive nature with a least chance of prognosis until tumours become mature and metastasize at variety of atypical locations [3]. Median overall survival of malignant melanoma (MM) is only 5.3 months and the mean survival is 9.2 months [3]. Clinical studies identify lung as the most common metastatic site (18–36%) for melanoma [4] and only 5–19% of patients are generally survived after five years of diagnosis [3].

Malignant melanoma at lung creates further complications since the prophecy of lung cancer is poor due to its asymptomatic nature at the initial phase [5]. In fact, the symptoms are often mistaken with infection or effect of smoking, which further delays diagnosis. Therefore, majority of metastatic lung melanoma cases are diagnosed at either stage III or IV,

Abbreviations: CDK, cyclin dependent kinase; DMEM, Dulbeccao's Modified Eagle's Media; DMSO, dimethyl sulphoxide; ECM, extracellular matrix; EDTA, ethylenediaminetetraacetic acid; FAK, focal adhesion kinase; FBS, foetal bovine serum; IL, interleukin; JNK, Janus kinase; MMP, matrix metalloproteinase; PBS, phosphate buffered saline; ROCK, rho associated protein kinase or rho-associated coiled-coil kinase; STAT, signal transducer and activator of transcription; TGFβ, tumour growth factorβ; VEGF, vascular endothelial growth factor; Smad, Sma-and Mad-related protein; CBP, CREB-binding protein; HMGB1, high mobility group box protein1.

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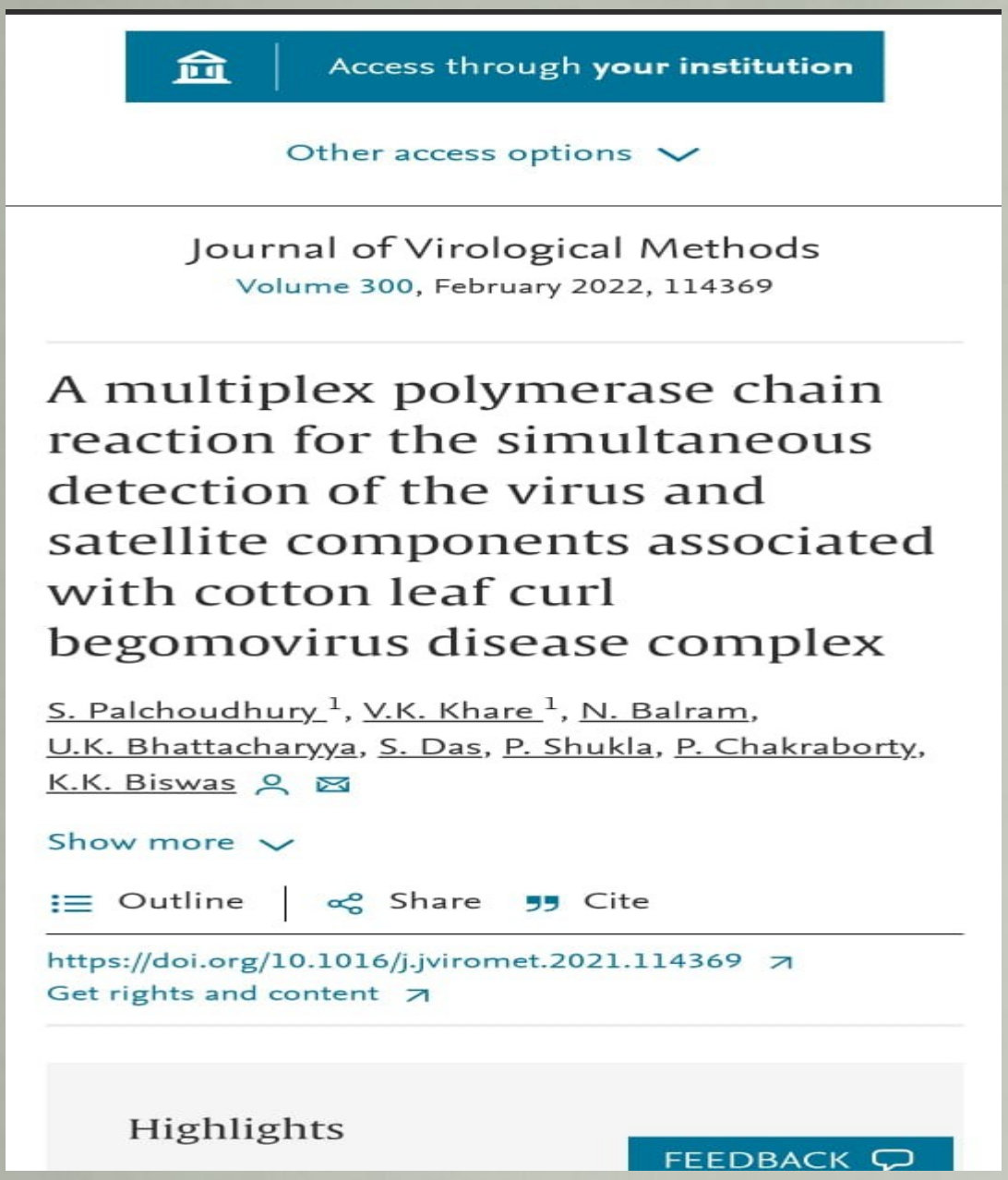
Ref. ..... Year 2022 Date 20

Name of the teacher: Dr. Shibu Das

Title of paper: A multiplex polymerase chain reaction for the simultaneous detection of the virus and satellite components associated with cotton leaf curl begomovirus disease complex



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A multiplex polymerase chain reaction for the simultaneous detection of the virus and satellite components associated with cotton leaf curl begomovirus disease complex

S. Palchoudhury [1], V.K. Khare [1], N. Balram, U.K. Bhattacharyya, S. Das, P. Shukla, P. Chakraborty, K.K. Biswas

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Highlights

FEEDBACK

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Title of paper: Reference Interval of Muscle Damage Indices and Cortisol in Young Athletes of Various Sports Discipline

RESEARCH ARTICLE

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Reference Interval of Muscle Damage Indices and Cortisol in Young Athletes of Various Sports Discipline

Surojit Sarkar [1], Swapan Kumar Dey [2], Gouriprosad Datta [1], Amit Bandyopadhyay [3,*]

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Abstract: Creatine kinase (CK), lactate dehydrogenase (LDH) and cortisol are widely accepted as biological markers. The purpose of the study was to frame the reference interval for muscle damage indices (CK, LDH) and cortisol in the young athletic population of various sports disciplines. 260 young male players [i.e., football (n=62), hockey (n=60), gymnastics (n=36), swimming (n=28), table tennis (n=25), sprint-jump-throw (n=36) and middle-long distance running (n=13)] were recruited for the study (mean age = 15.6±1.59 yrs). Assay of LDH, CK and cortisol was done using the standard enzymatic protocol. The reference interval was calculated by following the Clinical and Laboratory Standard Institute (CLSI) C28-A3 guideline and "MedCalc" software (version 19) with a 90% confidence interval. Serum LDH range was from 148.00-324.00 IU/L with a mean of 233.2±34.74 and a median around 236.25. Serum CK ranged from 17.00-43.50 IU/L with a mean of 28.93±5.23 IU/L and a median around 28.00. Cortisol ranged from 4.99-15.78 µg/dl with a mean of 9.31±2.09 µg/dl and a median around 8.90. The present study confers 165.63 - 303.43 IU/L, 19.00 – 40.09 IU/L and 6.07-14.15 µg/dl as the reference interval values for LDH, CK and cortisol, respectively. The present finding will guide the researchers to avoid misinterpretation of muscle damage indices values during any phase of competitive training of sports person.

Keywords: Reference Interval, Creatine Kinase, Lactate Dehydrogenase, Cortisol, Sports Discipline.

About the Authors

Mr. Surojit Sarkar has pursued both B.Sc (Physiology) in 2013 and M.Sc (Physiology) in 2015 from the University of Calcutta, India, and now he is pursuing a Ph.D. at the same university. Mr. Sarkar has also completed various courses, i.e., Workshop course on Statistics (from ISI, Kolkata) and Advance Proteomics course (from IIT, Kharagpur). Mr. Sarkar has experience working with many sophisticated high-end sports science techniques and molecular biology techniques. He is currently working as Physiologist Gd-III (Lead) at Sports Authority of India. He was awarded 'National Fellowship in Sports' in 2016 under the Ministry of Youth Affairs and Sports (MYAS), Govt of India and conducted the Fellowship under the Sports Authority of India.

Dr. Swapan Kumar Dey was the senior scientist of the Sports Authority of India (SAI). Presently, he is a visiting professor in the Department of Sports Science, University of Calcutta. He has done his master's and Ph.D. from Calcutta University in 1979 and 1988, respectively, in Sports, Exercise and Cardio-respiratory Physiology. Dr. Dey has more than 35 years of research and 30 years of teaching experience in the field of Sports and Exercise Physiology at graduate and post graduate levels. He teaches Sports Anthropometry and Sports Nutrition and Physiology to the students of various courses undertaken by SAI and post graduate physiology and sports science students. He is an active member of the Indian Science Congress Association, the Physiological Society of India and the Indian Association of Sports Medicine. He was attached as a Physiologist with the All India Football Federation (AIFF) of AFC's development program in India and a member of the

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Name of the teacher: Dr. Sahana Mazumder Sen
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An Intricate Discussion on the Conventional and Rapid Identification Methods to Identify MRSA: A Review

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Abstract: *Mortality due to MRSA infection varies from 10-63%. This study aims to summarize the standard identification methods to identify MRSA and to tally the frequency of methods used by the researchers to pinpoint MRSA. The biochemical and morphological methods include the conventional ways using standard antibiotics whereas, genetic methods look for MRSA specific genes like SCCmec element, mecA, mecC, etc. MRSA possess PBP2a, which can be identified using specific anti PBP2a antibody, brings it under rapid kit-based MRSA identification method. The frequency of the biochemical and morphological, genotypic and rapid kit-based identification methods is 72%, 62% and 19% respectively; whereas the specificity of the biochemical and morphological method and rapid kit-based methods vary between 82-95% and 81-100% respectively. Using whole clinical samples to culture along with the rapid kit-based methods will enhance our chances to identify MRSA rapidly. For the prevention of disease rapid identification is always the utmost priority.*

Keywords: mecA, MRSA, Penicillin, PBP2a, SCCmec, Staphylococcus aureus, VRSA

Background: The Bacteria –

Staphylococcus aureus is an 1µm diameter organism, colonizing the nasal cavity of humans as well as other organisms (Sadiq et al., 2020), which can cause multiple infections including blood stream infections (BSI), toxic shock syndrome (TSS), Staphylococcal food borne diseases, skin infections, sepsis, and other life threatening diseases(Ki & Rotstein, 2008; Tong, Davis, Eichenberger, Holland, & Fowler, 2015).*S.aureus* acquires an arsenal of some genes viz, Antibiotic resistance genes (ARGs), Virulence factors encoding genes (VFGs) which can be transferred from one generation to another with the help of Horizontal gene transfer (HGT) and recombination methods (Naorem, Urban, Goswami, & Fekete, 2020).The ARGs and VFGs independently can influence the drug resistance in the organism, making it difficult to deal. One such drug resistant *Staphylococcus aureus* is MRSA (methicillin resistant *Staphylococcus aureus*). MRSA is resistant against a broad range of antibiotics(Singh et al., 2017) including β-lactam antibiotics, co-trimoxazole, ciprofloxacin, erythromycin and so on. Very few antibiotics are available to combat with MRSA infection such as vancomycin, teicoplanin and linezolid (Adwan et al., 2013), eventually vancomycin resistant *Staphylococcus aureus* (VRSA) has also emerged in India as well as in other corners of the globe(Shaw & Mazumder, 2021).Focusing upon the prevalence of the deadly MRSA infection in different regions of India in a yearly manner has revealed that the burden is spiking high, making it difficult to check the outbreak. From the year 2015 to 2020, the prevalence of MRSA in India has increased from 37% to 69% respectively(Patil et al.) and also the MRSA is endemic in India(Indian Network for Surveillance of Antimicrobial Resistance (INSAR) group, 2013) as well as in United States (Escudero, 2014). As far as the mortality due to MRSA/*Staphylococcus aureus* is concerned, this bacterium seems to be highly infectious as well as dangerous for the human kinds. The mortality rate varies from 10% to 63.8% depending upon the kind of infection as well as coinfection (table-1).

Delay in MRSA identification may lead to severe life-threatening issues in MRSA infected patients. Present study aims to take a bird's eye view on various available identification methods to identify MRSA. This review also aims to suggest a probable way to identify MRSA without taking much time.

Some total of approx. 120 articles' abstract were reviewed using keyword "MRSA identification" between the year 2010 and 2020. 41 articles were found to be relevant with the study, further excluding the review articles/book chapters/books we get 32 published papers for the review.

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Name of the teacher: Dr. Bhuban Chandra Das

Title of paper: Magneto-Soret-Dufour thermo-radiative double-diffusive convection heat and mass transfer of a micropolar fluid in a porous medium with Ohmic dissipation and variable thermal conductivity

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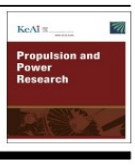

ORIGINAL ARTICLE

Magneto-Soret-Dufour thermo-radiative double-diffusive convection heat and mass transfer of a micropolar fluid in a porous medium with Ohmic dissipation and variable thermal conductivity

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Double diffusive convection;
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Abstract This paper deals with developing a numerical boundary layer flow model to analyze convective heat transfer characteristics of a micropolar fluid past a vertical plate in a composite material with viscous-Ohmic dissipations in the presence of a transverse magnetic field. The basic governing equations are solved numerically by using the Runge-Kutta-Fehlberg method. The computed results reveal a reduction in the velocity, temperature, and microrotation profiles by increasing the Prandtl number. Also, the concentration distribution is enhanced by enhancing or decreasing Soret-Dufour parameter, and there seems to be decremented in the skin-friction coefficient values with Schmidt number.

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Name of the teacher: Mr. Sanjay Kumar Paul

Title of paper: Exploring the possibility of drug repurposing for cancer therapy targeting human Lactate dehydrogenase A: a computational approach

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Exploring the possibility of drug repurposing for cancer therapy targeting human lactate dehydrogenase A: a computational approach

Sanjay Kumar Paul[a], Kaustav Dutta Chowdhury[a], Santi Ranjan Dey[a], Ayantika Paul[b] and Rajen Haldar[b]

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ABSTRACT

Human lactate dehydrogenase A (LDHA) is an anaerobic glycolytic enzyme involved in the inter-conversion of pyruvate to lactate. The level of LDHA in various types of cancer cells is found to be elevated and the dependence of cancer cells on anaerobic glycolysis is viewed as the reason for this elevation. Moreover, inhibition of LDHA activity has been shown to be effective in impairing the growth of tumors, making the LDHA as a potential target for cancer therapy. In this computational study, we have performed a pharmacophore based screening of approved drugs followed by a molecular docking based screening to find a few potential LDHA inhibitors. Molecular dynamics simulations have also been performed to examine the stability of the LDHA-drug complexes as obtained from the docking study. The result of the study showed that darunavir, moxalactam and eprosartan can bind to the active site of LDHA with high affinity in comparison to two known synthetic inhibitors of LDHA. The results of the molecular dynamics simulation showed that these drugs can bind stably with the enzyme through hydrogen bond and hydrophobic interactions. Hence, it is concluded that darunavir, moxalactam and eprosartan may be considered as potential inhibitors of LDHA and can be used for cancer therapy after proper validation of their effectiveness through in vitro, in vivo and clinical trials.

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KEYWORDS
lactate dehydrogenase A; drug repurposing; darunavir; moxalactam; eprosartan

Introduction

Efforts to find simple, safe and inexpensive cancer treatments have been going on for a long time. Various studies have repeatedly suggested that the distinguished features of cancer cells could be exploited to design blueprints to specifically kill cancer cells (Pucci et al., 2019). One such feature that has currently attracted the attention of scientists is the altered cellular metabolism exhibited by some cancer cells (Heiden et al., 2009; Vander Heiden, 2011, Mishra & Banerjee, 2019). For example, in normal resting cells, respiration occurs by cytoplasmic glycolysis followed by mitochondrial oxidative phosphorylation, however, in case of many cancer cells the oxidative phosphorylation is bypassed by the energy inefficient anaerobic glycolysis or glycolysis followed by lactic acid fermentation, which is a characteristic of hypoxic tissue (Ward & Thompson, 2012; Zhao et al., 2011). This phenomenon is also known as the Warburg effect (Liberti & Locasale, 2016). The reason for this altered cellular respiration in cancer cells is presumably the hypoxia, which they commonly encounter in the tumor microenvironment (Emami Nejad et al., 2021). So, if a way to stop this anaerobic respiration of cancer cells could be discovered, it might be used for cancer therapy.

The transition from oxidative phosphorylation to anaerobic glycolysis requires the enzyme lactate dehydrogenase which catalyzes the last step of anaerobic glycolysis i.e. inter-conversion of pyruvate to L-lactate with concomitant inter-conversion of NADH to NAD+ (Dashty, 2013; Li et al., 2015). This makes sense why most of the tumor cells over-express the lactate dehydrogenase enzyme. Few studies also indicate that tumor cells may release the overproduced LDH through their damaged cell membrane, resulting in increased serum LDH levels in cancer patients, which also can be detected clinically (Jurisic et al., 2015).

Detailed observation of the structure of lactate dehydrogenase shows that it is a tetrameric protein consisting of two types of subunits: M (muscle type) or H (heart type) encoded by two genes (*ldh*-A and *ldh*-B respectively). These two types of subunits through differential combination may assemble into five isozymes (Farhana & Lappin, 2021). Studies have shown that the homotetrameric lactate dehydrogenase A (LDHA) also known as LDH5 isozyme is the key player in cellular anaerobic respiration and the elevated level of this isozyme contributes greatly to cancer proliferation and survival (Augoff et al., 2015, Feng et al., 2018; Miao et al., 2013). The increase in LDHA level in cancer cells is viewed as the consequence of initiation of some transcriptional programs by the oncogenes such as Src, Myc and Ras in order to adapt with the hypoxic tumor microenvironments (Dang & Semenza, 1999). The stabilization of hypoxia inducible factor 1 alpha (HIF-1α) is the most important among them that contributes to the up regulation of LDHA along with other glycolytic enzymes (Semenza et al., 1996).

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Title of paper:Understanding the Role of Flavonoid Based Small Molecules in Modulating the Oncogenic Protein-Protein Interactions: A Quest for Therapeutic Arsenal

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Understanding the Role of Flavonoid Based Small Molecules in Modulating the Oncogenic Protein-Protein Interactions: A Quest for Therapeutic Arsenal

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ABSTRACT

We explored the anticancer activity of two synthetic flavonoid-based small molecules, HMDC and HMDF, with bioactive methylenedioxy functionality. HMDF inhibited the proliferation of the p53 wild-type (NCIH460 and A549), and p53 null (NCIH1299) non-small cell lung cancer and breast cancer (MCF-7) cells more potently than HMDC without significant cytotoxic effects on the normal lung-epithelial (L132) and macrophage (Raw 264.7) cells. HMDF mediated reduction of the cell proliferation occurred due to its attachment at the p53-binding domain of MDM2 (also evident from molecular docking analysis), which induced the disruption of the p53-MDM2 interactions. Ultimately, a higher expression of p53 in the NCIH460 cells was observed. The up-regulated p53 level instigated apoptosis of cancer cells. However, MDM2 expression level remained unaltered. The docking studies further indicate that HMDF can suppress the anti-apoptotic activity of Bcl-2 protein by blocking its BH3 domain.

1. Introduction

The diverse range of protein-protein interactions (PPIs) greatly influences a broad spectrum of vital biological processes indispensable for the survival of living organisms [1–5]. However, the disruption of the PPI network is the root cause of many human diseases, most commonly, multiple forms of cancer [6]. Therefore, the identification and modulation, i.e., either inhibition or stabilization of the aberrant PPIs and associated transcription factors that regulate the signaling cascades [3–7], are essential for developing efficient anti-cancer therapeutic agents with lesser side effects.

The murine double minute 2 (MDM2) gene encrypts a negative regulator of the tumor suppressor protein 53 (p53) that plays a fundamental role in regulating the cell cycle, apoptotic cell death, DNA repair mechanism, and innate immunity [8]. p53 is the master regulator of several cellular signaling pathways, and it also encodes a redox-sensitive transcription factor which generates a beneficial anti-cancer effect towards the genotoxic DNA damage [9]. Tumor suppressor p53 turns out to be inactive in almost 50% of human cancers, including non-small-cell lung cancer (NSCLC), due to its mutation or deletion [9–11]. Here, it is noteworthy that lung cancer is the most fatal and critical factor of cancer-related deaths worldwide [12]. Therefore, PPIs involving MDM2 and p53 are among the most widely studied areas of cancer research.

MDM2 effectively suppresses the p53 activity through three mechanisms. Firstly, MDM2 binding to p53 at its trans-activation domain blocks the p53 transcription activity. Secondly, MDM2 can promote the nuclear export of p53, and lastly, MDM2 acts as an E3 ubiquitin ligase triggering the proteasome-mediated degradation of p53 [13–15]. Therefore, the maintenance and revival of the function of p53 with simultaneous inhibition of the MDM2 activities are emerging as promising therapeutic strategies for developing effective anti-cancer drugs [16].

Nowadays, many pieces of research are carried out to shed light on the therapeutic potentials of small molecules towards the modulation of intracellular PPIs. Small molecules are being extensively explored as PPI modulators due to their (i) ability to bind to a specific bio-target, e.g., protein or nucleic acid, and altering its function; (ii) access to a wide range of organs with high cell-penetrating effects and active site-specificity; (iii) ability to modulate multiple targets simultaneously as well as reversibly and (iv) high metabolic stability.

Plant-derived secondary metabolites, e.g., flavonoids, are well-known examples of naturally occurring small molecules with po-

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HOME STAY TOURISM AND ITS SUSTAINABLE APPROACH IN RURAL DEVELOPMENT: AN APPRAISAL FROM EASTERN HIMALAYA

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ABSTRACT

Sustainable tourism development is critical to the conservation of nature and the preservation of indigenous culture. This is a contemporary global –national-regional-local issue with the adoption of the Sustainable Development Goals, to which India too is committed. Tourism destinations often are dependent on natural and cultural/heritage resources to form their attractions bases, which are linked to the economic vitality of local communities. One such unexplored areas is Ryshop, a small rural village and hill station of West Bengal, which is the tranquility of nature with its virgin untapped forest, and the serene Kanchenjunga within the lap of the mighty Himalayas. The lush greenery, panoramic view of hills and the simplicity of the indigenous inhabitants attracts the urban tourists to this place. The paper attempts an empirical presentation addressing the concept of home stay. A home stay by its combined words (home-stay) involves the staying of tourists at some one's home as a paying guest for a short-term period to feel at home, away from home. This stay may be provided at an individual level (a family) or at a community level (local communities) providing accommodation and other requisite consumer services for these short time visitors. Such a venture provides an economic incentive to the local people especially the poor who are residing in these sparsely populated regions. It also adds an ethnic flavor to the consumer's (tourist) taste. The concept of home stay tourism is an emerging perception on tourism introduced recently into the Indian tourism sector. The tourism sector to sustain should be in harmony with each local environment and culture. It is seen that, the sustainability approach is very much in vogue in this area; adopted by the local community. The social equity, environmental protection, and economic livability here sets an example which can be practiced at present in the Eastern Himalayan region especially in rural India with its multiple possibilities, and huge tourism opportunities. This primary level field based study has been conducted administering questionnaires, as well as with the help of individual open ended interviews and group discussions. This finding can be exemplified elsewhere as an approach on sustainable development of tourism through the community participation and management practiced at village level.

Keywords: Tourism, Home-Stay, Community, Sustainable Development.

I. INTRODUCTION

Tourism is the collection of activities, services and industries that delivers a travel experience, including transportation, accommodation, eating and drinking establishments, retail shops, entertainment business and other hospitality services provided for individuals or groups travelling away from home. The World Tourism Organization (WTO) defined sustainable tourism development as "that which meets the needs of present tourist and host regions while protecting and enhancing opportunities for the future". Sustainable tourism or Ecotourism is as an instrument to empower indigenous communities in a particular area (Sofield, 2003). Its goal is to achieve conservation and community development through the provision of economic and social benefits to the local communities for their well-being (Chapman, 2003). This is a contemporary global –national-regional-local issue with the adoption of the Sustainable Development Goals, to which India too is committed. Home-stay tourism is one of the aspects of sustainable ecotourism that endeavors to conserve the natural, cultural, and built environment; provide economic, environment and social benefits to local residents and provide a high-quality experience for the guests. Developing approaches that are able to touch upon each of these areas can ensure the long-term success of the community. Community based ecotourism through the home-stay model is one of the top activities promoted in society to reduce the incidence of rural poverty (Leksakundilok, 2004). A home stay by its combined words (home-stay) involves the staying of tourists at some one's home as a paying guest for a short-term period to feel at home, away from home. This stay may be provided at an individual level (a family) or at a community level (local communities) providing

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