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Myth in Sri Aurobindo's Poem: 'Love and Death'

GOBINDA BHAKTA

Abstract

The poem "Love and Death" is a mythical poem which is based on Indian epic, The Mahabharata and the Greek Mythical story, Orpheus and Eurydice. In this paper, I focus the light on the poem from the angle of mythical point. The theme of love predominates over death. Here the hero, Ruru due to his youthfulness and deep passion for love makes an arduous journey for entering into the kingdom of death to meet Yama, to get back the life of his beloved Priyamvada. Thus the whole journey and his struggle against the God of death in patala for the soul of his beloved are described from mythical point.

Keywords: Myth, Love, Death, Hell, Fate, God.

Myth is a traditional or legendary story. It is derived from the Greek word 'Mythos' which simply means 'story'. The active being in myths are generally gods and goddesses, heroes and heroines or animals and plants. Most myths are set in a timeless past before recorded time or beginning of the critical history. A myth is a sacred narrative because it holds religious or spiritual significance for those who tell it. Myths also contribute to and express a cultural system of thought and values. The Oxford Dictionary defines the term, myth thus: "A purely fictitious narrative usually involving supernatural person's actions or events and embodying some popular idea concerning natural or historical phenomena".

The definition clearly brings out three important basic aspects of the term, Firstly, Myth is a purely imaginative narrative. Secondly, it usually involves supernatural persons, actions or events; lastly, it embodies some popular ideas concerning natural or historical

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Study of Haemoglobin Level and Tumour Growth on Mouse Ascites Tumour in Response to Combination Effect of 2-Methoxyestradiol and Cyclophosphamide

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Abstract: S-180 tumour bearing mice were subjected to 2-Methoxyestradiol (2ME) and Cyclophosphamide (CP) monotherapy and 2ME and CP combination therapy on 7th day of ascetic tumour cell transplantation when the tumour growth was at log phase. Then, the effect has been studied on host's system in respect to dead cell - living cell frequency, tumour volume, haemoglobin percentage, and differential count of WBC. In 2ME and CP combination therapy, a steady increase in the dead cell or non-living cell population was noted with the steady decrease in tumour volume. Haematological studies from peripheral blood revealed a drastic depletion in neutrophil count and elevation of lymphocyte population on the 12th day and 16th day of tumour transplantation in combination therapy series. Moreover, the haemoglobin concentration is more or less stable in combination therapy treatment series. So, the 2ME and CP combination therapy provides some protective compensatory mechanisms in the body of the host.

Keywords: Combination therapy, Differential count, Viable cell, Haemoglobin Percentage, 2-Methoxyestradiol, Cyclophosphamide.

INTRODUCTION

Cancer is a complex multistage genetic disease in which a group of normal cells transforms into metastatic malignant cells. At present, surgery, radiation therapy and chemotherapy are common methods of cancer treatment. Among these, chemotherapy has become much popular due to some reasons. Firstly, it prevents cell proliferation by interfering with their ability to replicate DNA and secondly, it can induce apoptosis in cancerous cells [1-4].

MATERIALS AND METHODS

Experimental animal

Swiss Albino adult mice (*Mus musculus*) with an average body weight of 20g were grouped and housed in normal laboratory condition for acclimatization at 24° - 25°C temperatures. Mice were provided standard mice food and water ad libitum.

Selection of animal tumour model

Sarcoma 180 (S-180), a well-known transplantable tumour, was maintained intraperitoneally in Swiss albino mice (1 x 10⁶ cells/ animal). All experiments were done in accordance to the guideline of Institutional Animal Ethics Committee (IAEC).

S-180 tumour transplantation

Freshly aspirated S-180 tumour cells were diluted with 0.9% normal saline under sterile condition and were injected intraperitoneally to normal mice for induction of ascitic tumour [14-15] for pursuing our experiments.

But this type of treatment has some toxic side effects on normal cells. Many chemotherapeutic agents may induce cytological abnormalities (i.e. chromosomal aberrations) as well as haematological abnormalities. Use of combination treatment is a novel idea to treat cancer as combination therapies may induce less toxic side-effects at cytological and haematological level. Moreover, good combination may protect the host from some undesirable effects. In the present study, 2-Methoxyestradiol (2ME)-an anti-angiogenic, anti-neoplastic [5-10] agent has been used in combination with an alkylating anti-tumour drug cyclophosphamide (CP). CP has been used in different cancer patient as monotherapy and combination therapy [11-13]. Different types of cytological effects of 2ME and CP have been reported in different animal tumour model systems [9,10] but its effect on host's hemopoietic system during the period of treatment has not been studied yet. So, the present study has been oriented to find out the effect of monotherapy of 2ME, CP and combination therapy of 2ME and CP at haematological level during the course of treatment using Sarcoma180 tumour bearing mouse.

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RESEARCH ARTICLE

Novel combination of 2-methoxyestradiol and cyclophosphamide enhances the antineoplastic and pro-apoptotic effects on S-180 ascitic tumour cells

Srabantika Mallick¹ · Atish Barua² · Goutam Paul³ · Samarendra Nath Banerjee¹

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Abstract Sarcoma 180 (S-180) tumour cell line is a stable murine tumour cell line with 98–99% stumour takes capacity in Swiss albino mouse - *Mus musculus*. 2 Methoxyestradiol (2ME) - a promising anti-neoplastic and anti-angiogenic agent, showed toxicity to host body in higher concentration. Cyclophosphamide (CP), the anti-neoplastic agent has long been used as a chemotherapeutic drug for treatment of different cancers. Our studies have shown that the combination effect of 2ME and CP on S-180 tumour cell line is anti-proliferative and less toxic. The treatment with lower concentrations of 2ME and CP (6.5 mg 2ME/kg body weight + 75 mg CP/kg body weight) antagonistically increased the life span of tumour bearing mice and synergistically inhibited the viable cell population. 2ME or CP treatment individually induces G₂/M arrest. The combination treatment of 2ME + CP (6.5 mg 2ME/kg body weight + 75 mg CP/kg body weight) produced a significant increase of cells in the G₀ which is the indication of cell arrest or apoptosis. Reduction of cell viability by 2ME + CP treatments is due to apoptotic cell death. This combination therapy produced a significant inhibitory effect of cell proliferation and augmentation of cell accumulation in the G₀ phase (i.e. apoptosis). Apoptosis is

validated by Fluorescence staining of control and treated S-180 tumour cells with Acridine Orange and EtBr dye. Moreover, a steady increase in the frequency of complex chromosomal aberrations (i.e. tri-, quadri-radial translocations) in tumour cells was noted in that particular concentration of combination therapy treated series along with the increase in dead cell frequency and tumour regression pattern. It is assumed that, these chromosomal abnormalities or damages recorded in higher frequency prevent the affected metaphases to enter into the next cell cycle through apoptosis or necrosis. This study introduces a novel combination, where this particular concentration of 2ME + CP (i.e. 6.5 mg 2ME/kg body weight + 75 mg CP/kg body weight) not only enhanced the life span of tumour bearing mouse and decreased the tumour volume antagonistically but also inhibited the viable cell population synergistically, which could serve as a potential effective regimen for cancer treatment.

Keywords Apoptosis · Chromosome · Chou-Talalay method · Combination effect · Combination index · Cyclophosphamide · 2 Methoxyestradiol · S-180 tumour cell line

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Abbreviations

AO	Acridine orange
CP	Cyclophosphamide
EtBr	Ethidium bromide
2ME	2Methoxyestradiol
S-180	Sarcoma 180
CI	Combination Index

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COMMON FIXED-POINT THEOREMS FOR HYBRID GENERALIZED (F, φ) -CONTRACTIONS UNDER THE COMMON LIMIT RANGE PROPERTY WITH APPLICATIONS

H. K. Nashine,¹ M. Imdad,² and M. Ahmadullah²

UDC 517.9

We consider a relatively new hybrid generalized F -contraction involving a pair of mappings and use this contraction to prove a common fixed-point theorem for a hybrid pair of occasionally coincidentally idempotent mappings satisfying the generalized (F, φ) -contraction condition with the common limit range property in complete metric spaces. A similar result involving a hybrid pair of mappings satisfying the rational-type Hardy–Rogers (F, φ) -contractive condition is also proved. We also generalize and improve several results available from the existing literature. As applications of our results, we prove two theorems on the existence of solutions of certain systems of functional equations encountered in dynamic programming and the Volterra integral inclusion. Moreover, we present an illustrative example.

1. Introduction and Preliminaries

Let (X, d) be a metric space. Then, following Nadler [28], we adopt the following notation:

$CL(X) = \{A : A \text{ is a nonempty closed subset of } X\}$;

$CB(X) = \{A : A \text{ is a nonempty closed and bounded subset of } X\}$;

for nonempty closed and bounded subsets A and B of X and $x \in X$,

$$d(x, A) = \inf\{d(x, a) : a \in A\},$$

and

$$\mathcal{H}(A, B) = \max\left\{\sup\{d(a, B) : a \in A\}, \sup\{d(b, A) : b \in B\}\right\}.$$

Recall that $CB(X)$ is a metric space with the metric \mathcal{H} , which is known as the Hausdorff–Pompeiu metric on $CB(X)$.

In 1969, Nadler [28] proved that every multivalued contraction mapping defined on a complete metric space has a fixed point. In proving this result, Nadler used the idea of Hausdorff metric to establish the following multivalued version of the Banach contraction principle:

Theorem 1. *Let (X, d) be a complete metric space and let \mathcal{T} be a mapping from X into $CB(X)$ such that, for all $x, y \in X$,*

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

where $\lambda \in [0, 1)$. Then \mathcal{T} has a fixed point, i.e., there exists a point $x \in X$ such that $x \in \mathcal{T}x$.

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Relation-theoretic metrical coincidence and common fixed point theorems under nonlinear contractions

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ABSTRACT

In this paper, we prove coincidence and common fixed points results under nonlinear contractions on a metric space equipped with an arbitrary binary relation. Our results extend, generalize, modify and unify several known results especially those are contained in Berzig [J. Fixed Point Theory Appl. 12, 221-238 (2012)] and Alam and Imdad [To appear in Filomat (arXiv:1603.09159 (2016))]. Interestingly, a corollary to one of our main results under symmetric closure of a binary relation remains a sharpened version of a theorem due to Berzig. Finally, we use examples to highlight the accomplished improvements in the results of this paper.

2010 MSC: 47H10; 54H25.

KEYWORDS: complete metric spaces; binary relations; contraction mappings; fixed point.

1. INTRODUCTION

Banach contraction principle (see [8]) continues to be one of the most inspiring and core result of metric fixed point theory which also has various applications in classical functional analysis besides several other domains especially in mathematical economics and psychology. In the course of last several

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ORIGINAL RESEARCH ARTICLE

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T11TS repress gliomagenic apoptosis of bone marrow hematopoietic stem cells

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Combating gliomagenic global immunosuppression is one of the emerging key for improving prognosis in malignant glioma. Apoptosis plays a pivotal role within the adult hematopoietic system particularly in regulating the cells of immune system. Gliomagenic regulation of apoptotic mediators within bone marrow milieu has not been elucidated. We previously demonstrated that administration of membrane glycopeptides T11 target structure (T11TS) not only rejuvenate bone marrow hematopoietic stem cells (BMHSCs) from glioma mediated hibernation by inhibiting gliomagenic overexpression of Ang-1/Tie-2 but also stimulate glioma mediated diminution of expression CD34, c-kit, and Sca-1 markers. In the present study, we investigated the impact of glioma on apoptotic signaling cascades of BMHSCs and consequences following T11TS therapy. Bone marrow smear and Annexin V staining confirm gliomagenic acceleration of apoptotic fate of BMHSCs whereas T11TS treatment in glioma-bearing rats disrupted apoptosis of BMHSCs. Flowcytometry, immunoblotting, and immunofluorescence imaging results revealed multi potent T11TS not only significantly down-regulates gliomagenic overexpression of Fas, Fas L, Bid, and caspase-8, the pro-apoptotic extrinsic mediators but also strongly inhibits cytosolic release of cytochrome-c, Apf-1, and Bax to deactivate gliomagenic caspase-9, 3 the key intrinsic apoptotic mediators followed by up modulation of anti-apoptotic Bcl-2 in glioma associated HSCs. T11TS is also able to diminish the perforin-granzyme B mediated apoptotic verdict of BMHSCs during gliomagenesis. The anti-apoptotic action of T11TS on glioma associated BMHSCs provide a crucial insight into how T11TS exerts its immunomodulatory action against glioma mediated immune devastation.

KEYWORDS

apoptosis, glioma, HSCs, immunotherapy, T11TS

1 | INTRODUCTION

The journey of HSC's destination is to progress through the cell cycle or remain quiescent. Following successive cell division, the active cells can either reside in the fortified niche or migrate, based on special developmental cues at specific time points. The essential alternative choices of HSCs are required to be made in between self-renewal and differentiation. In order to assure a persistent pool of regenerating cells without outgrowth of immature cell types, a tight regulation of HSC division is required (Domen, 2001). The importance of apoptosis, in combination with proliferation and self-renewal toward maintaining stable HSCs populations has become increasingly important. During stress-free normal physiological process apoptosis plays a pivotal role

in hematopoietic stem cells in eliminating aged and non-functional cells (Orelio & Dzierzak, 2007; Smith, 2003). Disruptive consequences of perturbed apoptosis of hematopoietic system and its correlation with many devastating pathological conditions have also been elaborated (Domen, Cheshier, & Weissman, 2000; Domen, 2000; Domen & Weissman, 2000). There is evidence that apoptosis plays an essential physiological role in regulating in vivo HSCs numbers, activity (Orelio & Dzierzak, 2007) and the size of the hematopoietic cell mass (Alenzi et al., 2009). Several recent investigations have provided insights into some of the key molecular mechanisms involved in regulating the cells of the immune system (Campbell, Gray, Anstee, Strasser, & Cory, 2012; Hockenbery, Zutter, Hickey, Nahm, & Korsmeyer, 1991; Lagasse & Weissman, 1994; Mason et al., 2013;

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The novel-molecule T11TS facilitated arousal of glioma-mediated dormancy of bone-marrow hematopoietic stem-cells

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Abstract

Aim: T11TS, a potent anti-gliomagenic glycoprotein, stimulates both peripheral and intracranial immune response. The status of bone marrow hematopoietic stem cells (BMHSCs), the cradle of regeneration of all blood cells, during gliomagenic global immune devastations has not yet been investigated. Therefore, we aimed to delineate the effects of T11TS on immature and mature compartments of hematopoietic machinery.

Methods: Flowcytometric analysis of cultured BMHSCs was evaluated for assessing the expression pattern of early hematopoietic stem cells (HSCs) markers such as CD34⁺, Sca-1⁺, c-kit⁺ and also Angiopoietin-1 and Tie-2 both in normal, glioma, and in T11TS treated glioma-bearing animals. Immunofluorescence imaging and western blot analyses of BMHSCs were also carried out.

Results: There was significant downregulation of HSCs-markers CD34⁺, Sca-1⁺, c-kit⁺ in ethyl nitrosourea-induced glioma-bearing animals followed by an increase in the expression level of Ang-1 and Tie-2 that determines the quiescence and self-renewability of stem cells. T11TS administration reversed the gliomagenic transformation of expression of the above mentioned markers. The results flowcytometric-analysis was also well corroborated with immunofluorescence imaging and western blot analysis.



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RAPID COMMUNICATION

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T11TS immunotherapy repairs PI3K-AKT signaling in T-cells: Clues toward enhanced T-cell survival in rat glioma model

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Malignant glioma is the most fatal of astrocytic lineage tumors despite therapeutic advances. Onset and progression of gliomas is accompanied by severe debilitation of T-cell defense and T-cell survival. One of the chief contributors to T-cell survival downstream of activation is the PI3K-AKT pathway. Our prior studies showed that the novel immunotherapeutic molecule T11-target structure (T11TS) blocks T-cell apoptosis in glioma. We also showed activation of immunological synapse components and calcineurin-NFAT pathway following T11TS immunotherapy of glioma-bearing rats. This led to investigations whether such T-cell activation upon T11TS therapy translates into activation of downstream PI3K/AKT signals which may be related to observed blockade of T-cell apoptosis. For the purpose, we assessed by flow cytometry and immunoblotting, expressions of PI3K, PDK1, AKT, p-AKT, and PTEN in splenic T-cells of normal, experimentally-induced glioma-bearing rats and glioma-bearing rats receiving first, second and third doses of T11TS. We also determined comparative nuclear translocation of NF- κ B across groups. We found significant increases in T-cell expressions of PDK1, PI3K, and p-AKT in T11TS-treated animal groups compared to sharp downregulations in glioma. AKT levels remained unchanged across groups. PTEN levels declined sharply after T11TS immunotherapy. T11TS also caused enhanced NF- κ B translocation to the T-cell nucleus compared to glioma group. Results showed heightened activation of the PI3K-AKT pathway in glioma-bearing rats following T11TS immunotherapy. These results illustrate the novel role of T11TS immunotherapy in ameliorating the PI3K pathway in T-cells in glioma-bearing animals to enhance T-cell survival, according greater defense against glioma. The study thus has far-reaching clinical outcomes.

KEYWORDS

AKT, glioma, phosphatidylinositol-3 kinase (PI3K), T-cell, T11-target structure (T11TS)

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Degradation of toxic organic dyes in aqueous medium in greener ways: Exploring the utility of Indian Curry Leaf plant and the nanoparticles synthesized using it

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ABSTRACT

Two protocols based on (1) the use of leaves of Indian Curry leaf plant (*Murraya koenigii* Spreng.) as the green adsorbent for toxic organic dye and (2) the use of monometallic Au and Ag nanoparticles (NPs) and bimetallic Ag/Au NPs (synthesized by the aqueous extract of leaves of Indian curry leaf plant) as the green catalysts for the toxic organic dyes such as Methylene blue, Nile blue and Methylene green have been developed. The protocols developed are very easy to operate and require very simple laboratory set-up. Moreover these protocols are applicable at room temperature and pressure thus minimizing the energy cost. In other words, our protocols represent a green chemical route toward the remediation of toxic organic dyes from aqueous medium.

Keywords: Organic dyes; Toxicity; Dye removal; Green adsorbent; Metal nanoparticles; Catalytic degradation

1. Introduction

Keeping the environment clean and safe has emerged as one of the main concerns for the modern society. At the same time, these are also the strategic priorities in the current research arena. Rapid industrialization brought the economic growth and social comforts but it also raised the concern for increasing environmental pollution and related health hazards. Environmental hazards such as water pollution or the contamination of the water bodies by the industrial wastes and other discharges are the threats to the living systems. There are several types of water toxicants or pollutants among which toxic organic dyes are note-worthy.

Organic dyes have extensive industrial applications. These dyes are used in the textile industries (most significantly) besides food products, cosmetics, pharmaceuticals and paper printing industries. These compounds are often toxic to the living systems and these toxicants are frequently found in industrial waste water. The highest amounts of varieties of such dyes are used by the textile industries.

There are several types of organic dyes depending upon their chemical structure, for example, azo, phthalocyanine, anthraquinone, quinone imine and xanthene dyes. However, the azo dyes are considered as the most effective and these type of dyes are easier to handle for industrial applications than dyes from natural sources but such naturally occurring

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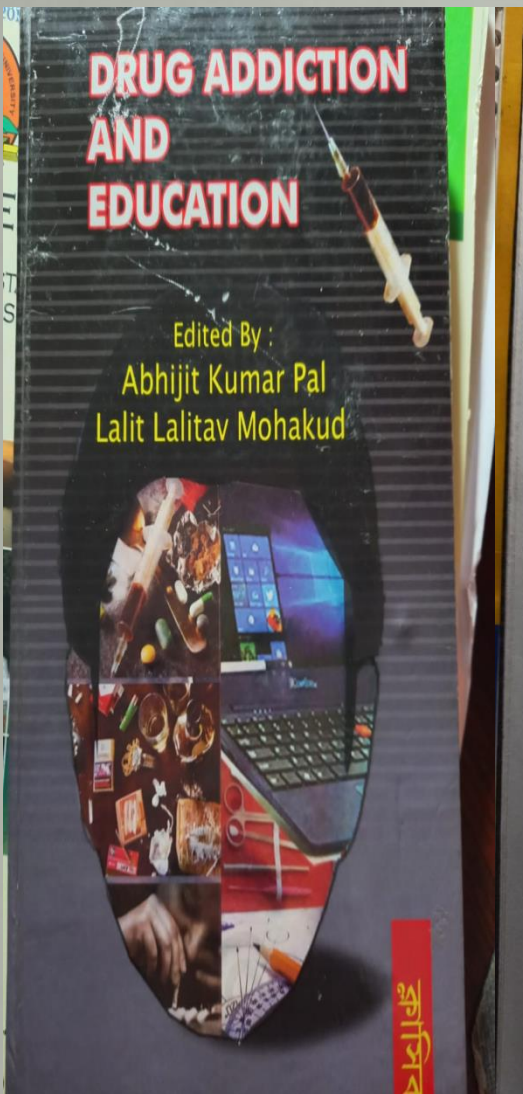
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Title of paper: New Tendency of Addiction Among the Street Children of Sealdah Station Area



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Original Research Article

Impact study of hygiene and health counselling as a controlling measure of iron deficiency Anemia

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Abstract

Background and Aim: Anemia is a moderate to severe public health problem in India. Coverage of anemia programmes are inadequate, safe water and sanitation status is moderate or poor, open defecation rates are significant, incidence of diarrhoeal diseases are high as a results of infection. Though poor bio-availability of iron is the root cause of iron deficiency anemia (IDA) the role parasites infection such as hookworm infection also plays a major role in IDA. There is a link between poor hygiene practices – worm infection– IDA. Hence this study was undertaken to educate women of reproductive age group (WRA) about impact of IDA and how good hygiene practice can eliminate the problem to at least some extent. **Methods and Material:** Women of reproductive age group (WRA) in rural population were taken randomly for this study. They was first screened for anemia and then IDA. The ID anemic women were then randomly allocated into two groups one as experimental and another as control. Base line hematological parameters and hygiene practices were obtained from them. Only the experimental group was counselled about good hygiene practices. The final hematological parameters and hygiene practices were obtained after eighteen months and were compared for statistical significance. **Results:** At the end of the study 306 women were found to be non anaemic in experimental group while in control group it was only 78 women. Statistical significant results were obtained in hygiene practices between experimental and control group. **Conclusion:** Our study hence shows that good hygiene practice does play an important role in controlling anemia.

Keywords: Anemia, Defecation, Hand washing

Introduction

Anemia is a disorder of the blood in which a person does not have enough hemoglobin, the protein responsible for carrying oxygen throughout the body.

Globally, two billion people are anaemic, which includes 315 million (95% CI: 291–340) in the South-East Asia Region (SEAR)[1]. Iron deficiency, the primary contributor to anemia, is the most widespread nutritional disorder while other micronutrient deficiencies including folate and vitamin B12 also contribute to anemia. Recent evidence indicates a greater role for anemia of inflammation caused by parasitic infections including malaria [2]. Iron deficiency anemia (IDA) is a significant public health problem in India. The National Family Health Survey (NFHS –2)[3], India reported that anemia is a major

health problem with over half of the women of reproductive age (WRA, 15-49 years) years having the condition. It was reported that 53.9 percent among women in the age group of 15-49 years living in rural area and 45.7 percent of urban women any form of anemia[3]. In the report of data in NFHS-3 it revealed that among married women between the ages of 15-49 years, the prevalence of anemia has risen from 51.8 percent in 1998-99 (NFHS-2) to 56.1 percent in 2005-06 (NFHS-3)[4]. In Chhattisgarh state as per NFHS-3 data the percentage of rural women having any form of anemia is 59.4%[5]. Thus, it is obvious that this problem clearly requires immediate attention and intervention. There are many causes of low hemoglobin, which involve too little production or too much destruction of hemoglobin. On the production side, Nutritional deficiencies, mainly of iron, caused by inadequate diet is the predominant cause of anemia in the south east Asia region (SEAR) [6].

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RESEARCH ARTICLE

Does effective counseling play an important role in controlling iron deficiency anemia among pregnant women

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ABSTRACT

Background: Anemia during pregnancy is a common problem in most developing countries. According to the World Health Organization (1968), iron deficiency anemia (IDA) was present in 40–99% of pregnant women. Although many government projects have been introduced to eliminate this public health menace, non-compliance of iron and folic acid (IFA) supplementation due to various reasons made the projects unsuccessful. Hence, it is time to reexamine the problem of anemia in pregnancy, to assess more carefully the local etiological factors for prevailing and responsible for IDA, and then to design new strategies for prevention of the same. **Aims and Objectives:** The main of this study is to provide counseling to IDA pregnant women by effective communication and to study the impact of counseling on hematological indices. **Materials and Methods:** Pregnant women of rural population were first screened for IDA and then IDA women were grouped into experimental and control group. The experimental group women received counseling regarding benefits of regular IFA supplementation and good hygiene practices while the women in the control group were devoid of such counseling. Data on hematological parameters, hygiene practices, and IFA supplementation were taken from both groups and also after the end of the study. Data were then analyzed for statistical significance. **Results:** Our study showed statistically significant improvement in anemic status among pregnant women of the experimental group. **Conclusion:** In our study, it can be concluded that community-based interventions by means of effective communication help in improving anemic status in pregnant women.

KEY WORDS: Iron Deficiency Anemia; Pregnant Women; Iron and Folic Acid Compliance; Hygiene Practices

INTRODUCTION

Pregnancy is a physiological condition, and there is usually no side effect on general health of a pregnant woman. Pregnancy results in hematological and hemodynamic changes. Changes

such as increased total blood volume and hemostatic changes are indeed very helpful to combat the hazards of hemorrhage during the time of delivery.^[1] The increase of plasma volume is less in iron deficient women than in those with optimum iron reserves. In some iron deficient women, this inability to expand plasma volume may sometimes even mask a decrease in hemoglobin (Hb) concentration.^[2]

Iron requirements are greater in pregnancy. Although iron requirements are reduced in the 1st trimester in absence of menstruation, these raise steadily thereafter as high as ≥ 10 mg/day.^[3] The amounts that can be absorbed from even an optimal diet, however, are less than the iron requirement in

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Does socioeconomic status of women play an important role in controlling iron deficiency anaemia

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Abstract
Anaemia among which iron deficiency anaemia (IDA) is most prevalent in women especially of the reproductive age (WRA). Though supplementation with iron helps to some extent in reducing anaemia but if the root causes are not uprooted then there are always chances of recurring anaemia cases and this is evidence from the prevalence of anaemic from NFHS-3 study. Our aims in this study was to study how anaemia can be controlled by nutritional counselling and the role of socioeconomic status of the women in anaemia eradication. The rural women were first screened for IDA and then randomly allocated into two groups designated as experimental and control group. The control group was devoid of any counselling from the authors. Our results at the end of the study shows that the women of experimental group were less anaemic compared to the women in the control group and the poor economic group had more percentage of anaemic women than that of the high economic group. Hence we may conclude that nutritional counselling proves beneficial in controlling anaemia and anaemic condition is more prevalent in women in poor economic status.

Keywords: Iron deficiency anaemia, Women of reproductive age group, socioeconomic status

1. Introduction
Almost 800 million women are affected by anemia worldwide. In India, it is classified as a major public health problem as it is estimated that 52% of non-pregnant women of reproductive age are anaemic [1]. Anaemia is defined as a reduction in the red cell mass in blood resulting in a drop in the amount of oxygen supply to meet the metabolic needs of the body [2]. According to World Health Organization (WHO) the global burden of deaths that is attributable to anaemia in women of reproductive age ranges from 16 800 to 28 000 annually with a greater risk of anaemia-related death in younger women [3]. Anaemia is also an important factor that negatively impacts the health of the women and their ability to work, particularly in their reproductive years, and leads to increased infant and maternal mortality [4, 5, 6]. Iron-deficiency anemia has important consequences for the future generations, as iron-deficiency anemia increases the risk for preterm labor, low birth weight, infant mortality and predicts iron-deficiency in infants after 4 months of age [7, 8]. Anaemia, of which iron-deficiency is the major contributor, accounts for 3.7% and 12.8% of maternal deaths during pregnancy and childbirth in Africa and Asia, respectively [9]. It also leads to cognitive deficits and reduced intellectual performance among school children [10]. Iron-deficiency anemia is observed when dietary intakes of iron declines, when iron is not sufficiently absorbed, when bodily requirements increase, or in cases of excessive blood loss [11, 12]. Economic analysis shows that iron-deficiency anaemia can be easily cured with low-cost measure, such as through the provision of dietary education at diagnosis. The National Family Health Survey (NFHS-2), India reported that anaemia is a major health problem with over half of every married woman in the age group of 15-45 years having the condition. It was reported that 53.9 percent among women in the age group of 15-49 years living in rural area and 45.7 percent of urban women any form of anaemia. In the report of data in NFHS-3 it revealed that among married women between the ages of 15-49 years, the prevalence of anaemia has risen from 51.8 percent in 1998-99 (NFHS-2) to 56.1 percent in 2005-06 (NFHS-3). In Chhattisgarh state as per NFHS-3 data the percentage of rural women having any form of anaemia is 59.8%.

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Research Article

PROTECTIVE ROLE OF CRUDE EXTRACT OF *AMORPHOPHALLUS CAMPANULATUS* AGAINST ETHANOL-INDUCED OXIDATIVE RENAL DAMAGE

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ABSTRACT

Objective: The current study investigates the nephroprotective effect of *Amorphophallus campanulatus* against chronic alcohol-induced oxidative stress and tissue damage.

Methods: The rats were simultaneously supplemented with ethanolic extract of *A. campanulatus* along with ethanol (40% w/v) 2 g/kg body weight/day for 30 days to evaluate the nephroprotective effect against alcohol toxicity. Renal antioxidant enzymes, serum urea, creatinine, and pro-inflammatory cytokines were assayed biochemically. Histomorphological and histochemical alterations were detected by Hematoxylin and Eosin, periodic acid Schiff, and Feulgen and Picrosirius stain, respectively. The degree of apoptotic cell death was examined by terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL) assay technique.

Results: Serum urea, creatinine, pro-inflammatory cytokines, tissue TBARS, and activity of glutathione metabolizing enzymes were significantly ($p < 0.01$) elevated, whereas cytosolic and mitochondrial superoxide dismutase, catalase, and levels of reduced glutathione were significantly ($p < 0.001$) decreased in the EtOH group compared to control. However, ethanolic extract of *A. campanulatus* (ACE) supplementation to the EtOH rats reversed these effects to normal levels. Furthermore, degenerative changes in renal cells with alcohol treatment were minimized to nearness in architecture by ACE supplementation. Glycogen and deoxyribonucleic acid depletion, excess fibrosis due to collagen deposition, and increased apoptotic cell number were also restricted by ACE supplementation, with the higher dose being more promising.

Conclusion: Thus ethanol-induced nephrotoxicity was attenuated by ACE treatment by the antioxidative and antiapoptotic property of the extract. Such effects of the extract may be due to the probable presence of different bioactive components in the tuber. Hence, it can be used as a regular nutrient or therapeutic agent to protect the renal cells.

Keywords: Apoptosis, Fibrosis, Nephrotoxicity, Oxidative stress, Pro-inflammatory cytokines, TUNEL.

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INTRODUCTION

Consumption of alcoholic beverages is considered as a usual habit in most societies around the world. Alcoholism is a serious human health ailment that can disturb the important defense systems in the body, including kidney tissue. The liver is the primary organ responsible for the oxidation of ingested alcohol, but other tissues, including the kidney, may contribute to alcohol metabolism as well [1]. Regular alcohol consumption raises the blood pressure, which *per se* is a risk factor for renal damage [2]. Besides, excess alcohol intake increases free radical or reactive oxygen species (ROS) production and causes oxidative stress by compromising the antioxidant defense system, production of the reactive product acetaldehyde, damage to mitochondria, and altered cytokine production [3-5]. ROS-induced altered antioxidant system causes continued damage to the vital biomolecules, and this condition ultimately gives way to impaired kidney function [6].

In the recent time, many natural products are being used to protect the tissues from various drugs or chemical-induced toxicities. The use of plants as food and medicinal remedies since ancient times is partially attributed to the biological efficacy of secondary metabolites that possess antioxidant activities such as phenolic compounds, Vitamins C and E, and carotenoids [7].

Currently, research interest has been focused on the role of antioxidants as well as antioxidant enzymes, in the treatment and prevention of the diseases mentioned above. The most commonly used antioxidants at present are vitamins, butylated hydroxyanisole, butylated

hydroxytoluene, propyl gallate, and tert-butylhydroquinone. However, they are suspected of being responsible for liver damage and acting as carcinogens in laboratory animals. Therefore, the development and utilization of more effective antioxidants of natural origin are desirable [8].

In Southeast Asian countries, besides vegetables, tuber crops also contribute to a major part of the staple diet. They are of immense importance because of their high calorific value. One such popular tuberous crop in India, especially the south and eastern region, is *Amorphophallus campanulatus* commonly known as "suran" in Sanskrit and elephant yam in English. *A. campanulatus* has its mention in Ayurveda.

Recently, from our laboratory, we reported the *in vitro* antioxidant potential of a hydroethanolic extract of *A. campanulatus* against DPPH, hydroxyl, and superoxide radical [9]. Besides, we have also studied the various bioactive components in the extract by GC-MS analysis and found that the extract had several bioactive components with antioxidant potency along with good source of components such as hexadecanoic acid and its methyl and ethyl esters, heptadecanoic acid, linoleic acid and its ester, oleic acid, stigmasterol, 1, 3, 5, benzenetriol, 4H-pyran-4-one, 2, 3-dihydro-3, 5-dihydroxy-6-methyl-, squalene, and Vitamin E [10]. None the less, hepatoprotective activity of the hydroethanolic extract against ethanol-induced oxidative stress in albino rats has also revealed an upregulation of *in vivo* antioxidant defense system and simultaneous attenuation in the level of tissue lipid

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Hepatoprotective effects of green *Capsicum annuum* against ethanol induced oxidative stress, inflammation and apoptosis in rats



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Interleukin 6
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ABSTRACT

Ethnopharmacological relevance: *Capsicum annuum* L. (CA) is used extensively as a spice and is a rich source of antioxidant vitamins. It has long been used in Indian, Native American, and Chinese traditional medicine as a carminative and an appetizer that normalizes liver function. However, its hepato-protective activity has so far not been studied.

Aim of the study: The present study was undertaken to evaluate the efficacy of aqueous extract of CA at two different doses (125 mg/kg body weight and 250 mg/kg body weight), against ethanol induced oxidative stress and apoptosis in liver tissue.

Materials and methods: Adult male Wistar rats, weighing 150–200 g, were randomly grouped (n = 6) and treated with ethanol (2 g/kg bw, i.p.), CA₁₂₅ (125 mg/kg bw, i.p.), CA₂₅₀ (250 mg/kg bw, i.p.), ethanol with CA (similar doses), and control (0.5 ml normal saline, i.p.) for 30 days. Lipid peroxidation (LPO) and reduced glutathione content (GSH) in tissue homogenate, along with catalase (CAT), superoxide dismutase (Cu-Zn-SOD & Mn-SOD), glutathione peroxidase (GPx), glutathione reductase (GR), glutathione-S-transferase (GST) and glucose-6-phosphate dehydrogenase (G-6-P-D) activity were evaluated. Serum levels of alanine transaminase (ALT), aspartate transaminase (AST), alkaline phosphate (ALP), triglyceride (TG), total cholesterol (CHLS), high density lipoprotein (HDL), low density lipoprotein (LDL) very low density lipoprotein (VLDL), tumour necrotic factor alpha (TNF-α) and interleukin 6 (IL-6) were also measured using ELISA kits. Histopathological evaluation of the hepatic tissue was performed by hematoxylin and eosin (H&E) and periodic acid-schiff (PAS) staining. TUNEL assay was performed for apoptosis detection.

Results: Ethanol significantly (p < 0.001) increased ALT, AST, ALP, TNF-α, IL-6, LPO, Cu-Zn-SOD, GST, GPx, TG, CHLS, LDL, VLDL levels, along with significant (p < 0.001) decrease in HDL, Mn-SOD, CAT, GSH, GR and G6PD activity. Co-administration of CA along with ethanol alleviated changes in the above parameters (p < 0.001) in a dose-dependent manner and also reduced the number of apoptotic death cells. Histopathological and histo-chemical studies of liver sections also ascertained the outcomes of this study.

Conclusion: Thus, it can be concluded that the aqueous extract of green CA can exert a protective effect against ethanol induced hepato-toxicity. The possible mechanism may be by acting as an antioxidant; preventing ethanol induced apoptosis and reducing pro-inflammatory cytokine levels.

1. Introduction

Hepatotoxicity is one of the common complaints leading to several metabolic disorders (Patel et al., 2008) and at times can even be fatal. Ethanol being a xenobiotic is metabolized primarily in the liver and excess consumption of ethanol results in acute hepatic toxicity.

Ethanol has long been consumed by most people of all socio-economic strata in the form of alcohol. It is a commonly consumed recreational beverage of modern society and when in excess, is responsible for causing Alcoholic Liver Disease (ALD). Study of literature suggests that the underlying mechanism of ethanol induced hepatotoxicity is oxidative stress and endotoxin mediated activation of Kupffer

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Enhancement of nonlinear response using vibrational resonance in a nonlinear oscillator; sum and difference frequency generation

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Abstract. We consider the second order response for nonlinear processes at the sum and difference frequencies of a nonlinear centrosymmetric system to a weak low frequency field excitation in presence of a strong rapidly varying time-periodic field. It is shown that the rapidly varying field breaks the centre of symmetry of the potential and shifts the steady state in such a way that the system becomes susceptible to weak field excitation at an optimal strength of the high frequency field. The magnitude nonlinear response to the weak field is of the order of the linear response in sharp contrast to the usual three-wave mixing processes traditionally carried out in strong laser fields.

1 Introduction

Ever since the development of the laser around the middle of the last century the study of nonlinear parametric processes e.g. harmonic generation, sum and difference frequency generation has been an important field of investigation in nonlinear optics, applied photonics and allied areas. In a second order process, two fields with degenerate or nondegenerate frequencies interact to produce the third field in a nonlinear medium. For this process to be operative it is necessary that the intensity of one of the two fields must be very strong. Secondly, the system must be devoid of centre of symmetry. Being a higher order process, the second order response is an order of magnitude weaker than the linear response. These studies have constituted a large body of literature over the last several decades [1–4].

Here, we present a theoretical and numerical study of second order nonlinear processes in a centrosymmetric potential to generate sum and difference frequency signals of a weak field. Our analysis is based on vibrational resonance [5–18] in a nonlinear oscillator model of Duffing type where the bistable system is driven by a bichromatic field. Vibrational resonance is essentially the deterministic analog of stochastic resonance [19–25] and its variants [26–37], where one examines the response of the system toward the excitation by a low frequency field in presence of a high frequency field playing the role of noise. The phenomenon has been verified experimentally in analog electronic circuits [6,7] as well as in laser systems with bistable polarization states [8,10,11,15,17]. The last two decades have witnessed significant progress of the

field in both experimental and theoretical fronts covering ghost-vibrational resonance, nonlinear vibrational resonance, generation of higher harmonics and others. The focus of the present paper is to explore the sum and difference frequency response due to weak field excitation in a centrosymmetric potential field where the centre of symmetry is destroyed by the application of a high frequency field at an optimal strength. As the high frequency field is not directly involved in the wave-mixing process for the generation of sum and difference frequency signals, this second order process is mechanistically different from the traditional parametric processes [3,4] carried out at high intensity laser field. We show that an interplay of high frequency oscillation and nonlinearity gives rise to a term which contributes significantly to the effective dynamics around the shifted steady state. An important offshoot of this contribution is that the nonlinear response to weak field excitation is of the order of the linear response.

The layout of the paper is as follows: in the next section, we introduce the model for vibrational resonance and calculate the nonlinear response for sum and difference frequencies using Blekhman perturbation theory. The results are compared with those of numerical simulations. The paper is concluded in Section 3.

2 Nonlinear response at sum and difference frequencies for a Duffing oscillator

To begin with we consider vibrational resonance in the model of a standard underdamped Duffing oscillator,

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

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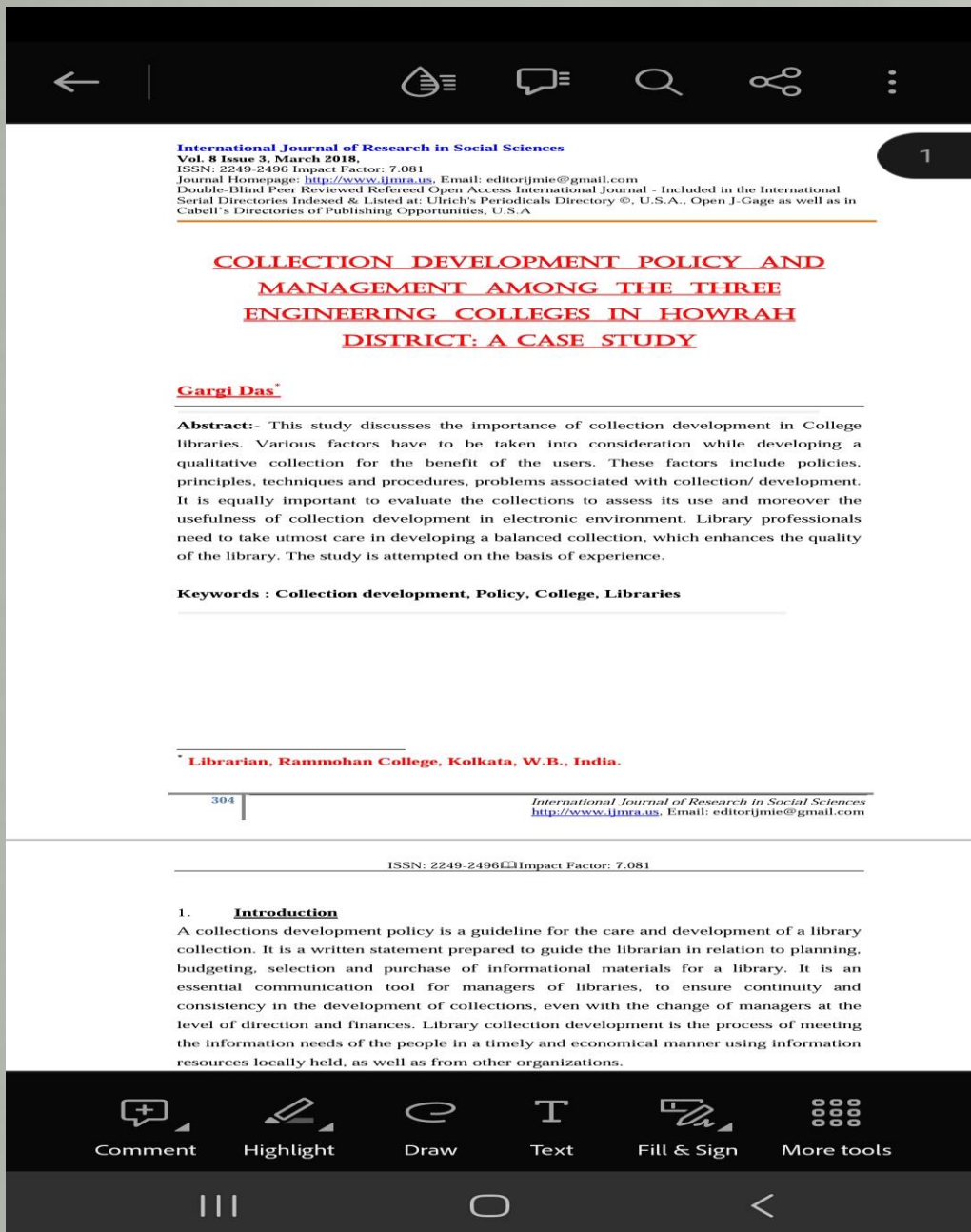
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Revival of cloaking effect in a driven bilayer graphene vector barrier

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ABSTRACT

Transmission profiles in bilayer graphene are studied theoretically through a rectangular vector potential (magnetic) barrier with and without the presence of an oscillatory potential. Unlike the electrostatic barrier, the Fano resonances (FR) are noted in the transmission spectra both for normal and glancing incidences due to non-conservation of chirality for a static vector barrier. The results for normal incidence indicate that the cloaking effect is a manifestation of the chirality conservation in charge transport through bilayer graphene scalar barriers. It is also noted that the aforesaid FR for a static vector barrier might disappear (photon induced electronic cloaking effect) due to the predominant photon exchange processes in presence of an external oscillating potential. The study of Fano resonances in transmission spectrum is in high demand in respect of localization of charge carriers in graphene nano structures for its potential applications in digital device fabrications.

1. Introduction

Since the experimental realization of graphene [1], a wide variety of research work appeared in the literature regarding both the static and dynamic properties of mono and bilayer graphenes, particularly because of their many exotic properties [2]. Unlike the monolayer graphene (MLG), chiral charge carriers in the bilayer graphene (BLG) are massive and obey quadratic dispersions [2–7], similar to those of the Schrodinger electrons. The chiral property arises due to the valley degrees of freedom defined by the pseudo spin of the Dirac fermions. The chirality operator that correspond to the alignment between the pseudo spin and the momentum is given for the BLG by $\hat{h} = \hat{n} \cdot \hat{\sigma}$, where $\hat{\sigma} = (\sigma_x, \sigma_y)$ are the Pauli matrices and $\hat{n} = (\cos 2\theta/\tilde{n} + \sin 2\theta/\tilde{n})$ with $\theta = \tan^{-1}(k_y/k_x)$. The eigen values of the chirality operator are ± 1 that correspond to the electron like (+1) and hole like (-1) states in BLG. These two states are chiral in nature and coexist in the vicinity of the Dirac point [7]. The conservation of this chirality leads to the phenomenon of Klein transmission (i.e., perfect transmission) in the MLG [8] while almost zero transmission through the BLG at normal incidence [9] of the low energy charge carriers on an electrostatic barrier. Similar to the case of the Schrodinger electrons, the probability of transmission of the Dirac fermion through a BLG electrostatic barrier increases exponentially with the increase in incident energy of the charge carriers [10]. In contrast, the transmission spectra of the massive Dirac fermion for near normal incidence exhibit asymmetric Fano resonances (FR) arising due to the coupling between the discrete hole like state within the barrier and the electron like continuum outside [10,11]. While, at normal incidence, a remarkable change occurs where the FRs are found to be totally absent in the transmission spectra. The absence of the FR at normal incidence could be attributed to the decoupling between the discrete and the continuum states, the discrete state being cloaked by the electrostatic barrier in order to maintain the conservation of chirality in the BLG. Since the first report [10] of this electronic cloaking effect (analogous to the optical cloaking), several other theoretical attempts [11–13] were also made regarding this effect in the context of electronic confinement in a BLG microstructure. The experimental evidence of this electronic cloaking effect was reported recently due to Lee et al. [14] by probing the phase coherent transport behavior of a dual gated BLG transistor. As mentioned before, the cloaked states inside a BLG electrostatic barrier remain decoupled with the continuum outside the barrier. While, due to incorporation of the trigonal warping effect, this decoupling gradually disappears as was reported by Shytov et al. [15]. Since the cloaking effect is a manifestation of the chirality conservation and consequently the charge conjugation symmetry in the system, it is also quite likely to disappear in the case of an inhomogeneous magnetic field (magnetic barriers), due to the broken chirality in the BLG vector barrier. Although a few reports exist in the literature on the transmission property of the massive Dirac fermion in BLG magnetic barriers [7,16–19], the

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ORIGINAL ARTICLE

Protective and therapeutic efficacy of pomegranate extracts in combination with 2-methoxyestradiol (2-ME) on S-180 ascitic tumour cells

Anasua Banerjee¹ · Sudipta Chowdhury¹ · Srabantika Mallik¹ · Atish Barua² · Samarendra Nath Banerjee¹✉

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Abstract
Pomegranate (PG), an edible fruit, is used for medicinal purposes. Pomegranate extracts (PGEs) exhibit antiproliferative and antineoplastic activities. Our earlier studies showed that, aqueous extracts of PG inhibit the rate of cell proliferation in tumour cells with steady decrease of mitotic index and sperm head abnormality. 2-Methoxyestradiol (2-ME), an antineoplastic and antiangiogenic agent has been widely used in preclinical research for cancer therapy. Given the importance of PGE, our studies have been extended to evaluate the anticancer and apoptotic activity of PGE and 2-ME in combination on Sarcoma-180 ascitic tumour bearing mice. To evaluate the efficacy and safety of combined effect of PGE and 2-ME on in vivo Sarcoma-180 tumour bearing mice, we have undertaken different tests to measure growth potentialities of the tumour. Our results revealed that combined effects of PGE and 2-ME significantly reduce the cell population of the tumour and elevation of the life span of the host with less toxic side effects.

Keywords Sarcoma-180 (S-180) · Pomegranate extract (PGE) · 2-Methoxyestradiol (2-ME) · Bone marrow and germ cell toxicity

Introduction
Plants have long been used in traditional medicine as a cure for different diseases since thousands of years [2]. Many herbs and spices are known to possess antioxidant and anti-inflammatory properties which exhibit antimutagenic and anticarcinogenic activities [23]. Phenolic substances present in ginger possess anticarcinogenic properties [9]. Hanafy [13] demonstrated that ginger extract may have a chemotherapeutic effect on Ehrlich ascites cells. Pomegranate (PG), one of the important edible fruits, has been used for its medicinal purposes. It is known that, pomegranate extracts (PGEs) exhibit antiproliferative and antineoplastic activities [4, 14]. Pomegranate juice and its purified ellagitannins have been shown to exhibit antiproliferative activity [17]. 2-Methoxyestradiol (2-ME), a metabolite of 17 β -estradiol (E2), has emerged as a very promising agent for cancer treatment. It shows significant antiangiogenic properties that prevent tumour nourishment [5].
Our earlier studies showed that, aqueous extracts of PG inhibited the rate of cell proliferation in tumour cells with steady decrease of mitotic index and sperm head abnormality [3]. Given the importance of PGE, as single therapy, our studies have been extended to evaluate the antiproliferative as well as apoptotic effects of PGE and 2-methoxyestradiol (2-ME) in combination on Sarcoma-180 ascitic tumour bearing mice. Morphological changes in the structure of nucleus, especially nuclear fragmentation, are an early signal of apoptosis coupled with the damage of DNA. AO+EtBr double staining method is an ideal fluorescence technique to determine the viable cell as well as apoptotic potential of the combination therapy. We have also explored whether the combination effect or treatment is less toxic than the

This article is based on the presentation made during 18th All India Congress of Cytology and Genetics and International Symposium on "Translating Genes and Genomes" held at CSIR-Indian Institute of Chemical Biology, Kolkata in collaboration with Archana Sharma Foundation of Calcutta during January 29-31, 2018.

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CYTOTOXIC EFFECT OF BETEL NUT ON SEMINAL FLUID FRUCTOSE CONCENTRATION AND SPERM MOTILITY OF NORMAL MALE MICE

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ABSTRACT: Different types of substances (i.e. citric acid, fructose, glucose, potassium, zinc etc) have been found in seminal fluid. These substances are important for viability and motility of sperm. Fructose, the major carbohydrate, is essential for sperm head morphology, viability and motility, which serves as an energy source for spermatozoa. Till now, little work has been done about the impact of seminal fructose concentration on sperm head morphology or sperm characteristics. Moreover, knowledge about the effect of betel nut extracts on seminal fructose concentration and sperm head abnormality in mammals is insufficient and inconsistent. Therefore, the present study was aimed to investigate the dose dependent effect of betel nut extracts (BNEs) on seminal fluid of *in vivo* Swiss male albino mouse model considering sperm head abnormality test, sperm motility, fructose concentration of seminal fluid as parameters. Additionally, haematological parameters i.e. percentage of haemoglobin, total number of RBC and WBC, differential counts and the life span of both control and BNE treated mice were determined to evaluate the effect of toxicity. The present findings indicate that BNE being a potent, cytotoxic plant extract induces a variety of deleterious effects on the seminal fluid fructose level, sperm head abnormality and sperm motility of the mice. Moreover, analysis of haematological parameters showed a toxic effect in BNE treated groups. It is interesting to note that the different concentrations of BNE significantly reduced the mean survival time in mice in compare to control and vehicle groups.

KEYWORDS: Betel nut extract, seminal fructose concentration, sperm motility, big head sperm, normal sperm head.

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RELATION-THEORETIC METRICAL FIXED POINT THEOREMS UNDER NONLINEAR CONTRACTIONS

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Abstract. We establish fixed point theorems for nonlinear contractions on a metric space (not essentially complete) endowed with an arbitrary binary relation. Our results extend, generalize, modify and unify several known results especially those contained in Samet and Turinici [Commun. Math. Anal. 13, 82-97 (2012)] and Alam and Imdad [J. Fixed Point Theory Appl. 17(4), 693-702 (2015)]. Interestingly a corollary to one of our main results proved under symmetric closure of any binary relation remains a sharpened version of a theorem due to Samet and Turinici. Finally, we use examples to highlight the realized improvements in the results proved in this paper.

Key Words and Phrases: Complete metric spaces, binary relations, contraction mappings, fixed point.

2010 Mathematics Subject Classification: 47H10, 54H25.

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Title of paper: Relation-theoretic coincidence theorems for non-linear contractions in metric-like spaces

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RELATION-THEORETIC COINCIDENCE THEOREMS FOR NON-LINEAR CONTRACTIONS IN METRIC-LIKE SPACES

MD AHMADULLAH AND MOHAMMAD IMDAD

Communicated by Hassen Aydi

ABSTRACT. In this paper, we prove some coincidence and common fixed point results for non-linear contractions in metric-like spaces equipped with an arbitrary binary relation. Thereafter, we derive some fixed and common fixed point results which are sharper versions of the corresponding known results of the existing literature. Finally, we use some examples to demonstrate the usability and generality of our main results.

1. INTRODUCTION

The contraction principle which was originated in Banach [1] in 1922 continues to inspire the researchers working in metric fixed point theory. In recent years, many researchers studied fixed point results in ordered metric spaces (see, [2–13] and references cited therein). The most natural and extensively discussed idea of metric space has been generalized and improved by introducing several variants such as: partial metric space, metric-like space, b-metric space, 2-metric space, symmetric space, pseudo metric space, G-metric space and several others.

In 1994, Matthews [14] initiated the concept of partial metric space as a part of the study of denotational semantics of data flow networks. In recent years, a multitude of metrical fixed point theorems were extended to partial metrics (see, [14–26]) and such research activity is still on.

Hitzler [28], proved an interesting extension of the Banach contraction principle by introducing dislocated metric spaces which are also sometimes referred as metric-like spaces (see, Amini-Harandi [26]). Later, metric-like spaces and its modifications were investigated by many researchers. To highlight a few noted ones: İşik and Türkoğlu [29] established some order-theoretic fixed point results for weakly contractive mapping; Karapinar and Salimi [30] discussed the existence and uniqueness of a fixed point of a cyclic mapping; Shobkolaei et al. [31] proved some Suzuki-type fixed point results; Shukla et al. [32] introduced the notion of a 0 - σ -complete metric-like space and proved some common fixed point results; and Malhotra et al. [33] obtained order-theoretic fixed point results for F -type contractions. Most recently, Ahmadullah et al. [34] discussed relation-theoretic Banach contraction principle

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Key words and phrases: Fixed and common fixed point, metric-like space; contraction mappings and binary relation.

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Combined performance of non-linear thermal radiation and chemical reaction on MHD convective heat and mass transfer of a micropolar fluid over a non-isothermal surface

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EXPERIMENTAL IMMUNOLOGY

WILEY **immunology**

T11TS immunotherapy augments microglial and lymphocyte protective immune responses against *Cryptococcus neoformans* in the brain

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Abstract

Cryptococcus neoformans, the encapsulated yeast acquired through inhalation, remains localized in lungs, but harbours the CNS in immunocompromised individuals. Several treatment regimes have failed combating this disease totally, but long-term usage of drugs leads to organ damage. As T11-target structure (T11TS) has documented profound immune potentiation, we aimed to investigate the role of microglia, pivotal immune cells of brain in ameliorating cryptococcosis, with T11TS immunotherapy. Murine model with *C. neoformans* infection was prepared by intraperitoneal injection and the brains of rats examined 7 days post-infections for histopathology by PAS and Alcian blue staining corroborated with organ fungal burden evidencing restorative T11TS action on Cryptococcal meningitis. Immunotherapy with three doses of T11TS, a CD2 ligand, in *C. neoformans* infected rats, upregulates toll-like receptors 2, -4 and -9 of microglia, indicating increased phagocytosis of the fungus. Flowcytometric analysis revealed increased numbers of T11TS treated brain infiltrating CD4⁺ and CD8⁺ T-lymphocytes along with increased MHC I and MHC II on microglia, activating the infiltrating lymphocytes aiding the killing mechanism. Present study also indicated that T11TS increased production of Th1 inflammatory cytokines conducive to fungal elimination while the inhibitory Th2 cytokines were dampened. This preclinical study is first of its kind to show that T11TS effected profound immune stimulation of microglial activity of *C. neoformans* infected rats eradicating residual fungal burden from the brain and can be a useful therapeutic strategy in fighting against this deadly disease.

1 | INTRODUCTION

Cryptococcus neoformans is an encapsulated, hetero-basidiomycetous fungus producing infections in severely immunosuppressed host like in HIV infection, organ

transplantation, haematological malignancy or patients receiving high doses of corticosteroids.¹⁻³ It is acquired through inhalation of basidiospore or yeast cells and remains localized in lungs but due to its neurotropic nature, disseminates to the central nervous system (CNS) by escaping from lungs in individuals with depressed cell-mediated immunity (CMI). Lung being the port of entry of

Hazra and Omar Faruk contributed equally.

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Unravelling the apoptotic mechanisms in T-lymphocytes in an animal model for pollen induced airway allergy and studying the impact of specific immunotherapy

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<p>ARTICLE INFO</p> <p>Keywords: Apoptosis T-lymphocytes Intranasal immunotherapy Asthma Pollen allergy Rat model</p>	<p>ABSTRACT</p> <p>Asthma is a chronic inflammatory disorder of the airways, increasing in prevalence worldwide. Reduced T cell apoptosis may interfere with the down-regulation of an immune response resulting in T cell accumulation contributing to the chronic inflammation of asthma. Most studies focused so far on apoptosis of eosinophils but the detailed role of T lymphocytes apoptosis in allergic diseases is unclear yet. The present experimental study was designed to discern the modulation of various apoptotic proteins of splenic T lymphocytes in a previously established rat model of <i>Alstonia scholaris</i> pollen induced airway allergy. Flowcytometry, immunoblotting, and immunofluorescence imaging techniques were employed for the present investigation. Annexin-V studies registered early apoptotic rate of lymphocytes with allergen sensitization and challenge which was corrected following mucosal immunotherapy. The study demonstrates that allergen sensitization and challenge reduced apoptosis of splenic T-lymphocytes via Fas mediated extrinsic pathway, Bax/Bcl2 regulated intrinsic pathway and also perforin/granzyme mediated pathway which were normalized following allergen specific intranasal immunotherapy. Inadequate T cell apoptosis in asthma appears to interfere with normal T cell elimination, resulting in T cell accumulation, which contributes to chronic inflammation and may be the major underlying cause for tissue damage which can be modulated by intranasal immunotherapy. Thus the apoptosis inducing effect of allergen immunotherapy necessitates more studies to elaborate on its effects on various effector cells of airway inflammation.</p>
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1. Introduction

Allergic asthma is known to be a very complex, heterogeneous and most common chronic disorder that is mainly characterized by airway inflammation and airway hyper-reactivity (AHR) (Kim et al., 2010). According to the Global Asthma Report 2014 more than 334 million people worldwide suffer from one or other allergic ailments affecting the socio-economic quality of life. The pathogenesis of allergic asthma is associated with environmental factors which include pollen, many cell types, fungal spores, dust mites, insect debris, animal epithelia, etc. Among which pollen is one of the most common triggers of seasonal allergies (Singh and Mathur, 2012). Genetic predisposition and environmental factors orchestrates the allergic phenotype. This is associated with eosinophilic inflammation in the tissue and elaboration of Th2 lymphocytes which is required for the maintenance and propagation of the allergic inflammation (Holgate et al., 2007). Helper T lymphocytes play a key role in atopic diseases. In atopic individuals majority of Th0 differentiate to Th2 subpopulation. Disturbed T helper balance is explained by impaired apoptosis of T cells (Ying et al., 2003). Recent data suggest that mechanisms involved in the regulation of the survival of inflammatory cells may play a central role in the persistent inflammatory process characterizing allergy and asthma. Apoptosis serves to control the "excess" of inflammatory cells, limiting tissue damage, and ease the inflammation (Hasslett, 1999). Several diseases, like nasal polyps and rheumatoid arthritis, suggest that the chronicity of the disease is associated with failure or delay of apoptosis in inflammatory

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Review Article

Diverse role of Macrophytes in aquatic ecosystems: A brief review

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Abstract

The aquatic ecosystem is composed of aquatic flora and fauna which interact together in maintaining the aquatic ecosystem. Aquatic macrophytes are macroscopic forms of aquatic vegetation, including macro algae, mosses, ferns and angiosperms found in aquatic habitat. Macrophytes of freshwater ecosystems have diverse roles to play in the structure and functioning of these aquatic ecosystems. The depth, density, diversity and types of macrophytes present in a system are indicators of water body health. Aquatic vegetation can influence the water quality too. Macrophytes are considered as an important component of the aquatic ecosystem as the habitat and food source for aquatic life. Of all the biological treatments for controlling eutrophication, submerged macrophytes, has been recognized as being the most effective. This paper is a brief review of the diverse role of macrophytes in an aquatic ecosystem.

Key words: Aquatic ecosystem, macrophytes, structuring communities.

Introduction

The aquatic ecosystem is composed of aquatic flora and fauna which interact together in maintaining the aquatic ecosystem. Submerged macrophytes represent the major component in aquatic ecosystems and help shape the physical and chemical environment, as well as the biota (Jeppesen & Søndergaard, 1999). These hydrophytes provide a considerable number of ecological niches and sustain food chains (McAbendroth et al., 2005). Aquatic macrophytes are aquatic photosynthetic organisms, large enough to see with the naked eye, that actively grow permanently or

periodically submerged below, floating on, or growing up through the water surface. Aquatic macrophytes are represented in seven plant divisions: Cyanobacteria, Chlorophyta, Rhodophyta, Xanthophyta, Bryophyta, Pteridophyta and Spermatophyta (Chambers et al., 2007).

Aquatic macrophytes are macroscopic forms of aquatic vegetation, including macro algae, mosses, ferns and angiosperms found in aquatic habitat. Macrophytes of freshwater ecosystems have many roles to play in the structure and functioning of these aquatic ecosystems.

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