



# RAMMOHAN COLLEGE

(Formerly City College W. Dept.)

102/1, Raja Rammohan Sarani, Kolkata - 700 009

E-mail : rmc.tic85b@yahoo.in, rmc.principal@gmail.com

Accredited B++ Grade by NAAC

Ref. ....

Date ..... 20

3.3.1 Number of research papers published per teacher in the Journals notified on UGC website during the last five years

Year 2016

Name of the teacher: Dr. Md Ahmadullah

Title of paper: Unified relation-theoretic metrical fixed point theorems under an implicit contractive condition with an application

Ahmadullah et al. *Fixed Point Theory and Applications* (2016) 2016:42  
DOI 10.1186/s13663-016-0531-6

Fixed Point Theory and Applications  
a SpringerOpen Journal

RESEARCH

Open Access



## Unified relation-theoretic metrical fixed point theorems under an implicit contractive condition with an application

Md Ahmadullah, Javid Ali\* and Mohammad Imdad

\*Correspondence: javid@amu.ac.in  
Department of Mathematics,  
Aligarh Muslim University, Aligarh,  
202002, India

### Abstract

The main purpose of this article is to establish relation-theoretic metrical fixed point theorems via an implicit contractive condition which is general enough to yield a multitude of corollaries corresponding to several well known contraction conditions (e.g. Banach (Fundam. Math. 3:333-381, 1922), Kannan (Am. Math. Mon. 76:405-408, 1969), Reich (Can. Math. Bull. 14:121-124, 1971), Bianchini (Boll. Unione Mat. Ital. 5:103-108, 1972), Chatterjea (C. R. Acad. Bulg. Sci. 25:727-730, 1972), Hardy and Rogers (Can. Math. Bull. 16:201-206, 1973), Ćirić (Proc. Am. Math. Soc. 45:267-273, 1974) and several others) wherein even such corollaries are new results on their own. As an example we utilize our main results, to prove a theorem on the existence and uniqueness of the solution of an integral equation besides providing an illustrative example.

**MSC:** Primary 47H10; secondary 54H25

**Keywords:** complete metric spaces; binary relations; implicit relation; contraction mappings; fixed point

### 1 Introduction

In 1920, Banach formulated the classical contraction mapping principle in his Ph.D. thesis which was later published in Banach [1]. It is one of the most fruitful and applicable theorems ever proved in classical functional analysis. In the course of the last century, this theorem has been generalized and improved by numerous researchers chiefly by replacing contraction mappings with a relatively more general contractive mappings and this practice is still going on. Rhoades [8] carried out a comparative study of various classes of utilized mappings which include Kannan [2], Reich [3], Bianchini [4], Chatterjea [5], Sehgal [9], Hardy and Rogers [6], Ćirić [7] besides several other ones. The survey article due to Rhoades [8] is generally consulted by every researcher of this domain and also continues to serve as a standard reference.

In 1997, Popa [10] initiated the idea of an implicit function which is designed to cover several well known contraction conditions of the existing literature in one go besides admitting several new ones. Indeed, the strength of an implicit function lies in their unifying power besides being general enough to yield new contraction conditions. Here, it is fascinating to point out that some of the presented examples (in Section 2) are of nonexpansive

Springer

© 2016 Ahmadullah et al. This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

S Sanyal

Principal  
Rammohan College  
Kolkata - 700009



# RAMMOHAN COLLEGE

(Formerly City College W. Dept.)

102/1, Raja Rammohan Sarani, Kolkata - 700 009

E-mail : rmc.tic85b@yahoo.in, rmc.principal@gmail.com

Accredited B++ Grade by NAAC

Ref. ....

Year 2016

Date ..... 20

Name of the teacher: Dr Iman Hazra

Title of paper: Specific allergen immunotherapy attenuates allergic airway inflammation in a rat model of *Alstonia scholaris* pollen induced airway allergy.

International Immunopharmacology 30 (2016) 111–120

Contents lists available at ScienceDirect

**International Immunopharmacology**

journal homepage: [www.elsevier.com/locate/intimp](http://www.elsevier.com/locate/intimp)

**Specific allergen immunotherapy attenuates allergic airway inflammation in a rat model of *Alstonia scholaris* pollen induced airway allergy**

Ankur Datta <sup>a,b,1</sup>, Saibal Moitra <sup>a,1</sup>, Iman Hazra <sup>a</sup>, Somnath Mondal <sup>a,b</sup>, Prasanta Kumar Das <sup>a</sup>, Manoj Kumar Singh <sup>a</sup>, Suhrita Chaudhuri <sup>a</sup>, Debanjan Bhattacharya <sup>a</sup>, Santanu Kumar Tripathi <sup>b</sup>, Swapna Chaudhuri <sup>a,\*</sup>

<sup>a</sup> Department of Laboratory Medicine, School of Tropical Medicine, 108 C. R. Avenue, Kolkata 700073, West Bengal, India  
<sup>b</sup> Department of Clinical & Experimental Pharmacology, School of Tropical Medicine, 108 C. R. Avenue, Kolkata 700073, West Bengal, India

**ARTICLE INFO**

**Article history:**  
Received 8 October 2015  
Received in revised form 30 November 2015  
Accepted 1 December 2015  
Available online xxx

**Keywords:**  
*Alstonia scholaris* pollen  
Airway allergy  
Allergen immunotherapy  
Pollen allergy  
Rat model

**ABSTRACT**

Pollen grains are well established to be an important cause of respiratory allergy. Current pharmacologic therapies for allergic asthma do not cure the disease. Allergen specific immunotherapy is the only treatment method which re-directs the immune system away from allergic response leading to a long lasting effect. The mechanism by which immunotherapy achieves this goal is an area of active research world-wide. The present experimental study was designed to develop an experimental model of allergic lung inflammation based on a relevant human allergen, *Alstonia scholaris* pollen, and to establish the immunological and cellular features of specific allergen immunotherapy using this same pollen extract. Our results revealed that *Alstonia scholaris* pollen sensitization and challenge causes eosinophilic airway inflammation with mucin hypersecretion. This is associated with increased total IgE, increased expression of Fc $\epsilon$ R1 on lung mast cells and increased levels of IL-4, IL-5 & IL-13 as confirmed by ELISA, in-situ immunofluorescence and FACS assay. Allergen specific immunotherapy reduced airway inflammation and also decreased total IgE level, Fc $\epsilon$ R1 expression, IL-4, IL-5 & IL-13 levels. It was further noted that the reduction of these levels was more by intra-nasal route than by intra-peritoneal route. Thus we present a novel animal model of *Alstonia scholaris* pollen allergic disease and specific allergen immunotherapy which will pave the way towards the development of better treatment modalities.

© 2015 Elsevier B.V. All rights reserved.

**1. Introduction**

Asthma is the 14th most important disorder in the World in terms of the extent and duration of disability with 334 million people having asthma, particularly in low and middle income countries [1]. Moreover the complexity and severity of allergic diseases, including asthma, continue to increase especially in children and young adults [2,3]. Various factors which are responsible for this rise in asthma prevalence include aeroallergens [4,5], environmental factors [6–10] and genetic factors [11,12]. Among aeroallergens, pollen grains are well established to be an important cause of respiratory allergy [13–15]. Approximately 50% of the asthmatic patients are sensitized to specific proteins present in the pollen [16–19]. Local and regional flora determines the type and concentration of the pollen grains which gets dispersed in the ambient air [20–23]. This results in the geographical variation in the prevalence of sensitization to various pollen grain and the fluctuations in the incidence of respiratory allergy symptoms in the sensitized individuals which parallels with the flowering season of the offending plant [24,25].

*Alstonia scholaris* an evergreen tropical tree of the Apocynaceae family (commonly known as Indian devil tree) native to the Indian subcontinent, Southeast Asia and Australasia [26]. This tree flowers in the month of September to November. Flowers of *A. scholaris* are insect pollinated and release about 5000 pollen grains per flower [27]. Respiratory allergy to *A. scholaris* pollen is common in tropics and it is known to cause Asthma exacerbations, allergic rhinitis and atopic dermatitis during its flowering season. In Eastern India it is known to initiate about 15–20% sensitization in respiratory allergic patients [21,26,28].

During the past 3 decades much has been learned about the pathogenesis of allergen-induced airway inflammation. Human respiratory allergy involves an initial exposure to an allergen that results in T-helper 2 (Th2) cell dependent stimulation of the immune response that mediates the production of increased levels of IgE and cytokines like Interleukin 4, 5 and 13 [29,30]. The majority of IgE is bound by high affinity IgE receptor on mast cells, and IgE-bound Fc $\epsilon$ R1 cross-linking by a specific antigen mediates the release of inflammatory mediators by mast cells leading to the inflammatory response [31].

Since asthma is a multifactorial and multifaceted disease, some animal models are more suitable for studying aspects of human disease than others. Several animals like guinea pigs, mice, rats, sheep and dogs have been used as popular models for respiratory allergy [32,33].

\* Corresponding author. +91 9831386832 (mobile).  
E-mail address: [swapna.chaudhuri@gmail.com](mailto:swapna.chaudhuri@gmail.com) (S. Chaudhuri).  
<sup>1</sup> Equal contributors.

<http://dx.doi.org/10.1016/j.intimp.2015.12.004>  
1567-5768/© 2015 Elsevier B.V. All rights reserved.

S Sanyal

Principal  
Rammohan College  
Kolkata - 700009



# RAMMOHAN COLLEGE

(Formerly City College W. Dept.)

102/1, Raja Rammohan Sarani, Kolkata - 700 009

E-mail : rmc.tic85b@yahoo.in, rmc.principal@gmail.com

Accredited B++ Grade by NAAC

Year 2016

Ref. ....

Date ..... 20

Name of the teacher: Dr. Saurav Dutta

Title of paper: Realization of two dimensional ferromagnetism with giant coercivity in ultrathin  $\beta$ -Ni(OH)<sub>2</sub> layers grown on a MoS<sub>2</sub> surface.

PHYSICAL REVIEW B 93, 184403 (2016)

## Realization of two-dimensional ferromagnetism with giant coercivity in ultrathin $\beta$ -Ni(OH)<sub>2</sub> layers grown on a MoS<sub>2</sub> surface

Shatabda Bhattacharya,<sup>1</sup> Diptiman Dinda,<sup>1</sup> Bikash Kumar Shaw,<sup>1</sup> Saurav Dutta,<sup>2</sup> and Shyamal K. Saha<sup>1,4</sup>  
<sup>1</sup>Department of Materials Science, Indian Association for the Cultivation of Science, Jadavpur, Kolkata-700032, India  
<sup>2</sup>Department of Physics, Rammohan College, University of Calcutta, Kolkata-700069, India  
(Received 28 October 2015; revised manuscript received 1 April 2016; published 4 May 2016)

Due to the charge transfer effect at the contact of transition metal (TM) and MoS<sub>2</sub>, the use of ferromagnets in MoS<sub>2</sub> based spin transistor is not suitable. On the other hand,  $\beta$ -Ni(OH)<sub>2</sub> is known to be a layered type material with antiparallel Ni spins in alternate layers. Here, an ultrathin layer of antiferromagnetic  $\beta$ -Ni(OH)<sub>2</sub> is grown on the MoS<sub>2</sub> surface to achieve complete ferromagnetism with giant coercivity (2925 Oe). The origin of this ferromagnetic ordering is the reduction of Ni spin moments in Ni(OH)<sub>2</sub> layer adjacent to MoS<sub>2</sub> surface due to charge transfer from S to Ni. The use of antiferromagnetic layered type material to achieve ferromagnetic ordering with giant coercivity is a new concept to realize perfect two-dimensional (2D) ferromagnets which have major advantages due to the huge change in coercivity with thickness.

DOI: 10.1103/PhysRevB.93.184403

### I. INTRODUCTION

Since the discovery of graphene, tremendous interests have grown concerning two-dimensional (2D) materials due to their potential applications in next generation nanoelectronic and spintronic devices [1–6]. To overcome the limitation of zero band gap property in graphene, molybdenum disulfide (MoS<sub>2</sub>) has emerged as a potential alternative for 2D-based nanoelectronic and optoelectronic applications [7–9]. Although, intensive research on MoS<sub>2</sub> based field effect transistors has been carried out during the last few years, comparatively its use has been limited in spintronic devices in spite of having superior spin coherence length. The main reason behind this is the generation of Schottky barrier due to charge transfer at the MoS<sub>2</sub>/ferromagnetic (Fe, Co, Ni) contacts [10–12]. This charge transfer effect, which is detrimental to spin transport, is also observed in graphene/transition metal (TM) interface [13–15]. Therefore, application of MoS<sub>2</sub> in spintronic devices using TM based contacts (Fe, Co, Ni, etc.) is limited. To overcome the limitation of the charge transfer effect at the MoS<sub>2</sub>/TM interface, we have introduced a new concept to use layered type antiferromagnetic material instead of ferromagnetic layer on MoS<sub>2</sub> which will be useful in spintronic devices. The advantage of using this antiferromagnetic layered type material is the observation of ferromagnetic ordering with giant coercivity. Due to this charge transfer effect, spin moment of the layer adjacent to MoS<sub>2</sub> reduces, resulting in net uncompensated spins in the immediate upper layer. In addition to that, the use of this material provides an extra advantage in which the coercivity can be tuned in a wide range just by controlling the thickness of the antiferromagnetic layer.

In spin transistors with conventional ferromagnetic metals, switching fields at two different contacts is controlled by tuning the shape and size of the contacts. Hence, a wide variation of switching field is difficult to achieve [15–18]. However, in the present technique, switching fields at two different contacts can be varied easily by changing the thickness

of the antiferromagnetic layer grown on MoS<sub>2</sub> surface. To establish this concept of achieving ferromagnetism with a wide range of coercivity, in the present paper, we have grown an ultrathin layer of  $\beta$ -Ni(OH)<sub>2</sub> considering MoS<sub>2</sub> as a template/surface.

$\beta$ -Ni(OH)<sub>2</sub> is known to be an antiferromagnetic material with low coercivity (250 Oe) in its bulk phase [19–21]. In contrast, ferromagnetism with magnetic saturation and remarkably high coercivity (~2925 Oe) is achieved for our thin layered sample containing the lowest concentration of Ni precursor. Giant coercivity is achieved due to surface pinning of Ni<sup>2+</sup> spins at the interface. The anomalous increase in magnetoconductivity with temperature is explained by the temperature dependent Rashba spin-orbit coupling [22–25] which decreases with increasing temperature.

### II. SYNTHESIS AND STRUCTURAL CHARACTERIZATION

In the first step, the Ni(OH)<sub>2</sub> layer is grown on the MoS<sub>2</sub> surface with three different Ni concentrations, and the samples are designated as low concentration (LC), medium concentration (MC), and high concentration (HC), respectively. Concentration of the nickel precursor determines the thickness of Ni(OH)<sub>2</sub> layers grown on MoS<sub>2</sub> surface. For lowest Ni concentration, the thinnest Ni(OH)<sub>2</sub> layer was formed, i.e., sample LC. This is a very effective technique to tune the thickness of the nickel hydroxide layer just tuning the concentration of precursor. To synthesize 2D, Molybdenum sulfide sheets, 310 mg of hexaammonium heptamolybdate tetrahydrate (5 mmol) and 267 mg of thiourea (70 mmol) were dissolved in 35 ml of deionized water under vigorous stirring to form a homogeneous solution. Then, the solution was transferred into a 50 ml Teflon-lined stainless steel autoclave and maintained at 200°C for 24 h. The resultant product was washed with water and absolute ethanol several times to remove all unreacted molecules/ions. Finally, the as synthesized MoS<sub>2</sub> was dried at 60°C under vacuum. In the second step, to prepare a thin layer of Ni(OH)<sub>2</sub> on the MoS<sub>2</sub> surface, 50 mg of as synthesized MoS<sub>2</sub> powder was

\*cnsrks@iacs.res.in

S Sanyal

Principal  
Rammohan College  
Kolkata - 700009



# RAMMOHAN COLLEGE

(Formerly City College W. Dept.)

102/1, Raja Rammohan Sarani, Kolkata - 700 009

E-mail : rmc.tic85b@yahoo.in, rmc.principal@gmail.com

Accredited B++ Grade by NAAC

Year 2016

Ref. ....

Date ..... 20

Name of the teacher: Dr. Bhuban Chandra Das

Title of paper: Influence of Non-linear Thermal Radiation on MHD Double-Diffusive convection Heat and Mass Transfer of a Non-Newtonian fluid in a Porous Medium

Int. J. Appl. Comput. Math  
DOI 10.1007/s40819-016-0281-5



ORIGINAL PAPER

## Influence of Non-linear Thermal Radiation on MHD Double-Diffusive Convection Heat and Mass Transfer of a Non-Newtonian Fluid in a Porous Medium

Dulal Pal<sup>1</sup> · Bhuban Chandra Das<sup>2</sup> ·  
Kuppapalle Vajravelu<sup>3,4</sup>

© Springer India Pvt. Ltd. 2016

**Abstract** The present paper deals with the problem of steady, magnetohydrodynamic laminar double-diffusive convection heat and mass transfer of a micropolar fluid over a vertical permeable semi-infinite plate embedded in a uniform porous medium in the presence of non-linear thermal radiation. In addition, the present model allows the influence of heat generation/absorption and first-order chemical reaction. The governing equations are solved efficiently by Runge-Kutta-Fehlberg method with shooting technique. The effects of thermal buoyancy ratio, Schmidt number, chemical reaction parameter, heat generation/absorption and surface suction/injection on the fluid velocity, microrotation, temperature and solute concentration are analyzed. It is found that increase in the inverse Darcy number results in decrease in the velocity and microrotation distributions whereas reverse effects are seen on the temperature and concentration distributions. Also, it is observed that with increase in the magnetic parameter there is decrease in the velocity and microrotation gradient whereas reverse effects are noticed on the temperature and concentration distributions.

**Keywords** Double diffusive convection · Stretching sheet · Magnetohydrodynamics · Thermal radiation · Micropolar fluid · Thermal radiation

✉ Dulal Pal  
dulalp123@rediffmail.com  
Bhuban Chandra Das  
bhubanphs@rediffmail.com  
Kuppapalle Vajravelu  
kuppapalle.vajravelu@ucf.edu

<sup>1</sup> Department of Mathematics, Siksha Bhavana, Visva-Bharati University, Santiniketan, West Bengal 731 235, India

<sup>2</sup> Department of Mathematics, Panchra High School (XII), Birbhum, West Bengal 731133, India

<sup>3</sup> Department of Mathematics, University of Central Florida, Orlando, FL 32816, USA

<sup>4</sup> Department of Mechanical, Material and Aerospace Engineering, University of Central Florida, Orlando, FL 32816, USA

Published online: 16 December 2016

Springer

S Sanyal

Principal  
Rammohan College  
Kolkata - 700009



# RAMMOHAN COLLEGE

(Formerly City College W. Dept.)

102/1, Raja Rammohan Sarani, Kolkata - 700 009

E-mail : rmc.tic85b@yahoo.in, rmc.principal@gmail.com

Accredited B++ Grade by NAAC

Ref. ....

Date ..... 20

Year 2017

Name of the teacher: Dr. Md Ahmadullah

Title of paper: Strong convergence theorems for a quasi-contractive type mapping employing a new iterative scheme with an application

Honam Mathematical J, 39 (2017), No. 1, pp. 1-25  
<https://doi.org/10.5831/HMJ.2017.39.1.1>

## STRONG CONVERGENCE THEOREMS FOR A QUASI-CONTRACTIVE TYPE MAPPING EMPLOYING A NEW ITERATIVE SCHEME WITH AN APPLICATION

SUIJEET SINGH CHAUHAN, KIRAN UTREJA, MOHAMMAD IMDAD\*  
AND MD AHMADULLAH

**Abstract.** In this paper, we introduce a new scheme namely: CUIA-iterative scheme and utilize the same to prove a strong convergence theorem for quasi contractive mappings in Banach spaces. We also establish the equivalence of our new iterative scheme with various iterative schemes namely: Picard, Mann, Ishikawa, Agarwal et al., Noor, SP, CR etc for quasi contractive mappings besides carrying out a comparative study of rate of convergences of involve iterative schemes. The present new iterative scheme converges faster than above mentioned iterative schemes whose detailed comparison carried out with the help of different tables and graphs prepared with the help of MATLAB.

### 1. Introduction and Preliminaries

There exist different techniques to solve the problems involving non-linear equations employing the approximation fixed points of corresponding contractive type operators. Let  $(X, d)$  be a complete metric space and  $T : X \rightarrow X$  a self map. Suppose that  $F(T) = \{p \in X \mid Tp = p\}$ . Over the years various researchers have been approximating the fixed point of operators using several iterative processes.

In a complete metric space, Picard iterative scheme  $\{x_n\}_{n=0}^{\infty}$  defined by

$$x_{n+1} = Tx_n, \quad n = 0, 1, 2, \dots \quad (1.1)$$

Received January 10, 2016. Accepted December 20, 2016.  
2010 Mathematics Subject Classification. 47H10, 54H25.  
Key words and phrases. Fixed point, Picard iteration, Mann iteration, Ishikawa iteration, Agarwal iteration, Noor iteration, SP iteration, CR iteration, Rate of convergence and quasi contractive operators.  
\*Corresponding author.

S Sanyal

Principal  
Rammohan College  
Kolkata - 700009



# RAMMOHAN COLLEGE

(Formerly City College W. Dept.)

102/1, Raja Rammohan Sarani, Kolkata - 700 009

E-mail : rmc.tic85b@yahoo.in, rmc.principal@gmail.com

Accredited B++ Grade by NAAC

Ref. ....

Year 2017

Date ..... 20

Name of the teacher: Dr. Md Ahmadullah

Title of paper: Relation-theoretic contraction principle in metric-like spaces

BULLETIN OF MATHEMATICAL ANALYSIS AND APPLICATIONS  
ISSN: 1821-1291, URL: [HTTP://WWW.BMATHAA.ORG](http://www.bmathaa.org)  
VOLUME 9 ISSUE 3(2017), PAGES 31-41.

## RELATION-THEORETIC CONTRACTION PRINCIPLE IN METRIC-LIKE SPACES

MD AHMADULLAH, ABDUR RAUF KHAN AND MOHAMMAD IMDAD

**ABSTRACT.** In this paper, we extend the Banach contraction principle to metric-like as well as partial metric spaces (not essentially complete) equipped with an arbitrary binary relation. Thereafter, we derive some 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 result.

### 1. INTRODUCTION

Metric fixed point theory continues to be an active area of research under the ambit of non-linear analysis. Banach contraction principle remains a source of inspiration for the researchers of this domain which was established by Banach [11] in 1922. In recent years, many researchers studied fixed point results in ordered metric spaces (e.g., [1-5, 15, 23, 25, 26, 28] and references cited therein). The most natural and much discussed idea of metric space has been generalized and improved by introducing several variants such as: metric-like space, partial metric space, symmetric space, pseudo metric space, b-metric space, 2-metric space, G-metric space and several others.

In 1994, Matthews [22] initiated the concept of partial metric space and also established Banach contraction principle in such spaces. In recent years, a multitude of metrical fixed point theorems were extended to partial metrics (e.g., [6, 8, 17, 19, 22, 24, 26]) and such research activity is still on.

Hitzler [13], proved an interesting extension of the Banach contraction principle by introducing dislocated metric spaces. Here, it can be pointed out that dislocated metric spaces are also sometimes referred as metric-like spaces (e.g., Amini-Harandi [7]). For further details on metric-like spaces one can consult [7, 9, 10, 13, 14, 16] and references cited therein.

The aim of this paper is to extend the Banach contraction principle to metric-like spaces (not essentially complete) equipped with an arbitrary binary relation. As consequences to our main result, we derive some fixed point results which are

2010 *Mathematics Subject Classification.* 47H10, 54H25.

*Key words and phrases.* Metric-like space; partial metric space; contraction mappings; binary relation and fixed point.

©2017 Univerziteti i Prishtinës, Prishtinë, Kosovë.

Submitted May 19, 2017, Published July 10, 2017.

Communicated by Hemant Kumar Nashine.

S Sanyal

Principal  
Rammohan College  
Kolkata - 700009



# RAMMOHAN COLLEGE

(Formerly City College W. Dept.)

102/1, Raja Rammohan Sarani, Kolkata - 700 009

E-mail : rmc.tic85b@yahoo.in, rmc.principal@gmail.com

Accredited B++ Grade by NAAC

Ref. ....

Year 2017

Date ..... 20

Name of the teacher: Dr. Md Ahmadullah

Title of paper: Fixed point theorems for uniformly generalized Kannan type semigroup of self-mappings

CREAT. MATH. INFORM.  
26 (2017), No. 2, 231 - 240

Online version at <http://creative-mathematics.ubm.ro/>  
Print Edition: ISSN 1581 - 286X Online Edition: ISSN 1843 - 441X

## Fixed point theorems for uniformly generalized Kannan type semigroup of self-mappings

AHMED H. SOLIMAN<sup>1</sup>, MOHAMMAD IMDAD<sup>\*-2</sup> and MD AHMADULLAH<sup>2</sup>

**ABSTRACT.** In this paper, we consider a new uniformly generalized Kannan type semigroup of self-mappings defined on a closed convex subset of a real Banach space equipped with uniform normal structure and employ the same to show that such semigroup of self-mappings admits a common fixed point provided the underlying semigroup of self-mappings has a bounded orbit.

### 1. INTRODUCTION

The origin of metric fixed point theory can be traced back to classical Banach contraction theorem which was originated in the Ph.D. thesis of Banach in 1920. This useful and applicable theorem was later published in the form of a research paper in 1922 which has already earned around 2000 google citations. Indeed, this theorem is one of the most useful theorems ever proved in classical functional analysis. In the long course of last several decade, this natural theorem has been generalized and extended by improving the involved contraction condition or lightening the requirement of completeness and by now there exists an extensive literature which are also available in the form of books and survey articles. To mention a few, we recall the books due to Takahashi [22], Goebel and Kirk [8](Book), Rhoades [20](Survey article) and even many more.

In this paper, we prove our results on the common fixed point of semigroup of operators defined on suitable subsets of a Banach space. Technically speaking, some of the fixed point results proved for uniformly Lipschitzian mappings were extended to uniformly Lipschitzian semigroup of self-mappings and even more generally to Lipschitzian semigroup of self-mappings (e.g. [21, 23-32]). Recall that such mappings were first studied by Goebel and Kirk [9] wherein authors proved the existence of a fixed point of a  $k$ -uniformly Lipschitzian mapping  $T$  defined on a bounded closed convex subset of a uniformly convex Banach space  $B$  provided  $k < \gamma$  and  $\gamma > 1$  is the unique solution of the equation

$$(1 - \delta_B(1/\gamma))\gamma = 1, \quad (1.1)$$

where  $\delta_B$  denotes the modulus of convexity of  $B$ .

In 1973, Goebel and Kirk [9] posed the following question:

**Question.** Whether (or not) the constant  $\gamma > 1$  satisfying equation (1.1) is the greatest real number for which any  $k$ -uniformly Lipschitzian mapping  $T$  (with  $k < \gamma$ ) has a fixed point?

In 1993, Tan and Xu [21] answered the question of Goebel and Kirk [9] in the negative by proving the existence of a fixed point of a  $k$ -uniformly Lipschitzian one parameter

Received: 05.12.2016. In revised form: 07.03.2017. Accepted: 14.03.2017

2010 *Mathematics Subject Classification.* 47H09, 47H10, 47H20.

*Key words and phrases.* Uniformly Kannan semigroup of self-mappings, normal structure, modulus of convexity, characteristic of convexity and fixed point.

Corresponding author: Mohammad Imdad; mhimdad@gmail.com

S Sanyal

Principal  
Rammohan College  
Kolkata - 700009



# RAMMOHAN COLLEGE

(Formerly City College W. Dept.)

102/1, Raja Rammohan Sarani, Kolkata - 700 009

E-mail : rmc.tic85b@yahoo.in, rmc.principal@gmail.com

Accredited B++ Grade by NAAC

Ref. ....

Year 2017

Date ..... 20

Name of the teacher: Dr Iman Hazra

Title of paper: Modulation of regulatory T cells by intranasal allergen immunotherapy in an experimental rat model of airway allergy

International Immunopharmacology 47 (2017) 9–19

Contents lists available at ScienceDirect

**International Immunopharmacology**

journal homepage: [www.elsevier.com/locate/intimp](http://www.elsevier.com/locate/intimp)

**Modulation of regulatory T cells by intranasal allergen immunotherapy in an experimental rat model of airway allergy**

Saibal Moitra <sup>a,1</sup>, Ankur Datta <sup>a,b,1</sup>, Somnath Mondal <sup>a,b</sup>, Iman Hazra <sup>a</sup>, Sk Md Omar Faruk <sup>a</sup>, Prasanta K. Das <sup>a</sup>, Anjan K. Basu <sup>c</sup>, Santanu K. Tripathi <sup>b</sup>, Swapna Chaudhuri <sup>a,\*</sup>

<sup>a</sup> Department of Laboratory Medicine, School of Tropical Medicine, 108 C. R. Avenue, Kolkata 700073, West Bengal, India  
<sup>b</sup> Department of Clinical & Experimental Pharmacology, School of Tropical Medicine, 108 C. R. Avenue, Kolkata 700073, West Bengal, India  
<sup>c</sup> Department of Biochemistry & Medical Biotechnology, School of Tropical Medicine, 108 C. R. Avenue, Kolkata 700073, West Bengal, India

**ARTICLE INFO**

**Article history:**  
Received 11 December 2016  
Received in revised form 2 March 2017  
Accepted 20 March 2017  
Available online xxx

**Keywords:**  
Regulatory T cells  
Intranasal immunotherapy  
Foxp3  
GITR  
OX40  
CTLA 4

**ABSTRACT**

Allergic airway diseases such as asthma and allergic rhinitis are increasing in prevalence worldwide. The theory of an altered Th1/Th2 balance in allergic diathesis has recently been termed a "procrustean paradigm" as it failed to explain many preclinical findings. Regulatory T cells (Treg) have now been shown to be critical in T-cell homeostasis and in the maintenance of peripheral tolerance to allergens. Allergen specific immunotherapy (SIT) has been shown to induce regulatory T cells in allergic patients. Among various types of SIT, intranasal immunotherapy had not been studied in detail for the treatment of allergic airway diseases. So, there was a need to study the contribution of regulatory T cells and their mechanistic pathways following intranasal immunotherapy *in vivo*. It had been previously shown that intranasal allergen immunotherapy using *Alstonia scholaris* pollen extract abrogates allergic airway inflammation with decline in IgE and Th2 cytokine levels. The present study for the first time offers a multi-targeted approach towards attenuation of airway allergy by the generation of CD4 + CD25 + Foxp3 + T cells and other subsets of Treg cells like Tr1 cells, Th3 cells, CTLA4 + Treg cells, and also modulation of various Treg cell surface molecules like GITR, OX40, CD39 and CD73 by intranasal immunotherapy in the same animal model. This animal experiment will thus help to chart out newer molecular targets for treating allergic asthma or rhinitis.

© 2017 Published by Elsevier B.V.

**1. Introduction**

Allergic asthma is a Th-2 mediated disorder which is characterized by production of allergen-specific IgE, reversible airflow obstruction, airway hyper-responsiveness (AHR) to a wide variety of specific or non-specific stimuli, chronic airway inflammation and airway remodeling [1,2]. This abnormal behavior of airway cells is due to dysregulated immune homeostasis in the airways [3]. There exists compelling evidences that regulatory T cells (Tregs) are essential in the maintenance of immune homeostasis in the airways [4]. Subsets of Treg cells include naturally occurring, thymic derived CD4 + CD25 + Treg cells, inducible CD4 + CD25 + T cells, IL-10 producing Treg cells (Tr1 cells), and TGF  $\beta$  producing Th3 type Treg cells. Naturally occurring CD4 + CD25 + Treg cells have been shown to express a variety of cell surface molecules that include CD25, CD45RB<sup>low</sup>, CD62L, CTLA-4, GITR, OX-40 and most specifically the transcription factor Foxp3. Foxp3 functions as a master switch gene in the development and function of Treg cells [5]. The development of an allergic response to common inhaled allergens has been postulated to occur as a consequence of impairment in the numbers, function, or both of allergen specific Treg cells [6–8].

Allergen-specific immunotherapy (SIT) has been shown to improve allergen dysfunction and redirect the immune system away from allergic response and this has been shown to be associated with increased or restored Treg functions [9,10]. But the various pathways of Treg mediated suppression of allergic inflammation in SIT needs further elucidation.

In our previous study, we have developed a therapeutic intranasal immunotherapy rat model using *Alstonia scholaris* pollen and have shown that it effectively attenuates allergic airway inflammation [11]. In the present work, we have studied the effect of intranasal immunotherapy on Foxp3 expression in CD4 + CD25 + regulatory (Treg) cells

\* Corresponding author.  
E-mail address: [swapna.chaudhuri@gmail.com](mailto:swapna.chaudhuri@gmail.com) (S. Chaudhuri).  
<sup>1</sup> Equal Contributors.

<http://dx.doi.org/10.1016/j.intimp.2017.03.017>  
1567-5768/© 2017 Published by Elsevier B.V.

S Sanyal

Principal  
Rammohan College  
Kolkata - 700009





# RAMMOHAN COLLEGE

(Formerly City College W. Dept.)

102/1, Raja Rammohan Sarani, Kolkata - 700 009

E-mail : rmc.tic85b@yahoo.in, rmc.principal@gmail.com

Accredited B++ Grade by NAAC

Ref. ....

Year 2017

Date ..... 20

Name of the teacher: Dr Iman Hazra

Title of paper: Allergen immunotherapy modulates sensitivity of Treg cells to apoptosis in a rat model of allergic asthma

Research Article

Immunotherapy

For reprint orders, please contact: reprints@futuremedicine.com

## Allergen immunotherapy modulates sensitivity of Treg cells to apoptosis in a rat model of allergic asthma

Ankur Datta<sup>1,3</sup>, Saibal Moitra<sup>1,3</sup>, Prasanta K Das<sup>1</sup>, Somnath Mondal<sup>1</sup>, Sk Md Omar Faruk<sup>1</sup>, Iman Hazra<sup>1</sup>, Santanu K Tripathi<sup>2</sup> & Swapna Chaudhuri<sup>1,3</sup>

<sup>1</sup>Department of Laboratory Medicine, School of Tropical Medicine, 108 C B Avenue, Kolkata 700073, West Bengal, India  
<sup>2</sup>Department of Clinical & Experimental Pharmacology, School of Tropical Medicine, 108 C B Avenue, Kolkata 700073, West Bengal, India

\* Author for correspondence: Tel.: +91 983 138 6832; swapna.chaudhuri@gmail.com

<sup>†</sup> Authors contributed equally

**Aim:** To study the apoptosis of Foxp3<sup>+</sup> Treg cells following *Alstonia scholaris* pollen sensitization–challenge and following allergen immunotherapy. **Materials & methods:** Wistar rats were sensitized–challenged with *Alstonia scholaris* pollen and were further given intranasal immunotherapy. For the analysis of the apoptotic proteins on Treg cells by flow cytometry, multiple gating procedures were followed. **Results:** Allergen sensitization–challenge increases Annexin-V, Fas, FasL, caspases-8, 9, 3 cytochrome-C, APAF-1, Bax, perforin-1 and granzyme-B on Treg cells which is decreased following intranasal immunotherapy. On the other hand, Bcl-2 expression is decreased in allergy and increased by immunotherapy. **Conclusion:** Apoptosis of Treg cells is increased following allergen sensitization–challenge via extrinsic, intrinsic and perforin/granzyme pathways and allergen immunotherapy decreased the sensitivity to apoptosis of Treg cells.

First draft submitted: 4 April 2017; Accepted for publication: 30 August 2017; Published online: 14 November 2017

**Keywords:** *Alstonia scholaris* pollen • intranasal pollen immunotherapy • Treg apoptosis

Asthma of allergic phenotype is a Th-2 mediated disorder that is characterized by reversible airflow obstruction, airway hyper-responsiveness to a wide variety of stimuli, chronic airway inflammation and airway remodeling [1,2]. This abnormal behavior of airway cells is due to dysregulated immune homeostasis in the airways [3]. There exists compelling evidence that CD4<sup>+</sup>CD25<sup>+</sup> Treg cells suppress immune responses and are important in peripheral immunological tolerance [4]. Failure in this process can result in an exaggerated immune response and cause allergic airway inflammation. Deterioration of the balance between regulatory and effective immune responses can lead to the induction of several types of diseases. For example, effective immune responses are often hindered by an excessive number of Tregs in the tumor microenvironment; on the other hand, decreases in the number and functionality of Tregs are observed in many inflammatory conditions [5,6]. Given that Tregs are valuable targets for immune therapies against various inflammatory and autoimmune diseases, there is an urgent need to understand both the cellular and molecular mechanisms contributing to Treg homeostasis in various disease states. Unlike effector T cells, Tregs are considered to be anergic. However, Tregs undergo expansion and vigorous proliferation, particularly in a lymphopenic host, which suggests that these cells are active under such circumstances [7].

Programmed cell death (apoptosis) is the predominant underlying mechanism for maintaining T-cell homeostasis. Apoptosis itself is a delicate process that can be initiated via either an extrinsic or intrinsic signaling cascade [8]. The presence of low numbers of Treg cells at the site of inflammation could be due to increased rates of apoptosis of these cells, inadequate homing of Treg cells to the site of inflammation or to downregulation of their characteristic CD25 expression [9,10]. The exact mechanism in various disease states varies and needs to be studied. In the present study we have used a rat model of allergic sensitization–challenge to elucidate the modulation of various apoptotic proteins of Treg cells and hence its sensitivity to apoptosis by specific allergen immunotherapy.

Future  
Medicine

S Sanyal

Principal  
Rammohan College  
Kolkata - 700009



# RAMMOHAN COLLEGE

(Formerly City College W. Dept.)

102/1, Raja Rammohan Sarani, Kolkata - 700 009

E-mail : rmc.tic85b@yahoo.in, rmc.principal@gmail.com

Accredited B++ Grade by NAAC

Ref. ....

Year 2017

Date ..... 20

Name of the teacher: Mrs. Chayanika Roy

Title of paper: Population dynamics on soil insects in Greater Kolkata, West Bengal: A review

*Int. J. Exp. Res. Rev., Vol. 11: 35-42 (2017)*

International Journal of Experimental Research and Review (IJERR)

©Copyright by International Academic Publishing House (IAPH)

ISSN: 2455-4855 (Online)

Review Article

Received: 21<sup>st</sup> April, 2017; Accepted: 3<sup>rd</sup> June, 2017; Published: 30<sup>th</sup> June, 2017

## Population dynamics on soil insects in Greater Kolkata, West Bengal: A review

**Chayanika Roy, Sanjay Kumar Paul, Kaustav Dutta Choudhury and Santi Ranjan Dey\***

Assistant Professors, Department of Zoology,  
Rammohan College, 102/1, Raja Rammohan Sarani, Kolkata- 700009,  
West Bengal, India

\*Corresponding author: srdey1@rediffmail.com

### Abstract

Soil is the natural habitat for microorganisms, plants and animals. Insects are the most diverse groups of organisms on earth and have adapted a wide range of habitats. Soil is the weathered surface of the earth's crust which mixed with organic material and in which organisms live and plants grow. The soil insects play a significant role in soil ecosystem. They decompose dead materials, thereby help in nutrient cycling into the ecosystem and also act as an important bio-indicator of environmental changes. Different anthropogenic activities not only affect the soil insect communities but also create a diversified effect on other soil organisms and the soil as a whole. In Kolkata, the uncontrolled urbanization and industrialization affect the soil ecosystem. Particularly the vehicular exhaust containing the heavy metal lead cause enormous changes in the soil insect communities. An understanding of the deleterious effect of urbanization and industrialization on soil insects and of the importance of these organisms to soil ecology is still in its infancy. The present article is a review on the facts related with soil insect communities and the research work done in this field with reference to greater Kolkata.

**Keywords:** Deleterious effects, soil fertility, soil insects, research works, urbanization.

### Introduction

The word soil is derived from the Latin word 'solum' meaning earthy material in which plants grow. The science which deals with the study of soil is called soil science, Pedology (Pedos = earth) or Edaphology (Edaphos = soil). Soil can be defined as the mixture of minerals, organic matter, gases, liquids, and

countless organisms that together support life on earth. Insects are the most diverse groups of organisms on earth and have adapted a broad range of habitats successfully enjoying their own niche (Booth et al., 1979; Jana et al., 2014a). According to Jana et al., 2006; insects have the ability to differentiate in the more

S Sanyal

Principal  
Rammohan College  
Kolkata - 700009



# RAMMOHAN COLLEGE

(Formerly City College W. Dept.)

102/1, Raja Rammohan Sarani, Kolkata - 700 009

E-mail : rmc.tic85b@yahoo.in, rmc.principal@gmail.com

Accredited B++ Grade by NAAC

Ref. ....

Year 2017

Date ..... 20

Name of the teacher: Mrs. Chayanika Roy

Title of paper: A review on Ornithology of Kolkata metropolitan area

*Int. J. Exp. Res. Rev., Vol. 11: 52-55 (2017)*

International Journal of Experimental Research and Review (IJERR)

©Copyright by International Academic Publishing House (IAPH)

ISSN: 2455-4855 (Online)

Review Article

Received: 29<sup>th</sup> April, 2017; Accepted: 12<sup>th</sup> June, 2017; Published: 30<sup>th</sup> June, 2017

## A review on Ornithology of Kolkata metropolitan area

Sanjay Kumar Paul, Chayanika Roy, Kaustav Dutta Chowdhury and Santi Ranjan Dey\*

Assistant Professors, Department of Zoology,

Rammohan College, 102/1, Raja Rammohan Sarani, Kolkata- 700009

West Bengal, India.

\*Corresponding author: srdey1@rediffmail.com

### Abstract

Birds are considered excellent bio-indicators and ideal models for predicting environmental changes due to the effects of urbanization on ecosystems since they are highly diverse and conspicuous biota of the ecosystem. Bird species respond rapidly to changes in landscape alteration, composition and function and to the availability of habitat structures. Birds were classified into categories based on behavioral and physiological response guilds and a Bird Community Index Score (BCI) was calculated based on the types of birds present. As habitats shift from undisturbed to degraded, there will be a corresponding shift from specialist to generalist species because disturbed habitats could not support very specialized species. So, urban and industrial areas may be a very good area for observing such kind shift among the bird species. The paper is a review of this kind of study.

Keywords: Bio-indicators, bird community index Score (BCI), ornithology.

### Introduction

Birds are considered excellent bioindicators and ideal models for predicting environmental changes due to the effects of urbanization on ecosystems since they are highly diverse and conspicuous biota of the ecosystem (Padoa-Schioppa et al., 2006). One of the most useful things that birds can indicate is overall habitat quality. When birds are dependent on the habitat functioning in specific ways, the population trends of birds

can tell us about how well the ecosystem functions. Bird species respond rapidly to changes in landscape alteration, composition and function and to the availability of habitat structures (Clergeau et al., 1998; Tanveer et al., 2002). In some cases, it is not just the numbers of birds present, but the assemblage of bird species in an area that can indicate habitat quality. A study in the Central Appalachian Mountains showed that when forest habitats became

S Sanyal

Principal  
Rammohan College  
Kolkata - 700009