ANNUAL REPORT
2012-13

Vallabhbhai Patel Chest Institute
University of Delhi, Delhi, India

Website: www.vpci.org.in

14th Prof. Raman Viswanathan - VPCI Oration was delivered by Prof. Sami Bahna, Chief, Allergy and Immunology Section, Lousiana State University, USA, and Past-President, American College of Allergy, Asthma and Immunology, USA

8th Prof A.S. Paintal Memorial oration was delivered by Prof. S.K. Jain, Senior Consultant, Respiratory Medicine, Max Hospital, Noida; Coordinator, DNB (Respiratory Medicine), Metro Hospital, Noida; Ex-Advisor and Member, Scientific Advisory Committee, NIREH (ICMR), Bhopal and Ex-HOD, Cardio-respiratory Physiology, VPCI

ANNUAL REPORT
2012-13

Vallabhbhai Patel Chest Institute
University of Delhi, Delhi, India

Published and printed by Professor Rajendra Prasad, Director, Vallabhbhai Patel Chest Institute, University of Delhi, Delhi-110 007; Phone: 27402435, 27667102, 27667441, 27667667, 27666182 and printed at Bengal Offset Works, 335, Kahjoor Road, Karol Bagh, New Delhi-110 005 (Phone: 23610455, 23674614).

From the Director's Desk

It is my proud privilege to present the Annual Report of the Vallabhbhai Patel Chest Institute (VPCI) for the year 2012-13. This report reviews the wide range of activities of the Institute in the areas of teaching and education, research and patient care.

Postgraduate medical education is one of the thrust areas of the Institute. Students are trained for DM, MD and DTCD courses in Pulmonary Medicine and MD and PhD in Biochemistry, Physiology, Microbiology and Pharmacology. A large number of physicians, para-medical staff and students from other institutions / colleges were also trained in various departments of the Institute. The research contributions from the Institute are widely acclaimed. The vibrancy of these research projects / activities can be well judged from the list of publications in peer-reviewed journals, orations, guest lectures delivered and papers presented in the International and National Conferences by the faculty members and students of the Institute. The faculty members also received several Awards and Honours in their field of specialisation.

The Viswanathan Chest Hospital (VCH), the clinical wing of the Institute, is a tertiary care chest hospital with state-of-the-art patient-care facilities. It continues to provide excellent diagnostic and treatment services including critical care management to patients from Delhi, other parts of the country and neighbouring countries suffering from Respiratory Diseases. It also continues to provide other facilities including pulmonary function studies, skin testing, bronchoscopy, sleep studies, pulmonary rehabilitation and various biochemical, pathological and microbiological investigations.

The Tobacco Cessation Clinic at VCH, a Resource Centre for Tobacco Control is running with an aim to educate people to quit smoking and use of tobacco from all spheres through awareness campaigns, with main focus on college students because most of the tobacco users get into this habit in the initial college years. The critical care unit has expended its facilities with acquisition of transport ventilators, capnography, non-invasive ventilation, electrolyte analysis and other patient care facilities. The state-of-art management is protocol-based and is comparable to the best.

Comprehensive rehabilitation programme comprises of both educational and training sessions, that include topics on energy conservation, lung health, bronchial hygiene, chest physiotherapy, nutrition, optimisation of medication intake, domiciliary oxygen usage, stress management, breathing retraining, inspiratory muscle training and strength and endurance training of upper and lower limbs are continuing at Cardio-pulmonary Rehabilitation Clinic at VCH.

The Institute organised number of conferences, workshops and orations during the year where eminent experts from all over the world participated and shared their experiences.

The National Centre of Respiratory Allergy, Asthma and Immunology (NCRAAI) for the first time organised a workshop on "Respiratory Allergy" at Sri Lanka, in collaboration with the Association of Pulmonologists of Sri Lanka.

With the aim to disseminate scientific knowledge and latest developments in the field of chest diseases and allied sciences, the Institute continued the publication of its reputed and indexed quarterly publication *The Indian Journal of Chest Diseases & Allied Sciences*, in collaboration with the National College of Chest Physicians (India). The journal has wide national and international circulation.

The Institute proposes to further expand its patient care and research facilities by increasing the in-patients facility and range of investigations. Areas identified for special focus include lung cancer, interstitial lung disease, pulmonary function testing and critical care, pharmacogenomics, mycobacteriology, anaerobe bacteriology, besides continuing ongoing research activities. The research laboratories are being equipped with the latest technology to keep pace with the rest of the world.

I hope this presentation of our activities will be able to provide an overview into the progress made during the year 2012-13.

Prof. Rajendra Prasad

ANNUAL REPORT (2012-13)

CONTENTS

MILESTONES OF VPCI

April 6,	1949	Foundation stone of the Institute was laid down by Sardar Vallabhbhai Patel.
November	1951	Ad-hoc Governing Body was appointed by the Executive Council of University of Delhi for administrative affairs of the Institute.
December	1951	Main building of the Institute was completed.
January 12,	1953	The Institute was formally opened by Rajkumari Amrit Kaur, the Union Minister of Health, Government of India.
		Prof. R. Viswanathan was appointed as the Founder-Director. The grant for 1953-54 was Rs. 2 lakh.
January 21,	1955	A regular Governing Body was constituted by the Executive Council of the University of Delhi for the management and administration of the Institute.
April 4,	1955	The first meeting of the regular Governing Body was held.
	1955	Prof. A.S. Paintal reported the discovery of lung deflation receptors, a historical landmark in understanding the functioning of lung and its diseases.
July 1,	1957	Prof. R. Viswanathan took over as full-time Director of the Institute. Previously, he was the Deputy Director General of Health Services, Govt. of India and Honorary Director of the Institute.
September 24,	1957	Pt. Jawaharlal Nehru said in a message: "It was a brave act of the University of Delhi to start the V.P. Chest Institute".
October 24,	1957	Clinical Research Centre was inaugurated by Dr Rajendra Prasad, President of the Republic of India.
January 24,	1959	Indian Association for Chest Diseases was inaugurated by Sir A.L. Mudaliar. It was rechristened as National College of Chest Physicians (India) in January 1981.
July	1959	*The Indian Journal of Chest Diseases*, a Quarterly Journal, was started under the joint auspices of the V.P. Chest Institute and the Indian Association for Chest Diseases.
	1959	A ward of 20 beds was opened to admit patients.
	1959	By a resolution of the Governing Body, V.P. Chest Institute was nominated as a "National Institute for Teaching and Research in Chest and Allied Diseases".
January	1960	A Diploma course in Tuberculosis Diseases, which was started in March 1947, was re-designated as "Diploma in Tuberculosis and Chest Diseases" (DTCD) from XIV Course. The XV DTCD Course started from July 1960.
April 6,	1961	Foundation Day Celebrations of the Institute was started.
April 7,	1962	Foundation stone of Patel Niwas, a Post Graduate Hostel, was laid down by Dr C.D. Deshmukh, Vice-Chancellor, University of Delhi.

January 26,	1963	A contingent of V.P. Chest Institute staff participated in the Republic Day parade.
February 20-24,	1963	VII International Congress on Diseases of the Chest was held at Vigyan Bhawan under the auspices of V.P. Chest Institute, Indian Association for Chest Diseases and the University of Delhi.
August 1,	1964	Prof. A.S. Paintal joined as the Director of the Institute.
April 6,	1965	Patel Niwas was inaugurated by Dr C.D. Deshmukh on the XVI Foundation Day of the Institute.
	1966	Prof. A.S. Paintal was elected Fellow of the Royal Society of Edinburgh.
	1969	Padma Shree was awarded to Prof. R. Viswanathan.
	1974	Padma Bhushan was awarded to Prof. R. Viswanathan.
	1981	Prof. A.S. Paintal was elected Fellow of the Royal Society of London.
	1984	Prof. A.S. Paintal was elected General President of the Indian Science Congress Association [1984-85].
	1985	Prof. H.S. Randhawa was elected Vice-President of the International Society for Human and Animal Mycology [1985-88].
	1986	Prof. A.S. Paintal was appointed as Director-General of the Indian Council of Medical Research.
	1986	Padma Vibhushan was awarded to Prof. A.S. Paintal.
	1986	Prof. A.S. Paintal was elected President of the Indian National Science Academy [1986-88].
November 10,	1991	Prof. H.S. Randhawa joined as the Director of the Institute.
October 5,	1998	Dr V.K. Vijayan joined as the Director of the Institute.
April 6,	1999	Golden Jubilee Celebrations of the Foundation Day of the Institute.
		1st VPCI Oration was started.
June 14,	1999	24-hour Respiratory Emergency Services started.
November 12,	1999	His Excellency, Shri K.R. Narayanan, President of India, received the copy of Compendium of Activities (VPCI) 1949-99.
August 30,	2000	A New Ward (with an additional 40 beds) was inaugurated by Dr A. K. Walia, Honourable Minister for Health, Govt. of NCT of Delhi.
	2000	Dr V.K. Vijayan was elected International Regent, American College of Chest Physicians, U.S.A. [2000-06]
March	2001	A Respiratory Critical Care Unit was started.
March 15,	2001	CT Scan Centre was inaugurated by Honourable Padma Shree Dr C.P. Thakur, the Union Minister of Health & Family Welfare, Govt. of India.

April 21,	2001	1st Refresher (CME) Course in Respiratory Diseases started.
November 21,	2001	Tobacco Cessation Clinic was started.
August 14,	2002	A State-of-the-Art Oxygen Plant was inaugurated by Prof. P.N. Srivastava, Chairman, Governing Body (VPCI).
January 12-14,	2003	International Conference on Chest Diseases and Allied Sciences was held at India Habitat Centre, New Delhi, to commemorate the Golden Jubilee of the Inauguration of the Institute.
May 28,	2003	"Bhoomi Pujan" to start the construction work of the Auditorium.
	2004	Launching of the Institute website: <www.vpci.org.in>.
September 24,	2005	Prof. A.S. Paintal Memorial Oration was started.
January 10,	2006	An 8-bedded Intensive Care Unit was inaugurated by Prof. P.N. Srivastava, Chairman, Governing Body (VPCI).
December 8,	2006	Inauguration of the Golden Jubilee Auditorium by organising an International symposium on Herbal Drug Research and Therapy in Chest Medicine.
March 2,	2007	The Hospital wing of the Institute, Clinical Research Centre was re-named as "Viswanathan Chest Hospital" in honour of the Founder-Director of the Institute and the Golden Jubilee Auditorium was re-named as "Paintal Memorial Golden Jubilee Auditorium" in honour of the former Director of the Institute by a resolution of the Governing Body.
June 22,	2007	Yoga Therapy and Research Centre [in collaboration with the Morarji Desai National Institute of Yoga (MDNIY), New Delhi], was inaugurated.
September 18,	2007	Cardio-pulmonary Rehabilitation Clinic was inaugurated.
September 17,	2009	Approval by the University of Delhi to start Superspecialty DM Course in Pulmonary and Critical Care Medicine in VPCI with an intake of two seats per year.
August 3,	2010	Approval by the University of Delhi to start Diploma Course in Allergy & Clinical Immunology in VPCI with an intake of two seats per year.
February 12,	2011	Inauguration of the National Centre of Respiratory Allergy, Asthma and Immunology by Prof. P.N. Tandon, President, National Brain Research Centre Society and Chairman, Governing Body, V.P. Chest Institute, Delhi.
March 15,	2011	Permission from Medical Council of India to start DM (Pulmonary Medicine) course with annual intake of two students per year from the academic year 2011-12.
November 21,	2012	Prof. Rajendra Prasad joined as the Director of the Institute.

Prof. R. Viswanathan-VPCI Orations

1st Oration	April 6, 1999	Prof. N.K. Ganguly, Director-General, Indian Council of Medical Research, New Delhi.
2nd Oration	April 6, 2000	Prof. A.S. Paintal, former Director-General, ICMR and former Director, VPCI.
3rd Oration	April 6, 2001	Dr S. Lakshminarayanan, University of Washington School of Medicine, Washington, Seattle, USA.
4th Oration	April 6, 2002	Dr S. Padmavati, President, All India Heart Foundation and Director, National Heart Institute, New Delhi.
5th Oration	April 7, 2003	Prof. J.S. Bajaj, former Member, Planning Commission, Government of India and former Professor and Head, Department of Medicine, All India Institute of Medical Sciences, New Delhi.
6th Oration	April 6, 2004	Prof. H.S. Randhawa, former Director, V.P. Chest Institute, University of Delhi, Delhi.
7th Oration	April 6, 2005	Prof. Naranjan S. Dhalla, Distinguished Professor and Director, Institute of Cardio-vascular Sciences, St. Boniface General Hospital and Research Centre, University of Manitoba, Winnipeg, Canada.
8th Oration	April 6, 2006	Prof. C.N. Deivanayagam, Former Medical Superintendent, Hospital for Thoracic Medicine, Chennai.
9th Oration	April 6, 2007	Prof. K.K. Talwar, Director, Postgraduate Institute of Medical Education and Research, Chandigarh.
10th Oration	April 6, 2008	Prof. C.R. Babu, former Pro-Vice-Chancellor, University of Delhi, Delhi.
11th Oration	April 7, 2009	Prof. Peter J. Barnes, Head of Respiratory Medicine, Imperial College, London and Professor of Thoracic Medicine and Head of Airway Disease at the National Heart and Lung Institute and Honorary Consultant Physician at Royal Brompton Hospital, London.
12th Oration	April 6, 2010	Prof. M.K. Bhan, Secretary, Government of India, Department of Biotechnology, New Delhi.
13th Oration	April 6, 2011	Dr Vishwa Mohan Katoch, Secretary to the Government of India, Department of Health Research, Ministry of Health and Family Welfare and Director-General, Indian Council of Medical Research, New Delhi.
14th Oration	April 6, 2012	Prof. Sami Bahna, Chief, Allergy and Immunology Section, Lousiana State University, LA, USA, and Past-President, American College of Allergy, Asthma and Immunology, USA.

The Institute started VPCI Oration from 1999 onwards. The VPCI Oration was re-named as Prof. R. Viswanathan-VPCI Oration in 2005.

Prof. A.S. Paintal Memorial Orations

1st Oration	September 24, 2005	Prof. M.S. Valiathan, Honorary Adviser, Manipal Academy of Higher Education, Manipal (Karnataka).
2nd Oration	September 24, 2006	Prof P.N. Tandon, President, National Brain Research Centre Society, Gurgaon.
3rd Oration	September 24, 2007	Prof. P.N. Srivastava, First Chancellor, Manipur Central University, Imphal and former Vice-Chancellor, Jawaharlal Nehru University, New Delhi.
4th Oration	September 24, 2008	Prof. Nanduri R. Prabhakar, Director, Centre for System Biology of Oxygen Sensing, Department of Medicine, University of Chicago, USA.
5th Oration	September 24, 2009	Prof. Arun Dharmarajan, Winthrop Professor, School of Anatomy and Human Biology, Faculty of Life and Physical Sciences, The University of Western Australia, Nedlands, Perth, Western Australia.
6th Oration	September 24, 2010	Prof. Chulani Tissa Kappagoda, Professor of Medicine, University of California, Davis, USA.
7th Oration	September 23, 2011	Prof. J.S. Guleria, Senior Consultant (General Medicine), Sitaram Bhartia Institute of Science and Research, New Delhi and former Professor and Head, Department of Medicine, and Dean, AIIMS, New Delhi.
8th Oration	September 24, 2012	Prof. S.K. Jain, Senior Consultant, Respiratory Medicine, Max Hospital, NOIDA, Coordinator, DNB (Respiratory Medicine), Metro Hospital, NOIDA, Ex-Advisor and Member, Scientific Advisory Committee, NIREH (ICMR), Bhopal and Ex-HOD, Cardio-respiratory Physiology, VPCI.

THE INSTITUTE

The Vallabhbhai Patel Chest Institute (VPCI) is a post-graduate medical Institution devoted to the study of chest diseases. It is located in the Delhi University main campus providing the requisite academic environment in which a wide range of scientific facilities are available in various departments along with an excellent Institute Library.

Objectives

The main objectives of VPCI have been to conduct research on basic and clinical aspects of chest medicine, to train post graduates in Pulmonary Medicine and allied subjects, to develop new diagnostic technology and disseminate it to other institutions in the country and to provide specialised clinical and investigative services to patients.

Administration

The VPCI is a maintained Institution of University of Delhi and is fully funded by the Grants-in-Aid received from the Ministry of Health and Family Welfare, Government of India. The Institute is governed and administered by its own Governing Body as Constituted under Ordinance XX (2) of the University of Delhi Act. The Director, who is appointed by the Executive Council of University of Delhi, is the Chief Executive of the Institute. The Director of the Institute also functions as Member-Secretary (Ex-Officio) to the Governing Body of the Institute. The Institute also has a Standing Finance Committee constituted by the Governing Body to make recommendations about its budgetary requirements.

Organisation and Management

The organisation and management of the Institute is through Departmentation of activities based on various areas of specialisation and functions. The Academic, Scientific and Clinical services are organised under the Departments of Anaesthesiology, Cardio-respiratory Physiology, Radiodiagnosis and Imaging, Respiratory Allergy and Applied Immunology, Respiratory Medicine and Thoracic Surgery. These Departments along with Outdoor / Indoor patient care services and Respiratoy Emergency section are housed in Viswanathan Chest Hospital. The other Departments of the Institute include Biochemistry, Clinical Biochemistry, Biostatistics, Medical Mycology, Microbiology, Pathology, Pharmacology, Physiology and Respiratory Virology. These Departments are headed by the Faculty Members in the respective fields. The General and Personnel Management including various maintenance activities required for the Institute are supported by administrative services of the Institute which are available through following three sections controlled by the Deputy Registrar who reports to the Director. These sections are; *1*. Administration – I, *2*. Administration – II, and *3*. Finance and Accounts. The Administrative Section at Viswanathan Chest Hospital is controlled by the Nursing Superintendent. The administrative services and its sections functioning details are shown in the Administrative Structure chart in the succeeding pages.

GOVERNING BODY

CHAIRMAN	
The Vice-Chancellor, University of Delhi (Ex-Officio) or a person nominated by him	**Prof. P.N. Tandon** President, National Brain Research Centre Society, 1, Jagriti Enclave, Vikas Marg Extn Delhi - 110092
MEMBERS	
Treasurer, University of Delhi (Ex-Officio)	**Mrs Janaki Kathpalia**
Two members nominated by the Executive Council, University of Delhi	**Prof. Anil Tyagi** **Prof. S.C. Bhatla**
Dean, Faculty of Medical Sciences, University of Delhi	**Prof. Upreet Dhaliwal**
Three members nominated by the Ministry of Health and Family Welfare, Government of India, New Delhi	**Shri Rajiv Takru** Additional Secretary and Financial Advisor
	Shri Vishwas Mehta (*Attended GB meeting* Joint Secretary *on 27.09.2012*)
	Shri Anshu Prakash (*Attended GB meeting* Joint Secretary *on 08.01.2013*)
	Dr Jagdish Prasad Director General of Health Services
One member, not connected with the University, nominated by the Executive Council, University of Delhi	**Dr Satyajit Rath** Staff Scientist, National Institute of Immunology, Aruna Asaf Ali Marg, New Delhi-110067
One Professor of the Institute by rotation according to seniority for a period of one year	**Prof. A. Ray** *(till 02.11.2012)* **Prof. S.K. Chhabra** *(03.11.2012 onwards)*
One Reader or Lecturer of the Institute by rotation according to seniority for a period of one year	**Dr Ritu Kulshrestha** *(till 02.11.2012)* **Dr Anita Kotwani** *(03.11.2012 onwards)*
MEMBER-SECRETARY	
Director, Vallabhbhai Patel Chest Institute, University of Delhi, Delhi (Ex-Officio)	**Prof. Rajendra Prasad**, Director (*21.11.2012 onwards*) **Prof. S.N. Gaur**, Director (Acting) (*till 20.11.2012*)

Standing Finance Committee

Additional Secretary and Financial Advisor — *Chairman*
Ministry of Health and Family Welfare
Government of India
Nirman Bhawan
New Delhi

Joint Secretary or Nominee — *Member*
Ministry of Health and Family Welfare
Government of India
Nirman Bhawan
New Delhi

Prof. Ashok Shah — *Member*
Department of Respiratory Medicine
V.P. Chest Institute
University of Delhi
Delhi

Shri P.R. Santhanam — *Member*
Deputy Registrar
V.P. Chest Institute
University of Delhi
Delhi

Prof. S.N. Gaur — *Member-Secretary* (*till 20.11.2012*)
Director (Acting)
V.P. Chest Institute
University of Delhi
Delhi

Prof. Rajendra Prasad — *Member-Secretary* (*21.11.2012 onwards*)
Director
V.P. Chest Institute
University of Delhi
Delhi

Scientific Advisory Committee

Prof. S.K. Jindal — *Chairman*
Head, Department of Pulmonary Medicine
Post Graduate Institute of Medical Education and Research
Chandigarh -160 012

DDG (M) — *Member*
Ministry of Health and Family Welfare
Government of India
New Delhi

Principal — *Member*
University College of Medical Sciences (UCMS)
Delhi

Prof. S.K. Chhabra — *Member*
Department of Cardio-respiratory Physiology
V.P. Chest Institute
University of Delhi
Delhi

Prof. Mridula Bose — *Member*
Department of Microbiology
V.P. Chest Institute
University of Delhi
Delhi

Prof. S.N. Gaur — *Member-Secretary* (*till 20.11.2012*)
Director (Acting)
V.P. Chest Institute
University of Delhi
Delhi

Prof. Rajendra Prasad — *Member-Secretary* (*till 21.11.2012 onwards*)
Director
V.P. Chest Institute
University of Delhi
Delhi

Human Ethics Committee

Prof. S.K. Jain — *Chairman*
Senior Consultant (Pulmonology)
Mool Chand Hospital
New Delhi

Prof. Ashwani Kumar Bansal — *Member*
Dean, Faculty of Law
University of Delhi, Delhi

Prof. Sushma Batra — *Member*
Head, Department of Social Work
University of Delhi, Delhi

Prof. R. Dewan — *Member*
Head, Department of Medicine
Maulana Azad Medical College and
Associated LNJP & GB Pant Hospitals
B.L. Taneja Block, 1st Floor
New Delhi-110 002

Prof. S. Dwivedi — *Member*
Dean / Principal
Hamdard Institute of Medical Sciences & Research (HIMSR)
Hamdard Nagar
New Delhi - 110 062

Prof. Ashok Kumar Saxena — *Member*
Department of Anesthesiology and Critical Care
University College of Medical Sciences (UCMS)
Shahdara, Delhi-110 095

Prof. B.D. Banerjee — *Member*
Department of Biochemistry
University College of Medical Sciences (UCMS)
Shahdara, Delhi-110 095

Dr Ashima Anand — *Member*
Principal Investigator
DST Project
V.P. Chest Institute
University of Delhi, Delhi

Prof. S.N. Gaur — *Member-Secretary* (*till 20.11.2012*)
Director (Acting)
V.P. Chest Institute
University of Delhi, Delhi

Prof. Rajendra Prasad — *Member-Secretary* (*21.11.2012 onwards*)
Director
V.P. Chest Institute
University of Delhi, Delhi

Animal Ethics Committee

Prof. A. Ray — *Chairman*
Head, Department of Pharmacology
V.P. Chest Institute
University of Delhi, Delhi

Prof. K. Ravi — *Member-Secretary*
Head, Department of Physiology
V.P. Chest Institute
University of Delhi, Delhi

Dr Anuradha Chowdhary — *Member*
Associate Professor, Department of Medical Mycology
V.P. Chest Institute
University of Delhi, Delhi

Dr Ritu Kulshrestha — *Member*
Assistant Professor, Department of Pathology
V.P. Chest Institute
University of Delhi, Delhi

Dr D.N. Rao — *Main Nominee of CPCSEA*
Professor, Department of Biochemistry
All India Institute of Medical Sciences
Ansari Nagar
New Delhi - 110 029

Dr Om Singh — *Link Nominee of CPCSEA*
National Institute of Immunology (in the event of non availability of
Aruna Asaf Ali Marg Dr D.N. Rao)
New Delhi - 110 067

Dr B.B. Batra — *Nominee of CPCSEA*
A-316, Sarita Vihar (Non Scientific Socially Aware
New Delhi - 110 076 Member)

Dr (Mrs) Promodkumari — *Nominee of CPCSEA*
Professor, Department of Pharmacology (Scientist from outside the
University College of Medical Sciences Institute)
University of Delhi, Delhi-110 095

Dr Rajinder Bajaj — *Member*
Veterinarian
V.P. Chest Institute
University of Delhi, Delhi

ORGANISATIONAL STRUCTURE

DIRECTOR

RAJENDRA PRASAD, MD, DTCD, FAMS, FCCP (USA), FNCCP, FCAI
FIAB, FIMSA, FCCS, DSc (Hon. Causa)

Biochemistry

S.K. Bansal, MSc, PhD
Professor

Biostatistics

Mujeeb-ur-Rahman, MSc, PhD, PGDCP
Assistant Professor

Cardio-respiratory Physiology

S.K. Chhabra, MBBS, MD
Professor

Clinical Biochemistry

Vishwajeet Rohil, MBBS, MD
Assistant Professor

Medical Mycology

(Mrs) Anuradha Chowdhary, MBBS, MD
Associate Professor

Microbiology

(Mrs) Mridula Bose, MBBS, MD
Professor (Superannuated on 31st December 2012)

(Mrs) Malini Shariff, MBBS, MD, PhD
Associate Professor

(Mrs) Mandira Varma-Basil, MBBS, MD, DNB
Associate Professor

Pathology

(Mrs) Ritu Kulshrestha, MBBS, MS (Biomedical Sciences), DNB (Pathology), MNAMS
Assistant Professor

Pharmacology

A. Ray, MBBS, MD, PhD, MNAMS, FAMS
Professor

(Mrs) Anita Kotwani, MSc, PhD
Associate Professor

(Mrs) Kavita Gulati, MSc, PhD
Associate Professor

Physiology

K. Ravi, MSc, PhD
Professor

Vishal Bansal, MBBS, MD, DNB, PhD, MNAMS, FCCP (USA)
Assistant Professor

Respiratory Medicine

Rajendra Prasad, MD, DTCD, FAMS, FCCP (USA), FNCCP, FCAI, FIAB, FIMSA, FCCS, DSc (Hon. Causa)
Director, Professor

S.N. Gaur, MBBS, MD, PhD (Medicine), FCCP (USA), FNCCP (I), FCAI
Professor

Ashok Shah, MBBS, DTCD, MD, FNCCP (I), FCAI
Professor

Respiratory Allergy and Applied Immunology

Raj Kumar, MBBS, MD, MNASc, FNCCP (I), FCAI, MIAOH, MAAAAI
Professor

Balakrishnan Menon, MBBS, DMRD, MD
Associate Professor

Dr Nitin Goel, MBBS, MD
Assistant Professor (Adhoc)

Respiratory Virology

(Mrs) Madhu Khanna, MSc, PhD
Associate Professor

Viswanathan Chest Hospital
Officer-in-Charge
Rajendra Prasad

Library

(Mrs) Uma Tyagi, MPhil (Physics), MLib Sc
Librarian

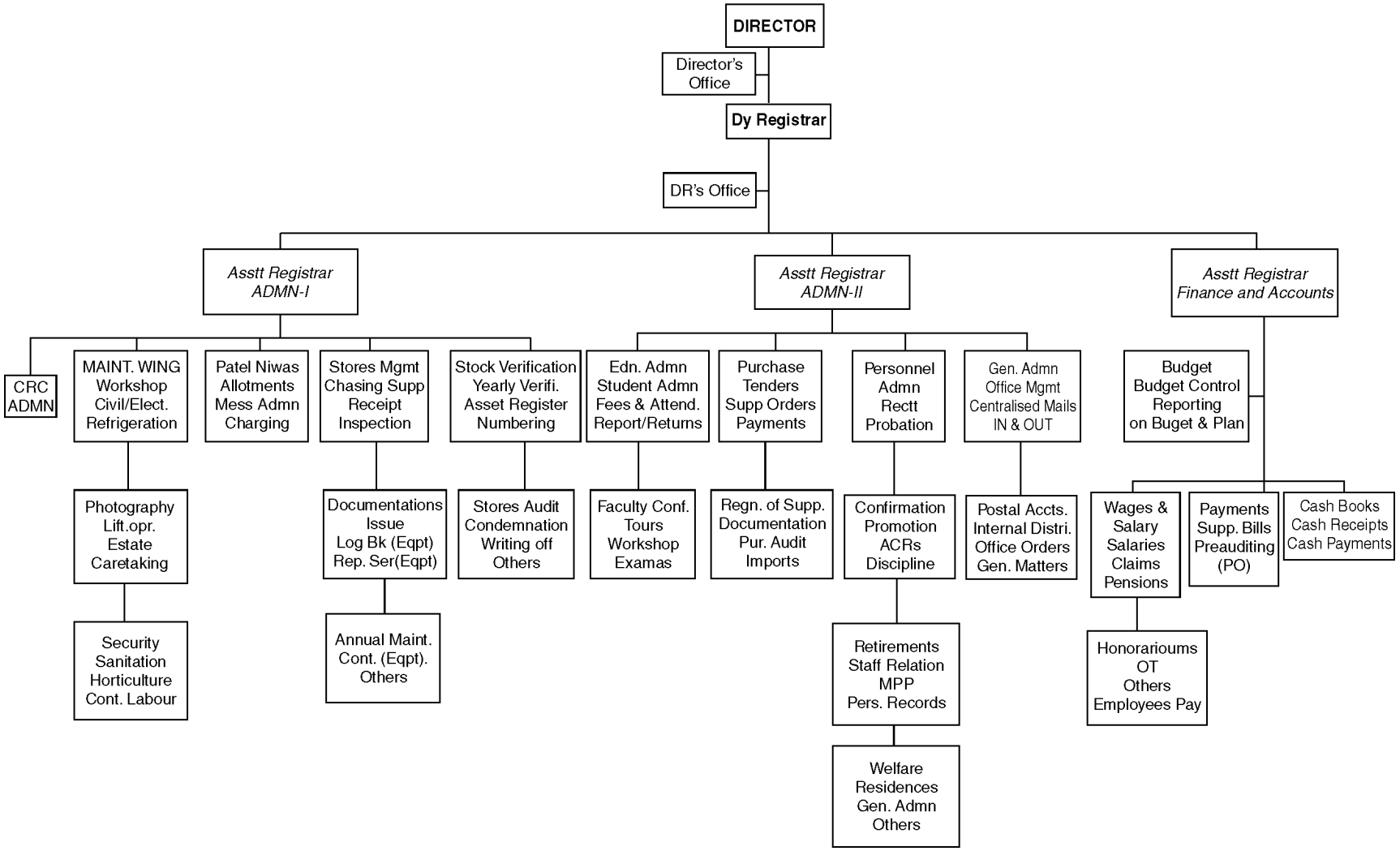
Animal House

Rajinder Bajaj, BVSc & AH
Veterinarian

Administration

P.R. Santhanam, MA (Publ Admn), MHRM, MBA, LLB, PGDPM
Deputy Registrar

ADMINISTRATIVE STRUCTURE



Viswanathan Chest Hospital

The Viswanathan Chest Hospital (VCH), formerly known as Clinical Research Centre, is the hospital wing of the Institute with the following Departments. It provides specialised investigations and treatment to patients referred to this Institute.

- Respiratory Medicine
- Respiratory Allergy and Applied Immunology
- Cardio-respiratory Physiology
- Radiodiagnosis and Imaging
- Clinical Laboratories of Biochemistry and Microbiology
- Anaesthesia
- Thoracic Surgery

Facilities available at Viswanathan Chest Hospital

- Outpatient Department
- In-patient Facility with 128 beds
- 24 Hours Respiratory Emergency
- 8 bedded Respiratory Intensive Care Unit (with facilities of 6 ventilators),
- Pulmonary Function laboratory
- Sleep Laboratory
- ECG
- Allergy and Applied Immunology Laboratory
- Clinical Hematology and Pathology Laboratory
- Clinical Biochemistry Laboratory
- Radiology Unit
- 64 Slice MDCT Scan Center
- Microbiology Laboratory
- Tobacco Cessation Clinic
- Yoga Therapy and Research Centre
- Cardio-pulmonary Rehabilitation Clinic
- Picture Archiving and Communication Systems (PACS)
- Medical Records Section

Specialised investigations available at VCH

- Pulmonary Function Tests
- Arterial Bslood Gases
- Electrocardiogram
- Polysomnograms
- Fibreoptic bronchoscopy
- Respiratory Allergy Skin Tests
- Clinical Immunology
- Computed Tomography
- Plain Radiography

- Ultrasound
- Guided FNAC
- BACTEC System for Tuberculosis
- Medical Thoracoscopy

Detailed data of patients attending VCH during the year

Number of new patients attending OPD	:	10311
Number of old patients visiting OPD	:	52867
Total		**63178**

Number of indoor patients

General wards	:	1919
Emergency wards	:	1954
Total		**3873**
Emergency treatment provided	:	15679
Total number of patients treated in ICU	:	492

Number of routine and specialised investigations done at VCH

Pulmonary function tests	:	18381
Bronchoscopy	:	212
CT scans	:	2934
Ultrasound examinations	:	236
X-rays	:	21708
Electrocardiogram	:	7912
Polysomnograms	:	69
Arterial blood gases	:	7443
HIV testing	:	350
Serum IgE	:	3268
ANA, c-ANCA, p-ANCA, SCL-70	:	120
Clinical biochemistry	:	39910
Skin tests	:	1336

Mycology (VPCI and other hospitals)

Sputa	1551
Blood specimen	770
Bronchial lavage / aspirate / washings	195
Endotracheal aspirate / pleurial fluid	92
Tissue biopsies / nasal polyps / skin scrapings	10
Miscellaneous (blood culture / swabs / urine / CSF / FNAC)	15
Total	**2633**

Bacteriology Laboratory

Clinical specimens processed for isolation and identification of aerobic pathogens

Nature of Specimen	***No.***
Sputum	2907
Urine	177
Bronchial Aspirate	91
Pleural Fluid	40
Blood	79
Endotracheal Aspirate	123
Miscellaneous	10
Total	**3427**

Mycobacteriology Laboratory

Clinical specimens processed for acid-fast bacilli [AFB] (Direct smear and culture examinations)

Nature of Specimen	*No.*
Sputum	5657
Sputum (BACTEC)	301
Post Bronchoscopy Sputum	92
Bronchial Aspirate	174
Bronchoalveolar Lavage (BAL)	27
Pleural Fluid	101
Endotracheal Aspirate	99
Others	24
Total	**6475**

Pathology

Section	*No.*
Haematology	13,305
Coagulation Laboratory	1086
Histopathology	168
Cytopathology	425
Clinical Pathology	566

Tobacco Cessation Clinic

Tobacco Cessation Clinic (TCC) at VPCI, Delhi, a specialised service for peoples who are habituated or addicted to smoking / tobacco chewing are provided assistance and support to quit the use of tobacco. The aim of the TCC is to educate people from all spheres through awareness campaigns, with main focus on college students because most of the tobacco users get into this habit in the initial college years.

The TCC is being operational since November 2001 under the supervision of Prof. Raj Kumar, Head, National Centre of Respiratory, Allergy, Asthma and Immunology, VPCI, Delhi. The clinic provides free counselling, examination and diagnostic testing (Monday to Friday; 9 AM to 5 PM). The TCC also conducts programmes outside the Centre, therby helping the smokers / tobacco habitués to quit their addictions effectively, and also maintaining long-term and even permanent abstinence by cessation techniques, counselling and pharmacotherapy.

The TCC conducted workshops regularly in different parts of Delhi, to train the physicians, counsellors, volunteers and other stake holders involved in smoking cessation. Since inception, TCC conducted 55 educational programmes for physicians, paramedical professionals and general public.

The activities of TCC were expnded in the year 2002 with the financial support from World Health Organization (WHO) and Ministry of Health and Family Welfare, Government of India to make it a more comprehenshive programme Centre. Further, the TCC was upgraded in the year 2009 as Resource Centre for Tobacco Control.

The TCC has prepared educational materials in the form of booklets, pamphlets, stickers, etc., for physicians and general public. Prof. Raj Kumar, Head,TCC has played an important role in compilation and editing of the book titled; *Tobacco Dependance and Treatment Guidelines*, which was published by Govt. of India.

Till date, 4493 new tobacco users and 1983 follow up tobacco users were availed the services of TCC. The tobacco users seen during camps and various educational programmes have not been included here.

The TCC is committed to help the people who want to quit smoking / tobacco use.

Yoga Therapy and Research Centre

The Yoga Therapy and Research Centre [in collaboration with the Morarji Desai National Institute of Yoga (MDNIY), New Delhi], functions at VPCI with one yoga physician, two yoga instructors and an attendant.

Yoga classes runs in different batches from 8-9 AM, 9-10 AM, 10-11 AM, 11 AM -12PM and 2.30-3.30 PM, Monday to Saturday.

Yoga sessions are specially designed for the management of different health disorders, like bronchial asthma, hypertension, stress, obesity etc. Patient first reports to yoga OPD at VCH of VPCI (9.00 AM -3.00 PM) every Wednesday and Friday. After obtaining case history of the patient, necessary counselling is given by the yoga physician. Then the patient is advised to undergo yoga training and educational session, according to individual's health status for a particular period. Once the training sessions are completed, the patient is re-examined to note the improvement made by him / her by the yoga physician. Then patient is advised for home programme with an advice to attend the training sessions once or twice a week at the Yoga Centre for better health and quality of life and to keep their records. Special yoga sessions for staff of VPCI are also arranged time to time.

Following numbers of patients were attended the Yoga Therapy and Research Centre during the year:

Outdoor Patients	539
Indoor Patients	934
Promotional Health Programme	474
Total	**1947**

Outdoor Patients

Bronchial asthma	62
Stress	10
Chronic obstructive pulmonary disease	28
Hypertension	114
Obesity	100
Cervical spondylitis	25
Migraine	25
Backache	40
Allergic rhinitis	25
Arthritis	48
Diabetes	50
Tuberculosis	12

Indoor Patients

Bronchial asthma	261
Chronic obstructive pulmonary disease	444
Interstitial lung disease	39
Sinusitis	60
Pneumonia	50
Tuberculosis	80

Cardio-pulmonary Rehabilitation Clinic

Cardio-pulmonary Rehabilitation Clinic is involved in the management of patients suffering with chronic respiratory diseases such as Chronic Obstructive Pulmonary Disease (COPD), Bronchial Asthma (BA), Interstitial Lung Diseases (ILD), Bronchiectasis; and Post-TB sequelae and Obstructive Sleep Apnea (OSA) who have exercise limitation and are often disabled in activities of daily living (ADL) due to shortness of breath despite being on optimal pharmacological treatment including non-invasive ventilation (NIV) and long-term oxygen therapy (LTOT). This disability leads to functional dependence, loss of job, social isolation and depression. Recurrent medical expenses and hospital admissions along with loss of income adds to socio-economic burden on the family and health care resources.

Patients of VCH are enrolled for consultation and further management in this programmeme, which is designed to help patients to improve their functional capacity so that they can live independently.

Clinic Timings:

Monday to Friday: 9.00 A.M. to 1.00 P.M.

The comprehensive rehabilitation programme includes:

- Assessment of patients for their functional capacity, breathlessness, oxygen requirement during rest and on exertion, disability in activities of daily living and quality of life.
- After assessment, patients are enrolled for 6-10 weeks in supervised rehabilitation programme (3-5 sessions / week under Intensive and 1-2 sessions / week under Maintenance programme).
- Breathing retraining, education and scheduling for rehabilitation of newly referred patients.

Comprehensive rehabilitation programme comprises of both educational and training sessions, that include topics on energy conservation, lung health, bronchial hygiene, chest physiotherapy, nutrition, optimisation of medication intake, domiciliary oxygen usage, stress management, breathing retraining, inspiratory muscle training and strength and endurance training of upper and lower limbs.

Numbers of patients attended in Cardio-pulmonary Rehabilitation Clinic during the year.

Breathing Retraining and Education	:	**227**
Chest Physiotherapy	:	**973**
Supervised Rehabilitation Programme (Intensive and Maintenance)	:	**65**

Specialised Centre

National Centre of Respiratory Allergy, Asthma and Immunology

The National Centre of Respiratory Allergy, Asthma and Immunology (NCRAAI) was established in February 2011. The aim of the Centre is to conduct research and training on various aspects of allergy and asthma (aetiopathogenesis, diagnosis and treatment). A brief description about the activities of NCRAAI during the year is given below;

1. **NCRAAI Website.** Prof. Rajendra Prasad, Director, VPCI launched NCRAAI website: www.ncraai.org on 27th November 2012 with Prof. Raj Kumar, Head, NCRAAI; Dr B.K. Menon, Dr Nitin Goel, other staff of the Centre and Shri P.R. Shanthanam, Deputy Registrar of the Institute. A book containing details of various programmes and activities of the NCRAAI, compiled and edited by Prof. Raj Kumar was also released on this day.

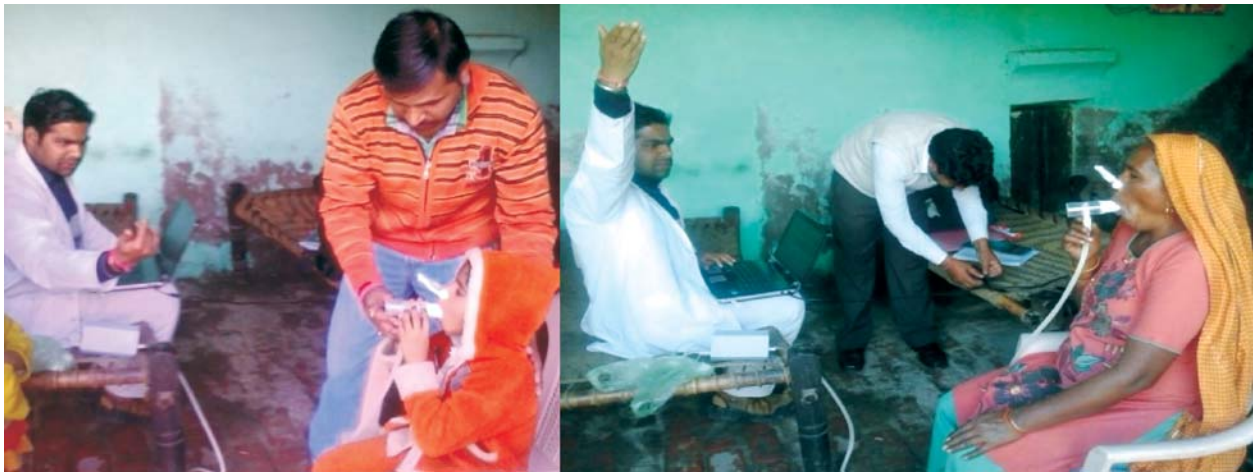
2. **International Training Programme organized in Sri Lanka.** For the first time, a workshop on "Respiratory Allergy" was organised by NCRAAI, in collaboration with the Association of Pulmonologists (Sri Lanka) at Colombo (Sri Lanka) 20th August 2012.

3. **Research Activities:** The Centre is engaged with the following research activities:

   - Measurement of exhaled nitric oxide (FE_{NO}) in normal, atopic and asthmatic children.
   - Study of sino-nasal involvement in patients with interstitial lung diseases.
   - Correlation of functional exhaled nitric oxide, nasal nitric oxide with atopic status in bronchial asthma, allergic rhinitis and bronchial asthma with allergic rhinitis.
   - A study of skin sensitivity to various aeroallergens in patients having bronchial asthma and / or allergic rhinitis in India.

- To study food allergy and food intolerance in patients having bronchial asthma and chronic obstructive pulmonary diseases (COPD).

- Indoor air pollution and asthma exacerbation in children: a population-based study in the villages of Delhi.



4. **Short term Specialised Training for International and National Medical & Para Medical Professionals:** The Centre organised international and national conferences besides various short-term specialised training and teaching programmes for medical and paramendical professionals. A total of 45 medical professionals from India and abroad were trained duriong the year. Also 13 paramedical professionals were trained during the year.

Animal House

The Institute has one of the best 'state-of-the-art' Animal House. It is fully equipped with facility of International Standards of Animal Experimental Laboratories. It provides optimum environment in experimental and breeding animals.

The Institute Animal House is registered with the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) (vide registration no. 170 / 1999 / CPCSEA, dated 1st December 1999) for breeding and conducting experiments on small Laboratory Animals.

The different species and strains of small laboratory animals are bred and maintained to supply the quality animals as per the requirement. Institute Animal Ethics Committee (IAEC) keeps a check to promote the humane approach of animal experimentation with the basic objective of providing specifications that will enhance animal care and quality in the pursuit of advancement of scientific knowledge that is relevant to humans and animals.

The Animal House is managed by a well qualified Veterinarian. The other staff includes Technical Assistant and Attendants who are experienced and trained in modern methods of animal care, breeding and husbandry. The Animal House has a compliance (assurance) with the standards of Public Health Services (PHS), Policy on Human Care and Use of Laboratory Animals, Office of Laboratory Animal Welfare (OLAW), National Institute of Health, Bethesda, USA.

Library

The Institute has one of the best library in the field of Pulmonary Disease and Allied Sciences having 10,018 Books, 22,450 bound Journals, 155 CD's, 496 Theses and 100 National and International Reports. A total of 100 Journals (95 International and 05 National) are being subscribed by the library, 20 Journals (08 International and 12 National) are being received on exchange programmeme with the Institute's Journal and 33 Journals (09 International and 24 National) are received on complimentary basis. Library is also subscribing four English and four Hindi newspapers.

Library renders its services not only to the scientists / research scholars of the Institute, but also to other Colleges and Institutes of the University of Delhi. Library is also affiliated with DELNET (Developing Library Network) to access various databases like Union Catalogue of Books / Periodicals for providing timely and current information. Much emphasis is also laid on to provide abstracts, references and specific information, if required. Apart from this, online searches are being carried out for providing instant access of Information Resources to the desktop of researchers through LAN (Local Area Network). The Internet services have been provided right on the desktop of each Faculty Member through LAN and leased line connectivity with 2 Mbps from MTNL. Library also provides inter-library loan facilities and reprographic services on demand.

The Library follows an Open Access system. Library is equipped with modern information technology equipments and continues to provide Internet / Email services to the users to access CAS (Current Awareness Services) and SDI (Selective Dissemination of Information) services. These are provided to the users in the form of online / offline through e-mail and print during the year. Library uses 'LibSys 4.0' software package, which is an integrated multi-user library management system that supports all in-house operations of the Library. The 'LibSys' consists of modules on acquisition, cataloguing, circulation, serials, article indexing and OPAC.

The Library services are available to Members and Users of University of Delhi from Monday to Friday (8.30 A.M. to 7.00 P.M.).

PUBLICATION DIVISION

Publication Division of the Institute has been publishing a quarterly periodical, ***the Indian Journal of Chest Diseases and Allied Sciences*** **(IJCDAS)**, in collaboration with the National College of Chest Physicians (India). The Journal was started in 1959 by (late) Prof. R. Viswanathan, Founder-Director of VPCI. The Journal has a wide national and international circulation and is indexed in PubMed, Medline, IndMed, INSEAR, and Ulrich's Directory, etc. Full text articles published in the Journal (July-September 2003 onwards) can be accessed online through the following sites:

V.P. Chest Institute's site : **<http://www.vpci.org.in>,**

Indmed's site : **<http://medind.nic.in>.**

The Division is also responsible for documentation and dissemination of research output through Annual Report and other publications of the institute.

DEPARTMENTAL ACTIVITIES

Biochemistry

Research

1. Pharmacogenomics of bronchial asthma: a study on polymorphism in b_2-adrenoceptor (*ADR*B2) and corticotropin releasing hormone receptor 1 (*CRHR1*) genes in responders and non-responders to salbutamol and budesonide

The study was conducted to identify the genetic variations in b_2-adrenoceptors (*ADR*B2) and the corticotropin releasing hormone receptors 1 (*CRHR1*) genes in responders and non-responders to b_2-agonist (salbutamol) and corticosteroids (budesonide) in asthmatic patients and healthy individuals in Indian population. In *ADR*B2 gene, SNPs observed in study subjects were at -1343 (A / G),-1023 (G / A),-654 (G / A), 46 (A / G), 252 (G / A), 491(C / T), 523 (C / A) and 1053 (G / C) and 1239 (A / G), in Indian population; many of which are already known in different populations form different countries.

In *CRHR1* gene, we studied the single nucleotide polymorphisms (SNP's) in all the 14 Exons including their flanking regions. We observed the presence of three novel SNPs: *(a)* intron 3 at 34048 (C / A), *(b)* in intron 13 at 50229 and *(c)* in intron 13 at 50300 (A / C) positions. The other known SNPs, not reported in asthma earlier, were found at positions 30972 (G / A), 37260 (C / T), 50089 (G / T) and 46012 (A / C). Association of these SNPs with the disease was not observed in the study subjects. Further, one known SNP, reported in asthma earlier, was found in intron 2 at position 30892 (C / A), that showed association with the disease, supporting the findings of others.

Association of SNPs with non-responders to salbutamol or budesonide treatment could not be established due to small sample size. Further studies are in progress.

2. Studies on erythrocyte membrane protein profile and oxidant and antioxidant status of blood in bronchial asthma

Asthma is a chronic inflammatory disorder of airways in which several cell types such as lymphocytes, mast cells, macrophages, eosinophils, neutrophils, and epithelial cells are involved in airway inflammation. Besides these, lines of evidence suggest that erythrocytes have the potential to participate in the inflammatory response and in tissue repair. Erythrocytes can efficiently bind and release inflammatory mediators suggesting their role in inflammatory disorders including asthma. The inflammatory cells infiltrating the airways in asthma produce toxic reactive oxygen species (ROS) and in circulation they themselves are exposed to oxidative stress as well.

Erythrocyte membranes are composed of several proteins performing various functions. Oxidative stress is known to cause changes in erythrocytes membranes. Our earlier studies have shown changes in protein profile of erythrocyte membranes in bronchial asthma. We, therefore, hypothesized that changes in erythrocyte membrane proteins profile in bronchial asthma may be associated with oxidant / antioxidant balance or vice versa.

Our preliminary studies have further confirmed our earlier findings that in asthma there is no difference in the total number of erythrocytes. However, the total protein contents of the membrane were significantly higher in asthmatics than the healthy controls. The resolution of membrane proteins on SDS-PAGE resolved a different protein profile of asthmatics than healthy controls. Further experiments are in progress.

Biostatistics

The Department of Biostatistics provides comprehensive, flexible statistical support tailored to the ongoing needs of researchers. Teaching of basics of Biostatistics and state-of-the-art statistical methods along with use of the Statistical Package for Social Sciences to the students of the Institute which help them in their dissertations / theses. The Department compiles periodic reports of various activities including diagnostics, staff pattern, etc., of VPCI for the submission to the Ministry of Health and Family Welfare, Government of India, Directorate General of Health Services, Government of Delhi, etc. The Department also carries out research data analysis of the varous departments of the Institute.

Research

1. To assess the prevalence, screening and recognition of anxiety and depression in chronic obstructive pulmonary disease patients

Chronic obstructive pulmonary disease (COPD) is a disease with multiple co-morbidities. Two of the most common and least treated co-morbidities of COPD are Anxiety and Depression. These co-morbid, psychiatric disturbances are frequently overlooked or regarded as natural features of the lung disease. A co-morbid psychiatric disorder is possible to treat successfully that leads to improved quality of life and less restricted general functioning of the individual.

So far, a total number of 60 COPD patients with age ranged from 46 to 82 years (61.1 ± 8.0) were screened for anxiety and depression, using Generalized Anxiety Disorder 7 (GAD-7) and Patient Health Questionnaire 9 (PHQ - 9) schedules, the prevalence of anxiety and depression present in COPD patients was found to be 51% and 90%, respectively.

2. To translate, validate and psychometric profile of 'Hindi' version of Depression, Anxiety and Stress Scale 42-item (DASS-42)

The Depression Anxiety Stress Scale (DASS), a 42-item questionnaire has been used across the world as research instrument to measure psychological aspects such as depression, anxiety and stress. This instrument has already been translated in 28 other international languages.

Patients with chronic airway lung disease such as COPD often experience depression, anxiety and stress.

The study designed to translate, validate and psychometric profile of 'Hindi' version of the DASS-42 in COPD patients was conducted in the Viswanathan Chest Hospital of VPCI. Nearly 125 patients in the age group of 40 years and above were included in this study. DASS-42 questionnaire (Hindi version) will be administered to the patients with COPD. Recoding of anthropometric and pulmonary function test measurements will also be recorded and analysed in this study.

Cardio-respiratory Physiology

Research

1. Pulmonary functions in normal adults in India: development of reference standards for spirometry, static lung volumes and single breath diffusion capacity

A multicentric study to develop regression equations for spirometric parameters, lung volumes and diffusion capacity, coordinated by the Institute and funded by the Indian Council of Medical Research was completed. It was carried out at four centres: North (Delhi), South (Bangaluru), East (Kolkata) and West (Mumbai). After screening by chest radiograph and physical examination, lung function tests were carried out. Similar methodology and equipments as per the standardisation guidelines of the American Thoracic Society-European Respiratory Society was used at all the centres. More than 1600 subjects were finally included on the basis of technically acceptable tests. Foced vital capacity (FVC), Forced expiratory volume in the first second (FEV_1) and peak expiratory flow rate (PEFR) and other flow rates were found to have a good correlation with height. The FEV_1 / FVC ratio was found to decrease with increasing age. Diffusion capacity was observed to decrease with age. Regression equations for the lung function parameters have been developed for the four centres.

Till now, most of the centres in India were using equations that were developed for western populations leading to substantial misinterpretation and misclassification of patients. This is the first-ever effort of this kind in India where standardised and uniform methodology was used to develop regression equations in different populations in the country. The available equations were old and obtained on equipment technology that is no longer in use. The equations fulfil the unmet needs in the field of pulmonary medicine and will enable a more accurate diagnostic assessment and monitoring of patients with chest diseases.

2. Heart rate variability in chronic obstructive pulmonary disease: association with systemic inflammation and clinical implications

The phenomenon of heart rate variability (HRV) in patients with chronic obstructive pulmonary disease (COPD) and its relationship to severity of disease is under evaluation. Experimental data collection has been completed. A total of 66 patients with COPD compared with age-matched smoker and non-smoker controls shows that unlike other diseases with increased risk of cardiac mortality, there is increased modulation of HRV with an increase in both sympathetic and para-sympathetic components. Systemic inflammation indices, C-reactive protein (CRP) and interleukin-6 (IL6) were found increased in patients. The cardiac safety of drugs used in COPD, b_2- agonists and anticholinergics, has been debated and uncertainty persists. We have examined the effect of these drugs on HRV. No evidence of adverse effects was found indicating the cardiac safety of these drugs. Data on 24-hour holter monitoring of these patients is under analysis for the frequency and pattern of cardiac arrhythmias.

3. Endothelial dysfunction in chronic obstructive pulmonary disease

Although COPD manifests mainly as a pulmonary disease, it has significant extra- pulmonary component and cardiovascular disease (CVD) is the major cause of morbidity and mortality in patients with COPD. Recent studies have identified increased arterial stiffness and altered vascular function in patients with COPD, suggesting a role for systemic vascular dysfunction in mediating this cardiovascular risk. A study was taken as an endeavour to evaluate endothelial function in patients with COPD as evidenced by endothelial-dependent and endothelial-independent vascular relaxation and relate it to the severity of COPD, and to study, if any, relationship between autonomic imbalance, as quantified by heart rate variability, and endothelial dysfunction in patients of COPD. The study was completed. We observed that patients with COPD have endothelial dysfunction as compared to matched controls independent of smoking, as evidenced by abnormal augmentation index and impaired response to salbutamol. Our patients did not had clinical evidence of atherosclerosis and had normal echocardiography and ankle-brachial index (ABI), suggesting that augmentation index screens patient with endothelial dysfunction before overt atherosclerosis ensues. The endothelial dysfunction begins early in COPD and likely develops as an independent process rather than as a consequence of progressive disease, as there was no correlation with clinical and physiological

markers of severity. Though autonomic dysfunction and endothelial dysfunction were not related, the increased sympathetic activity in autonomic dysfunction may be important as it may promote endothelial dysfunction.

4. Electrocardiographic screening for cardiac involvement in pulmonary sarcoidosis

Cardiac involvement in sarcoidosis is often not detected during life because of non-specific manifestations. Arrythmias pointing to a diagnosis of cardiac sarcoidosis, *i.e.*, conduction abnormalities, atrioventricular block (AVB) or bundle branch block (BBB) are detected in less than 5% of patients with sarcoidosis. The antemortem diagnosis of myocardial sarcoidosis is difficult because electrocardiogram (ECG) abnormalities or cardiac failure are non-specific and may be related to other causes. Recently, use of specialised electrocardiographic tools has permitted identification of abnormalities of cardiac sarcoidosis. A study has been started to determine the occurrence of abnormalities in specialised electrocardiographic monitoring using signal averaged electrocardiogram (SAECG), QTc dispersion, microvolt T wave alternans and 24-hour holter monitoring in patients with pulmonary sarcoidosis and to explore the relationship between the electrocardiographic abnormalities and clinical, physiological and radiological features of pulmonary involvement in sarcoidosis.

5. Retrospective review of lung function tests database for quality control and supranormal spirometry

Spirometry is pivotal to the screening, diagnosis, and monitoring of respiratory diseases and is increasingly advocated in primary care practice. Although spirometry is often described as a simple screening test, due consideration is essential not only of equipment selection, but, importantly, of test performance and correct interpretation of the results. The importance of quality control is immense. Quality assurance is one of major regular tasks of pulmonary function laboratories. The Pulmonary Function laboratory at the Vallabhbhai Patel Chest Institute performs more than 20000 tests every year, and therefore, has a huge database available for review. This data is being reviewed to determine how frequently the acceptability and repeatability criteria are met, specifically each specific criterion and relate it to age, diagnosis and severity. Another objective is to identify subjects with supranormal FVC (greater than 120%) and study radiological and other physiological correlates from the recorded clinical data and develop an algorithm for interpretation.

Clinical Biochemistry

The Department of Clinical Biochemistry is providing diagnostic services for the patient care and also actively involved in the research and teaching of postgraduates MD (Medical Biochemistry) and PhD students. The Department is also providing summer training to students from other institutions / colleges.

Research

1. Studies on implications of epigenetic modulation due to histone hyperacetylation in tumour cells induced by drugs targeting protein acetylation system through a novel mechanism

Molecular mechanisms in cell transformation processes increasingly indicate that cancer is also an epigenetic disease and it has been shown that the imbalance of acetylation and deacetylation levels results in the development of malignancies. Protein acetylation in cells is regulated by synchronised activities of histone acetyl transferases (HAT) and histone deacetylases (HDAC) which have been implicated in homeostasis of DNA repair, cell cycle delay, apoptosis and senescence. Thus, elucidation of the role of histone acetylation in cell by the novel mechanism *i.e., via* calreticulin transacetylase (CRTAase) would hold key to the design of target oriented drugs in cancer therapy including lung tumourigenesis.

In our plan of work transacetylase activity of CRTAase was to be proved in tumour cells by analysing the effect of valproic acids and various polyphenolic acetates on tumour cell by studying apoptosis in tumour cell lines as a result of histone hyperacetylation. Various polyphenolic acetates and their combinations with calreticulin and HDAC inhibitors were used in the studies. We have studied whether these combinations lead to increased apoptosis in the cancer cells or not, thereby exploring the role of polyphenolic acetates and calreticulin as potential candidates intended for their use as target oriented chemotherapeutic and chemopreventive drugs acting by the above mentioned novel mechanism.

We have extended our studies to assay CRTAase in human non-small cell lung cancer A549 cell line culture tumour cells *in vitro* and CRTAase catalysed modification of histone by various combinations of PAs [Ellagic acid peracetate, Querecitin Pentaacetates, 6-Acetoxy Quinolone and 7, 8-Diacetoxy-4-Methyl Coumarin (DAMC)] and Valproic acid as HDAC inhibitor. Apoptosis studies are being carried out by florescent microscopy and Flow-cytometric analysis. Extent of histone protein acetylation is being determined by Western blotting using commercially available specific anti-acetyl histone (Ac-Lys) H3 and H4 antibodies.

The data clearly demonstrates: *(a)* increased apoptosis in all treatment groups compared to dimethyl sulfoxide (DMSO) controls, *(b)* alone all polyphenolic acetates (DAMC, EAA, QPA and 6-AQ showed significant increase in apoptosis compared to controls and CAL alone, and *(c)* VA and CAL alone did not show any significant increase in apoptosis compared to controls.

G1, G2 and S phase though showed decreased percentage of cell in all treatment groups compared to control. This is for the first time epigenetic modulation by acetylated histone by the novel method, using specific anti H3 lysine antibodies is being demonstrated resulting in increased apoptosis, which is highly encouraging for us to carry out further research.

2. To elucidate the molecular mechanism of development of COPD in smokers in North Indian population

Nearly 90% of Chronic Obstructive Pulmonary Disease (COPD) is caused by long term cigarette smoking; however, only 25% of chronic tobacco smokers develop COPD. But why do only 25% of long-term smokers develop COPD, when others do not? It appears that smokers who acquire COPD may have a different genotype than those lifelong smokers in whom lung function declines at a slower pace or not at all. The association of COPD and smoking with SNPs in the candidate genes- ADAM33, MMP1, MMP9 and MMP12 genes in North Indian population is intended to be studied. In three groups formed on the basis of smoking history and Spirometry as mentioned in the project protocol (*Group I i.e.*, Smokers with normal spirometry and without any co-morbidity, *Group II i.e.*, Smokers with spirometry proven COPD and without any co-morbidity and *Group III i.e.*, Non-smoker healthy individuals as controls). Aim of the study was to find out the quantification of various metalloproteinases and polymorphisms in metalloproteinases genes, ADAM33, MMP1, MMP9

and MMP12 and their association with smoking and COPD. Primers were designed using appropriate software and initial studies have been done using gene runner programmeme.

After taking consent from the subjects and filling up the questionnaire, sprometry and chest radiographs were done. Blood samples were obtained from the subjects in the morning into *Vacutainers* for the estimation of various parameters including quantification of gene product proteins and PCR analysis.

We have standardised PCR programme for complete set of primers which is being used for analyzing various SNPs in ADAM 33 and MMP1, MMP9 and MMP12 genes.

MMP1, MMP9, MMP12 and ADAM33 metalloproteinases were quantified for all of the serum samples, using the specific precoated ELISA kits. Protein concentrations were determined as absorbances using the ELISA Reader.

Presently, DNA sequencing analysis studies are underway, 9 SNPs in **ADAM 33 gene:** Reference SNP ID: rs2787095, rs2280090, rs2280091, rs2280089, rs612709, rs511898, rs3918396, rs528557 and rs597980 and in MMP genes: MMP1 gene: SNP 1G-16072G, SNP ID - rs1799750; MMP9 gene: SNP C-1562 T, SNP ID - rs3918242; MMP12 gene: SNP A-82G, SNP ID - rs652438.

Statistical analysis will be performed after obtaining all the results.

3. A study to correlate the activity of ADAM33 gene protein with oxidative stress in asthma

The study was conducted in patients with asthma, and healthy normal controls. The objectives of the studies were: *(a)* to determine the lipid per oxidation by measuring the MDA levels in all the groups under study, *(b)* to determine the level of antioxidants: Vitamin C and Glutathione (GSH) in all the groups under study, *(c)* to estimate ADAM-33 gene protein levels in all the groups under study and *(d)* to correlate ADAM-33 protein levels with MDA levels, Vitamin C and Glutathione levels in all the groups under study.

In this study, we observed that there was an increase in the ADAM33 levels and depletion of antioxidants levels like Vitamin C and GSH in the serum samples of the patients having asthma as compared to the controls. We found a significant negative correlation between ADAM33 levels and antioxidant levels like Vitamin C and GSH in the serum analysed by Pearson's correlation coefficient (r). There was also an increase in MDA levels in the serum samples of the patients having asthma but there was non-significant correlation between ADAM33 levesl and MDA levels on Pearson's correlation coefficient analysis.

Medical Mycology

Research

1. Clonal expansion and emergence of environmental multiple-triazole-resistant *Aspergillus fumigatus* strains carrying the TR34/L98H mutations in the *cyp*51A gene in India

Azole resistance is an emerging problem in *Aspergillus*, which impacts the management of aspergillosis. We investigated the emergence and clonal spread of resistance to triazoles in environmental *Aspergillus fumigatus* isolates in India. A total of 44 (7%) *A. fumigatus* isolates from 24 environmental samples were found to be triazole resistant. The isolation rate of resistant *A. fumigatus* was highest (33%) from soil of tea gardens followed by soil from flower pots of the hospital garden (20%), soil beneath cotton trees (20%), rice paddy fields (12.3%), air samples of hospital wards (7.6%) and from soil admixed with bird droppings (3.8%). These strains showed cross-resistance to voriconazole, posaconazole, itraconazole and to six triazole fungicides used extensively in agriculture. Our analyses identified that all triazole-resistant strains from India shared the same $TR_{34}/L_{98}H$ mutation in the *cyp*51 gene. Microsatellite analysis revealed that in contrast to the genetic uniformity of azole-resistant strains the azole susceptible isolates from patients and environments in India were genetically very diverse. All nine loci were highly polymorphic in populations of azole-susceptible isolates from both clinical and environmental samples. Furthermore, all Indian environmental and clinical azole resistant isolates shared the same multilocus microsatellite genotype not found in any other analyzed samples, either from within India or from the Netherlands, France, Germany or China. Our population genetic analyses suggest that the Indian azole-resistant *A. fumigatus* genotype was likely an extremely adaptive recombinant progeny derived from a cross between an azole-resistant strain migrated from outside of India and a native azole-susceptible strain from within India, followed by mutation and then rapid dispersal through many parts of India. Our results are consistent with the hypothesis that exposure of *A. fumigatus* to azole fungicides in the environment causes cross-resistance to medical triazoles. The study emphasises the need of continued surveillance of resistance in environmental and clinical *A. fumigatus* strains.

2. First environmental isolation of *Cryptococcus gattii*, genotype AFLP5, from India

Cryptococcus gattii, is an opportunistic pathogen causing cryptococcosis in immunocompetent hosts. *C. gattii* natural habitat is decayed wood and its genotype, VGII has emerged in Canada and Pacific Northwest in last decade causing a large outbreak of cryptococcosis. We investigated the occurrence of rare *C. gattii* genotypes in the environment of India. A total of 101 isolates of *C. gattii*, originating from 556 samples of decayed wood inside trunk hollows of 311 heterogeneous tree species and their surrounding soil were investigated and molecularly characterised using amplified fragment length polymorphism. Of these, only a solitary isolate proved to be AFLP5 / VGIII. It originated from decayed wood inside a trunk hollow of *Manilkara hexandra*, a native tree in Delhi, the remainder belonged to AFLP4. Antifungal susceptibility testing showed a low MIC_{90} (0.25 µg mL^{-1}) of the new azoles posaconazole and isavuconazole for these environmental isolates. AFLP5 / VGIII, is one of the rarely reported genotypes of this pathogen. Genotype AFLP5 has been mainly reported from environmental sources in Colombia and from clinical sources in California (USA), where it seems to be endemic. Phylogenetic analysis of multi-locus sequence typing data showed that the Indian AFLP5 *C. gattii* isolate had a distinct profile compared with a cluster of mainly Colombian and Californian *C. gattii* AFLP5 isolates. As molecular typing of human pathogenic fungi is still in its infancy and not accessible to many countries, our current knowledge cannot be taken as reflective of the true geographic distribution of *C. gattii* AFLP5 or its other rarely reported molecular types.

3. Isavuconazole MIC distributions and epidemiological cutoff values for *Aspergillus* spp. for the CLSI broth microdilution method (M38-A2 document): a multicenter study

Aspergillosis is an important fatal fungal infection with high mortality rates. The first-line of treatment is azoles, namely voriconazole. With the emergence of azole resistance in *Aspergillus fumigatus* in Asia and Europe the antifungal susceptibility testing of *Aspergillus* species is recommended. The present study was undertaken to establish the epidemiologic cut-off values (ECVs) for the new triazole, isavuconazole and

Aspergillus spp. Wild type (WT) MIC distributions (organisms in a species / drug combination with no detectable acquired resistance mechanisms) were defined with the available isolates of the following *Aspergillus* species complexes: 855 *A. fumigatus*, 444 *A. flavus*, 106 *A. nidulans*, 207 *A. niger*, 384 *A. terreus*, and 75 *A. versicolor*; 29 *Aspergillus* section *Usti* isolates were also included. CLSI broth microdilution MIC data gathered in Europe, India, Mexico and the United States were aggregated to statistically define ECVs. ECVs expressed in ìg / mL were: *A. fumigatus* species complex 1; *A. flavus* species complex 1; *A. nidulans* species complex 0.25; *A. niger* species complex 4, *A. terreus* species complex 1 and *A. versicolor* species complex 1; due to the low number of isolates, an ECV was not proposed for *Aspergillus* section *Usti*. These ECVs may aid in detecting isavuconazole non-WT isolates with reduced susceptibility to this agent due to *cyp51A* (an *A. fumigatus* species complex resistance mechanism among the triazoles) or other mutations.

Microbiology

Research

1. Functional analysis *of mce1A* and *mce4A* gene of *M. tuberculosis* using over-expression approach

Mycobacterium tuberculosis (MTB), an obligate pathogen, is well known to be able to survive even within the macrophages. The *mce4* operon of mycobacteria has an important role to play during this invasion and survival inside the macrophages. In our previous works, we have reported that *mce4A* gene of *mce4* operon expresses during stationary phase and has cholesterol binding property, which was demonstrated through in-vitro and ex-vivo approaches. After quantification of cholesterol in cells through these two approaches, in this report, we have focused on visualisation of cholesterol depletion in MTB infected THP-1 cells. Depletion was higher in the *mce4A* over-expressing MTB infected THP-1 derived macrophages. We further demonstrated this increased utilisation by *mce4A* over-expressing MTB through mouse model, where we infected the Balb / c female mice with wild type and recombinant MTB and isolated serum from blood at regular intervals of time. A regular and continuous decrease in serum cholesterol was quantified yet again in case of infection with *mce4A* over-expressing MTB.

2. Functional analysis of *mce1A* and *mce4A* protein of *M. tuberculosis*: role in cholesterol transport and phagolysosome fusion inside macrophages

This study is to explore the role of *mce4A* protein of MTB in transport of cholesterol and its effect survival of mycobacteria inside the host cell. The cholesterol binding property of purified Mce4A protein was explored by performing the spectral binding assay where a continuous increase in the absorbance (390nm-420nm) of *mce4A* was observed for all concentrations of cholesterol (20, 30, 40, 50 µM) in comparison to *mce1A* protein. Further, to investigate the ability of *mce4A* protein in uptake of cholesterol from the cell environment we quantified cholesterol from THP-1 cells infected with recombinant (over-expressing *mce4A* and *mce1A*, and antisense *mce4A*) MTB H37Rv. *mce4A* over-expressed MTB imported five times more radioactive cholesterol from the medium inside the THP-1 cells. We further confirmed this uptake by performing filipin staining specific for cholesterol visualisation at different time intervals post infection (48 and 72 hours) of the THP-1 cells. The *mce4A* over-expressing MTB infecting THP-1 demonstrated a greater decrease in cholesterol as shown by filipin in comparison to wild type and *mce1A* over-expressing MTB. We also visualised the effect of *mce4A* over-expressing MTB infection on THP-1 through transmission electron microscopy. More number of mycobacteria was found inside the phagosomes in case of *mce4A* over-expressing MTB infected THP-1 macrophages in comparison to *mce1A* over-expressing MTB and wild type H37Rv, at different time points (48 and 72 hours).

3. Expression analysis of an array of genes of *M. tuberculosis* clinical isolates from pulmonary tuberculosis and lymph node tuberculosis: search for mycobacterial factors associated with differential clinical manifestation

Tuberculosis (TB) generally infects the lungs. But, the bacilli also infect other parts of the body in case of severe infections especially in immune suppressed patients; these infections are known as; extra-pulmonary TB, extra-pulmonary TB may co-exist with pulmonary TB as well. Lymph node TB called lymphadenitis is the most common extra-pulmonary manifestation of TB. It is still not clear why MTB causes pulmonary TB in some individuals and extra-pulmonary TB in others. In the present study, clinical isolates of MTB from pulmonary TB and lymph node TB will be analysed in detail up to the molecular level to address this question.

Ten MTB clinical isolates from pulmonary TB and 10 from lymph node TB patients, and one reference strain MTB H37Rv available in our laboratory from previous sample collections are maintained on Lowenstein–Jensen medium and in Middlebrook7H9 broth. These strains were used for current analysis. We found that the MTB clinical isolate from lymph node TB has a slow growth rate as compared to the clinical isolate from pulmonaryTB by comparing their O.D. $_{600}$. Mycolic acid of MTB H37Rv has been extracted; and efforts are ongoing to quantify it by using High performance liquid chromatography. The obtained profile will be used

as control to compare lipid profile of different MTB isolates which have been obtained from patients of lymph node TB and pulmonary TB, grown under different culture conditions. We will also analyse level of different genes expression associated to lipid metabolism. This will help to identify if there is any differential pattern of gene expression and mycolic acid content of MTB obtained from lymph node TB and pulmonary TB patients. For this, mRNA has been isolated and the corresponding cDNA has been prepared and stored at -80 ^{0}C for further use.

4. Regulation of expression of *mce4* operon of *M. tuberculosis*: search for upstream promoter activity and regulatory proteins

This study was designed to identify the promoter region as well as the regulatory proteins of *mce4* operon of MTB. Rapid amplification of 5'cDNA revealed that transcription start site (TSS) of *mce4* operon is 56bp downstream from putative translational start site. As new TSS was found, 600bp DNA region with new TSS was cloned in pSD5B that has shown significant promoter activity. Further promoter activity was analysed under different stress conditions, like acidic stress, surface stress and oxidative stress and hypoxia. Promoter of *mce4* operon was found over- expressed in the presence of surface stress and hypoxia. To search for regulatory proteins of *mce4* operon, 600bp promoter region was labelled with biotin and pull down assay with MTB lysate was performed. Proteins obtained from pull down assay were purified by 2D gel purification kit and separated using 2D gel electrophoresis. Most prominent proteins on polyacrylamide gel were excised and identified by MALDI-TOF analysis. MASCOT analysis of MALDI-TOF data showed 4 ribosomal binding proteins, one RPOA, one MIHF and one PPI protein. These proteins further strengthen the fact that *mce4* operon is cholesterol importer and expresses in later phase of growth.

5. Phenotypic and molecular characterisation of drug resistant *Pseudomonas aeruginosa* isolates from clinical samples

Two hundred sixty-three isolates of *Pseudomonas aeruginosa* were isolated from clinical samples from patients attending VPCI. Antibiotic susceptibility testing was performed and 30 isolates were found to be resistant to carbapenems. The minimum inhibitory concentration of these isolates to meropenem was more than 256. These isolates were further screened for the presence of various beta-lactamases, like ESBL, AmpC and MBLs and 29, 22 and 30 were found to be positive, respectively. Among these 4, 3 and 5 were confirmed to be positive for ESBL, MBL and AmpC respectively by phenotypic confirmatory test. Further work is underway to isolate more of these isolates and characterise all by polymerase chain reaction (PCR) and perform typing of the isolates by RAPD and MLST.

6. Hospital infection control surveillance

Various samples from ICU and ward like suction ports, oxygen masks and ports, mattresses, airbed, bed railings, hand swabs from health-care professionals working in these units, environment samples etc were collected from 16th January to 15th March 2013. Major findings were that *Klebsiella pneumoniae* was isolated from a blanket in ICU. The patient using that blanket had subsequently developed infection with *Klebsiella pneumoniae*. Samples from airbed, oxygen port yielded *Pseudomonas* with varying degree of resistance to antibiotics.

7. Genetic variations in host innate and adaptive immune response in tuberculosis: a search for risk loci in north Indians

Infectious pathogens have long been recognised as potentially powerful agents impacting on the evolution of human genetic diversity. Analysis of case – control studies provides one of the most direct means of identifying human genetic variants that currently impact on susceptibility to particular infectious diseases. For over 50 years candidate gene studies have been used to identify loci for many major causes of human infectious mortality, including malaria, tuberculosis (TB), human immunodeficiency virus / acquired immunodeficiency syndrome, bacterial pneumonia and hepatitis. There are several approaches to study the disease susceptibility with all the methods having their pros and cons. The goal of these studies is a better understanding of disease pathogenesis and resistance in the expectation that this will lead, in time, to improved interventions such as better drugs or vaccines to prevent or attenuate the great global burden of infectious disease morbidity and mortality.

A second application that is gaining increasing attention is the potential to stratify populations for risk of infectious disease based on genetic profiling. This has not been a priority until now as most preventive interventions such as childhood vaccines have been aimed at universal coverage. However, as more potentially useful vaccines are licensed and the costs of new vaccines escalate, targeted use is becoming a consideration.

The current study was designed to address the role and importance of genetic variations in susceptibility to TB in north Indians. The current times have seen a multitude of studies emerging on the subject from various parts of the world. Even so, the current population was relatively under-represented in such analysis. We have used a population based case-control approach for our study, which involves comparison of the allele prevalence in diseased *versus* non-related, non-diseased individuals.

This study contributes significantly to the TB host genetics field, since several candidate genes, never investigated before, were tested as susceptibility factors. In addition, we considered susceptibility genes previously identified in other populations. This is important as ethnic validation of commonly reported variants in different populations is desirable. In total, 112 polymorphisms in 25 genes were selected from both the innate and adaptive immune branches operating in TB, were genotyped in the north Indian population during this study. Allele frequencies were compared and linkage disequilibrium and haplotypes investigated. We also estimated the serum cytokine levels in TB to assess the profile in north Indians, and to identify serum biomarkers for this population. The serum cytokine levels were also correlated with the corresponding genotypes to search for possible correlation and demonstrate in the present synthesis that the serum cytokine levels vary with the respective genotypes for certain genetic variants. We also, considered lymph node TB, an extra-pulmonary form of TB for analysis and could successfully identify the varying genetic and immune profile of this form from pulmonary TB, extending the idea that different clinical manifestations in TB can result due to variance in the genetic makeup of an individual in these immune response genes. Specifically, we identified a risk for rs1427294 of *SP110* polymorphism for lymph node TB but not pulmonary TB. This gene is important to control apoptosis of infected macrophages and any alteration of the function can have significant impact on TB. Similarly a variant of the P_2X_7 gene showed higher risk for lymph node TB, which is also incidentally related to apoptosis, leading us to speculate that the apoptotic axis may be important in lymph node TB. As is recognised, after infection with MTB, to generate an effective immune response the bacilli are carried to the draining lymph nodes for antigen presentation. During this time the apoptotic axis might play a crucial role. If the infected macrophage undergoes apoptosis, it would lead to better antigen presentation and any variations in the genes such as P_2X_7 and *SP110* regulating this axis affecting the normal functioning could lead to establishment of infection at these sites by the thriving bacilli.

The other genetic variants of importance were from the *CD209* gene and *LTA4H* gene, which are important in innate immune response in TB. Therefore, it emerges from the current study that variations in the innate immune variants have a close relation to the development of lymph node TB. Surprisingly, the cytokine genetic variants had no apparent effect on susceptibility to TB.The cytokine axis and genetic variants in the cytokine genes were significant risk factors pulmonary TB. We also show that there exists a significant gene–gene interaction among cytokine SNPs that may further accentuate the importance of the identified SNPs in governing the genetic susceptibility toTB in north Indians. Some of the earlier investigated variants in other world populations were not replicated in the present study. This could be due to *(i)* the difference in ethnicity, as it governs the outcome of TB susceptibility in TB, and *(ii)* some of the previously published associations considered during our study had extremely low sample numbers and were therefore under-powered.Overall the work carried out contributes many markers, genetic and serological, towards understanding of the complex interaction behind the immunity in TB. The north Indian population was scanned thoroughly by a wide choice of markers. The markers identified in this study would aid in further investigations in a larger population to strengthen the role of genetic markers in TB.

8. Drug resistance profiling and molecular typing of *M. tuberculosis* isolates from different community settings in North Delhi

The present study has been planned to ascertain the incidence of drug resistance in MTB isolates from patients in Delhi being treated in the private setting and patients being treated in Government run DOTS or non-DOTS centres; and to determine the MTBgenotypes from the isolates of three groups of patients under

study. Besides the drug resistance profiles in the three different centres, we will also investigate the presence of any clustered MTB isolates, thus showing the impact of interventions aimed at reducing recent transmission.

The objectives of the study were, first, to study the prevalence of drug resistant, multidrug resistant and extensively drug resistant MTB isolates from 500 patients in North Delhi being treated *(a)* in the private setting, *(b)* through a DOTS centre and *(c)* in a non-DOTS government centre, in a follow up study. Genotypic characterisation of the isolates obtained from the three groups of patients under study by MIRU typing, Spoligotyping and IS6110 RFLP shall also be performed.

Sputum samples were collected from 695 patients, 485 from the DOTS centre at Rajan Babu Institute of Pulmonary Medicine and Tuberculosis [RIPMT] (formerly RBTB Hospital), 70 from private clinics in North Delhi and 140 from VPCI. Of the 485 samples obtained from RIPMT, 339 were new, 102 were previously treated and 44 had been categorised as multi-drug resistant. Of the 70 samples obtained from private clinics, 54 were new and 16 were previously treated; while of the 140 samples obtained from VPCI, 21 were new, 59 were previously treated and 60 could not be characterised. Of these, 372 patients from the DOTS centre, 25 patients from VPCI and 12 patients from private clinics were followed up after two months of therapy. Repeat sputum samples were taken from70 of the 372 patients followed up at the DOTS centre, 6 of the 25 patients followed up from VPCI and all 12 patients from private clinics. The rest of the patients had improved with therapy. Three patients from the DOTS centre had died. Till date, 273, 20 and 83 samples from RIPMT, private clinics and VPCI, respectively, have been found to be culture positive. The other samples are still under observation. The isolated MTB strains were assayed for isoniazid, rifampicin, streptomycin and ethambutol susceptibility by proportion method. The frequency of multi-drug resistance (MDR) in the MTB strains obtained from those treated under DOTS, VPCI and in private clinics and tested for drug susceptibility till date was observed to be 11%, 14% and 5%, respectively.

Cluster analysis was carried out in the present study by IS*6110* and MIRU typing on 250 isolates and by IS*6110*, MIRU typing and spoligotyping on 101 isolates. On IS*6110* RFLP typing, 20% cases in the DOTS centre and 15% cases in private clinics were found to have <6 bands. We did not find any isolate with no IS*6110* bands. In the present study, the 16 strains with <6 IS*6110* bands, had been placed into a clusters by IS*6110* typing. MIRU typing, however, revealed all the strains to be unique isolates. IS*6110* revealed 10 clusters. Of these, one cluster consisted of three isolates while the others consisted of 2 isolates each. On MIRU typing, two of the clusters were found to be true clusters. In the other 8 clusters, MIRU typing differentiated the strains forming the clusters into unique types. No epidemiological link was found in one of the true clusters. A link was detected in the other. Spoligotyping, in the present study, revealed 49 SIT patterns. Of these, 7 SITs were newly created. This observation might suggest a possible introduction of new genotypes due to casual contacts and / or increased international travel. The most common spoligotype found in our study was SIT26 (CAS1-Delhi, n=21, 20.8% of isolates), followed by SIT11 (EAI3-IND lineage, n=11 strains, 10.9% of all isolates). Thus, the various spoligotypes found in our study were: EAI 26.7%, CAS 43.6%, Beijing 5.94%, and Manu 4.95%.

9. Expression analysis and protein profiling of drug efflux transporters in clinical isolates of *M. tuberculosis*

Mycobacterium tuberculosis is intrinsically resistant to various antibiotics due to its unusually thick cell wall. Involvement of efflux pumps is a second major cause to increase intrinsic drug resistance in MTB. We propose to investigate the mRNA expression analysis of efflux related genes under drug pressure to investigate the role of efflux pumps in drug resistance, particularly in multi-drug resistant isolates of MTB obtained from patients of pulmonary TB.

In spite of several studies, the sub inhibitory concentration of drug that leads to optimal expression of efflux pumps is still unclear. Various studies have been carried out to study the mRNA expression of efflux pumps but the sub-inhibitory concentration of drugs that was taken in these studies varied. Hence, we exposed log phase H37Rv to ½ MIC, 1 / 3 MIC and ¼ MIC of rifampicin, isoniazid, ethambutol and ciprofloxacin over a period of 24 hours and performed qRT-PCR to observe the expression of 11 efflux pump genes. We observed a gradual increase in the expression of efflux pumps with increasing sub-inhibitory concentration of INH. However, surprisingly, with streptomycin, rifampicin, ethambutol and ciprofloxacin exposure, the number of overexpressed genes were found to be higher on exposure to lower sub-ihibitory concentration (1 /

4 MIC). Infact, a gradual increment in gene expression was observed with decreasing sub-inhibitory concentration of drugs. To conclude, more efflux genes are active under low sub-inhibitory concentration of all antituberculous drugs, except isoniazid. The expression of efflux genes in the presence of sub-inhibitory concentration of antituberculous drugs, excluding isoniazid, is also increased at lower concentrations. To the best of our knowledge, this is the first report on the response of efflux pumps to increase or reduce the levels of drugs.

We have also observed that the RNA expression of 10 efflux pump genes of 5-drug sensitive and 5-drug resistant isolates. For this purpose, we used ½ MIC of isoniazid and ¼ MIC of rifampicin, streptomycin, ethambutol and ciprofloxacin. Over-expression was seen in three genes on exposure to rifampicin. Of these, one gene was also overexpressed in the presence of ciprofloxacin. None of the efflux genes were seen to be overexpressed in the presence of isoniazid, ethambutol or streptomycin. In addition, 2D gel has been standardised to study the protein profile of H37Rv, in order to determine the efflux proteins ove-rexpressed in the presence of sub-inhibitory concentrations of antituberculous agents.

10. Sloppy molecular beacon analysis of drug resistant *M. tuberculosis* isolates in north Delhi

The present study was conducted to determine the frequency of specific mutations that lead to drug resistance in MTB isolated from patients of TB being treated in the North Delhi area.

Isolates of MTB (n=108) were obtained from patients of TB attending the RIPMT and VPCI. The isolates had been confirmed to be MTB by biochemical tests and PCR restriction analysis. All the isolates were subjected to a sloppy molecular beacon assay to determine mutations in genes known to be associated with drug resistance *viz.*, *katG, inhA, rpoB, rrs*, *embB*306, *gyrA* and *eis.* All the 21 isoniazid resistant isolates had a mutation at the 315 codon. Five of these also had a mutation at *inhA*. The most common mutation found in rifampicin resistance strains was 531 (55% of 20 rifampicin resistant isolates); followed by 516 (25% of 20 rifampicin resistant isolates). None of the isolates had a mutation at the *rrs* gene while 6 isolates had a mutation at the *embB*306 codon. The latter was also found to be resistant to ethambutol by proportion method.

11. SNP cluster grouping of *M. tuberculosis* isolates (SCG)

Single nucleotide polymorphisms (SNPs) are more exact tools for phylogenetic studies and are less prone to distortion by selective pressure. Selectively neutral SNPs may accumulate at a uniform rate and can be used to measure divergence. Nine SNP sets were used in the present study to identify clusters of MTB. The SCG identified were divided into the following groups: 1, 2, 3a, 3b, 3c, 4, 5, 6a, 6b and 7. Of the 153 isolates tested, SCG 3a was the most predominant amongst the isolates from north Delhi region.

Pathology

Research

1. Differential diagnosis of granulomatous lung inflammation on transbronchial lung biopsy: a two year study

Granulomatous lung inflammation is among the most commonly encountered pulmonary pathology and often poses a diagnostic challenge. An accurate identification of the histopathological features and categorisation of granulomas in transbronchial lung biopsy (TBLB) is needed to improve patient outcome. A retrospective analysis of 304 TBLB's received at Department of Pathology, VPCI, over a two year period from July 2010 to October 2012 was done. The TBLB's were histopathologically studied for the presence of granulomatous inflammation. Granulomas were categorised on the basis of their location (subepithelial / interstitial), presence or absence of necrosis, multinucleated giant cells (Langhans, foreign body type), intra-cytoplasmic inclusions (Schaumann body, crystals), AFB, PAS and reticulin staining patterns. The histopathological features were correlated with clinical / radiological features for final diagnosis. Granulomatous inflammation was seen in 52 / 304 cases (17.1%) with 30 males and 21 females, age ranging from 20-60 years. Definite diagnosis was possible on histopathology in 31 / 52 cases (59.6%). Tuberculosis was confirmed by the identification of AFB positivity in 6 cases (11.5%), caseating granulomas in 6 cases (11.5%), Langhans cells in 13 cases (25%). Submucosal non-necrotising granulomas with typical Schaumann bodies, diagnostic of sarcoidosis were found in 6 cases (11.5%). Definite diagnosis of granulomatous inflammation of lung is possible in nearly 60% cases by systematic histopathological pattern based analysis of TBLB alone. Tuberculosis is the most common causative agent. Its differentiation from sarcoidosis requires appropriate interpretation of histopathology and special stains. In addition, a rigorous clinical-radiological correlation is emphasised.

2. Anthracotic pigment in transbronchial lung biopsy: an innocent bystander or pathogenic agent for parenchymal lung disease

Anthracosis is the presence of carbon particles in the lungs and is known to be associated with bronchial tuberculosis and stenosis. Anthracosis is seen in the TBLB specimens in those who smoke or live in a city or industrial environment. The presence of anthracotic pigment in TBLB was studied and its significance assessed in a retrospective analysis of 235 TBLB received at Department of Pathology, VPCI over a two-year period from August 2010 to October 2012. The TBLBs were histopathologically studied for the presence of anthracotic pigment deposition, presence and extent of inflammatory and fibrotic reaction in lung parenchyma and evidence of granuloma formation. On the basis of histopathological features, biopsies were divided into 3 groups. Special stains including Perl's Prussian blue stain and polarising microscopy was done to rule out deposition of other pigments and crystals. Masson Trichrome and Ziehl-Neelsen stain were used to confirm the diagnosis of fibrosis and TB respectively. Deposition of anthracotic pigment, with or without fibrosis was seen in 12 biopsies. These included 7 males and 5 females with a mean age of 52 years (25 to 75 years). On the basis of the lung parenchymal changes the TBLB's were categorised into 3 groups; *Group 1*: Pigment deposition with fibrotic parenchymal reaction (n=4), *Group 2*: Pigment deposition with inflammatory parenchymal reaction (n=5), and *Group 3*: with granulomatous parenchymal reaction (n=3). In two cases of *Group 2* and one case of *Group 3*, parenchymal deposits of silicate crystals were also identified by polarising microscopy. Thus, anthracotic pigment deposition was seen to be associated with inflammatory and / or fibrotic parenchymal reaction. The identification of silicates and granulomatous inflammation suggests that the retained anthracotic particles alone may not be responsible to induce bronchial stenosis in patients of bronchial anthracofibrosis. The pathogenetic mechanisms involved need further elaboration.

3. Correlation of pleural biopsy histopathological patterns with fluid analysis in pleural tuberculosis

Pleural involvement by TB may be primary, secondary or post-primary (reactivation) pleurisy. The development of empyema and / or pleural fibrosis typically follows severe pleural space inflammation and exudative effusion. In haemorrhagic pleural effusions, an accurate identification of the pleural pathology and its correlation with clinical-radiological features is necessary to reach a definitive diagnosis.

A retrospective analysis of the histopathological features of pleural biopsies received at Department of Pathology, VPCI from January 2009 to November 2012 was done. All cases were correlated with pleural fluid analysis and clinical / radiological features. All biopsies were stained with Haematoxylin & Eosin and Ziehl-Neelsen stain. A total of 12 biopsies were received. These included 10 males and 2 females, age ranging from 33 to 80 years, mean of 65 years. The adequate biopsies (n=11) were classified into *Group I*: malignant (2 / 11=18.2%), *Group II*: nonmalignant (9 / 11=81.8%). Pleural fluid submitted in *Group II* revealed haemorrhagic aspirate in 8 / 9 cases (88.9%), while lymphocyte predominance was seen in only 1 / 9 case (11.1%). In *Group II* histopathological analysis revealed, chronic lymphocytic pleuritis in 4 cases (44.4%), epithelioid granuloma formation in 3 cases (33.3%), necrosis in one case (11.1%) and fibrosis was seen in one case of non-resolving effusion (11.12%). Thus, in patients presenting with haemorrhagic effusion it is important to differentiate tubercular effusion from malignancy by pleural biopsy. The histopathological patterns of tubercular involvement of pleura vary depending upon the stage of involvement and epithelioid cell granulomas may not be identified in all cases. The knowledge of the histopathological patterns is necessary to accurately identify these cases and improve patient outcome.

Haematology and Clinical Pathology laboratories continued to function on all holidays for emergency, indoor and ICU patients.

Pharmacology

Research

1. A clinical study to evaluate the safety and efficacy of theophylline and its modulation by ascorbic acid in patients of bronchial asthma

Bronchial asthma is a common obstructive respiratory disease, affecting people around the world, and is a major global health problem. Combination of inhaled b_2-agonists and corticosteroids (standard treatment) is the best known treatment till date. Methylxanthines like theophylline are established bronchodilators for the treatment of bronchial asthma and other respiratory disorders. However, its narrow therapeutic index and the resultant adverse drug reaction (ADR) profile has considerably restricted its therapeutic use. Recently, there has been resurgence in the interest in the use of methylxanthines like theophylline, as an adjuvant, in the treatment of asthma and chronic obstructive pulmonary disease (COPD), in view of its newly discovered anti-inflammatory and immunomodulatory effects. Further, preclinical data has shown that oxidative stress may be involved in some aspects of theophylline toxicity and antioxidants protect against such adverse effects. Therefore, the understanding of the pharmacodynamics and pharmacokinetics of the toxicological mechanisms will help to rationalise drug therapy with this effective, time tested, and pharmacoeconomically viable agent. Therefore, the present study was designed to compare safety, efficacy and adverse drug reactions of theophylline and its modulation by antioxidant ascorbic acid in patients with bronchial asthma.

This was a prospective, open label, randomised, parallel design study. A total of 50 patients were enrolled and divided into two groups with 25 patients in each group: *Group 1*- Inhaler (Fluticasone + Salmeterol) + Theophylline 400mg SR; and *Group 2*- Inhaler (Fluticasone + Salmeterol) + Theophylline 400 mg SR+ Ascorbic acid (500 mg). Patients were followed up weekly for 4 consecutive weeks and assessment of safety and efficacy was done. Efficacy assessment was done using pulmonary function test parameters (FEV_1, FEV_1 / FVC ratio and FVC), clinical symptoms (cough, sputum and dypnoea) and emergency drug (SOS levosalbutamol) use while safety was assessed by recording ADRs in the standard prescribed format. Monitoring of serum concentration was done by using HPLC. Along with it monitoring of oxidative stress parameters like serum malondialdehyde (MDA) and superoxide dismutase (SOD) levels was also done using available biochemical tests. Analysis of data showed that both treatments produced continuous, comparable improvement in FEV_1, FEV_1 / FVC ratio and FVC values. Both treatments produced significant improvement in symptoms (cough, dyspnoea and sputum), which were comparable. Frequency of use of reliever medication (levosalbutamol) was also similar. However, assessment of safety parameters revealed that the incidence of ADRs were significantly lower in *Group 2* as compared to *Group 1*. We conclude that addition of ascorbic acid to theophylline adjunct therapy is associated with decreased incidence of adverse effects. Therefore, theophylline should be preferred in combination with ascorbic acid as add-on therapy in patients with bronchial asthma. HPLC measurement of serum concentration of theophylline showed that patients from both treatment groups had comparable serum theophylline levels of around 12 µg / mL. This shows that ascorbic acid do not seem to have an effect on pharmacokinetics of theophylline. Biochemical analysis showed that addition of ascorbic acid seem to have reduced the oxidative stress levels, as evident by decreased levels of MDA and increased levels of SOD in patients of *Group 2* as compared to *Group 1*. This difference in parameters of oxidative stress may explain the decreased incidence of theophylline adverse effects in patients of *Group 2* as compared to *Group 1*.

2. Experimental studies with chelidonic acid, a molecule of plant origin with possible therapeutic potential in bronchial asthma

Several strategies are being tried to promote herbal drug development and monoherbals and polyherbals have been tested in both pre-clinical and clinical situations. Chelidonic acid is a secondary metabolite from several plants and its presence in many alkaloids containing plants is known since long and is the salt forming acid for several bioactive plant alkaloids. Some like *Chelidonium majus* (Celandine) and several others of the Papavar species are reported to contain this substance. There is possibility of its ability to modulate the pharmacological activity of the alkaloids with which it co-exists in plants. Chelidonic acid has also been reported as the leaf closing signaling molecule for *Cassia minosodia* (an Indian medicinal plant) and

has been isolated from *Sorghum vulgare* seedlings (a common food material grown in India), flowers of *Cassia spectabilis* and leaves of *Gloriosa superba*. Structurally, this zinc site of the enzyme is analogous to many other immunological sites involved in histamine release and many other inflammatory phenomenon and there are also several reports on its zinc chelating properties. Preliminary studies showed that chelidonic acid at a dose of 10 mg / kg was effective in inhibiting histamine release comparable to disodium cromoglycate, a mast cell stabilizes used in the prophylaxis of asthma and related allergic disorders. This study was aimed at confirming this observation and extending it further to other parameters relevant for asthma. Our experiments showed that chelidonic acid (3, 10 and 30 mg / kg) dose dependently attenuated histamine release from rat peritoneal mast cells in ovalbumin immunised + challenged animals. Tests for adaptive immunity showed that chelidonic acid enhanced cell mediates immune responses as measured by the DTH assay, and marginally suppressed humoral immunity as measured by the anti-sRBC antibody titre (haemagglutination assay). Further experiments are planned to estimate histamine levels from incubated mast cells (*in vitro* anaphylaxis), and inflammatory markers in blood and bronchalveolar lavage fluid. This will provide additional information on the anti-inflammatory and immunomodulatory effects of this plant derived agent.

3. Brain nitric oxide and high altitude stress

Emotional and environmental stressors can influence the neurobehavioural profile of an organism. Further, behavioural factors like emotionality and cognition are recognised as important predictors of stress susceptibility. Ascent to high altitude is associated with decreased partial pressure of oxygen that in turn leads to reduced oxygen delivery to tissues, a condition referred to as hypobaric hypoxia. Brain in particular is highly vulnerable to such hypoxic stress due to its high oxygen requirement. There have been several reports on the occurrence of cognitive dysfunctions on exposure to hypobaric hypoxia in both natural and simulated conditions. High altitude stress effects were assessed on the neurobehavioural profile in rats. Hypoxia simulating high altitude at 8000 (HI) and 12000 (HII) feet was induced in hypoxia chamber. Restraint stress (RS) was given in specially designed restrainer boxes. Elevated plus maze (EPM) and Morris Water Maze (MWM) tests were used as behavioural tests for anxiety and cognition, respectively, and brain oxidative stress markers (malondialdehyde [MDA], glutathione [GSH]) were measured. The effects of nitric oxide modulators on behavioural and biochemical parameters were assessed in both control and experimental groups and compared statistically. RS alone reduced % OAE and % OAT when compared to the controls (no RS) showing an increased anxiety after exposure to RS. Similarly, increase in anxiety was also observed after exposure to hypobaric hypoxia. But the effect of hypoxia at 12,000 feet was more remarkable compared to hypoxia at 8,000 feet. When a combination of both RS and hypoxia at 8,000 feet and 12,000feet was give, the % OAE and % OAT reduced further compared to both the above cases, showing more anxiety in rats. This effect was also greater at 12,000 feet and showed highest level of anxiety among all the groups of rats. All the above responses were attenuated after L-Arginine treatment, whereas, L-NAME aggravated the same. Oxidative stress parameters were also assessed by measuring MDA and reduced (GSH) spectrophotometrically. MDA levels were found to be highest in the group treated with RS + HII + L-NAME and lowest in the group treated with HII+ L-Arginine. GSH levels were found to be highest in the group treated with HII + L-Arginine and lowest in the treatment group of RS+ HII+ L-NAME. Studies for cognitive effects in MWM showed that learning and memory was influenced by acute exposure to hypobaric hypoxia and RS. The mean escape latency time (ELT) on day 4 was found to be reduced when compared to day 1. The mean ELTwas lowest in group treated with RS+HI and highest in group treated with HII+L-NAME. The mean ELTincrease shows reduction in learning ability of the particular group and vice versa. Probe trial was conducted on Day 5 of each study, probe trial shows reduced time spent in the target quadrant in the group treated with HII + L-NAME and increased time spent in target quadrant in the group treated with HII+ L-Arginine MDA levels were found to be highest in the group treated with HII + L-NAME and lowest in HII+L-Arginine GSH levels were also found to be reduced in HII + L-NAME group and to be increased in HII+ L-Arginine group. These results suggest that NO may be involved in hypoxia induced anxiogenesis and that interactions between reactive nitrogen and reactive oxygen species may play a crucial role in this phenomenon. Further studies are in progress to confirm and extend this hypothesis.

4. Pharmacological studies on the possible mechanisms involved in theophylline-induced cardiotoxicity in rats

Methylxanthines are rapidly reemerging as viable therapeutic agents in the treatment of obstructive

airway disease. However, their narrow therapeutic index and hence the safety considerations still cloud its effective use. Recent studies have shown that theophylline in moderate to low doses may be effective as an inflammatory agent and hence interest regarding its rational use has been regenerated. Cardiotoxicity and neurotoxicity are two of the major safety concerns with the drug. The present study evaluated the possible mechanisms involved in theophylline induce cardiotoxicity with an aim to device strategies for the safe and effective use of this pharmacoeconomically viable agent. Experiments were conducted in albino rats and theophylline was administered interperitoneally in graded doses (50, 100 and 150 mg / kg) and heart rate and blood pressure (BP) were recorded and electrocardiogram (ECG) tracing taken by using the software based BIOPAC device. Blood was collected for assay of oxidative stress markers. The results showed that theophylline dose relatedly induced tachycardia and marginal increases in BP. No ischemic change was recorded in the ECG. These exchanges were accompanied by an increase in blood MDA and SOD levels and no appreciable change was seen in GSH levels. These preliminary results indicate that theophylline-induced cardiotoxicity may involve oxidative mechanisms, Further studies are in progress to critically evaluate this proposed hypothesis.

5. Pharmacological studies on stress-induced modulation of inflammation and immunity in rats

The interaction between the brain and the lung has been proposed. Emotional stressors are known to influence lung function and precipitate pathophysiological states. Nitric oxide (NO) is an important mediator in both brain and lungs. The present study evaluated the possible involvement of nitrergic mechanisms and their downstream signalling pathways in inflammation and immunity with reference to lung diseases. Restraint stress (RS) was used as the experimental stressor and the effects of NOergic agents were evaluated on lung markers of inflammation and immunity. Both humoral- and cell-mediated immune responses as well as markers of innate immunity were evaluated. Our experiments show that chronic but not acute stress influenced markers of both innate and adaptive immunity. RS exerted complexly differential effects on the inflammatory and immune cell counts in the blood. Chronic but not acute induced markedly differing nature of effects on the principal cellular components in blood. Whereas the neutrophil count was increased, the lymphocyte counts showed tendency towards inhibition. Pre-treatment with L-arginine clearly reversed the suppression in neutrophil counts whereas NO synthase inhibitors did not show any consistent pattern on the effects of chronic RS-induced blood counts. In tests for cellular immunity as seen by the delayed type of hypersensitivity response (DTH assay) acute RS had no significant effect on change in foot pad volume after intra-paw antigen challenge in antigen sensitised rats. None of the drug treatments had any influence on the change in paw volume from that seen in response to the acute RS. However, chronic RS (21 days) induced marked suppression in the DTH response which was attenuated by L-arginine pre-treatment. On the other hand, all NO synthase inhibitors showed opposite effects on this parameter of inflammation and immunity with L-NAME being most consistent in this regard. Mast cell degranulation was used a marker for antigen antibody reaction which could influence the inflammatory response. Acute RS had no significant effect on the mast cell degranulation as compared to controls. However, all the NO synthase inhibitors, induced suppression of mast cell degranulation when combined with acute RS. On the other hand, L-arginine was ineffective in these experiments. Interestingly, chronic RS enhanced the mast cell degranulation after 21 days exposure. 7-nitro indozole and to some extent aminoguanidine was effective in negating this effect. Oxidative and nitrosative stress are involved in various pathophysiological states and the present experiments evaluated the effects of acute and chronic RS and its modulation by nitrergic agents on some relevant parameters. Acute RS significantly reduced glutahthione (GSH) levels in blood and these changes were only influenced by pretreatments with either L-arginine or L-NAME. However, chronic RS induced markedly greater suppressions in GSH levels as compared to those seen during acute RS. Such chronic RS induced lowering of GSH levels were attenuated by L-arginine pretreatment, whereas, the NO synthase inhibitors produced similar effects as those seen after chronic RS alone. Acute RS had no effect on the MDA levels in blood and neither was these levels much influenced by NO modulators in the presence of RS. However, in the chronic experiments with 21 day RS exposure, there were appreciable increases in MDA levels as compared to the control values. The chronic RS induced elevations in MDA were attenuated with L-arginine pre-treatment and aggravated by the NO synthase inhibitors, with most marked changes being seen after L-NAME pre-treatments. NO is an important bioregulator and the present studies also evaluated the effects of both acute and chronic RS on NO metabolites (NOx) in blood. Acute RS had no significant effect on NOx levels in blood and neither was these levels much influenced when NO modulators were given in the presence of RS. However, there was a marked

suppression in NOx levels in blood after chronic RS (x 21 sessions). These chronic RS induced lowered NOx levels were reverted back to near normalcy in the presence of the NO precursor, L-arginine. On the other hand, none of the NO synthase inhibitors used were able to influence NOx levels when given in combination with chronic RS.

6. Prices of commonly used essential medicines in branded and branded-generic versions available in Delhi

The Indian health care system is characterised by high out-of-pocket payments by patients and their families. Further, medicines make most of the share (around 80%) for health care expenditure and up to 80% of the population in India has to buy medicines through out-of-pocket payments. Therefore, price and availability of medicines are by no means the only barriers to access to affordable medicines. Recently conducted surveys showed an unexpected variation in prices between sectors and among therapeutic equivalents. Medicines in India are known as "branded" and "branded- generic"; almost all products carry a brand (trade) name. So called *branded* medicines are manufactured by a multinational or an Indian manufacturer of good repute. *Branded* medicines are promoted by manufacturers, more popular, most sold and are relatively expensive than branded-generic which are less popular. We did a few studies to assess the quality of branded and branded-generic medicines and the results showed that both comply with the standards of IP.

The survey was planned and conducted in private retail pharmacies of different parts of National Capital Territory (NCT) of Delhi to find out the highest- and lowest-priced generic equivalent of medicines under National Essential Medicine List 2011 (NEML 2011).

7. National Medicine Policy (NMP) and drug use in South East Asia

This SEARPharm Forum project was funded by WHO-SEARO. The member countries participated in the project was Thailand, Indonesia, India, Sri Lanka, Bangladesh and Nepal. Dr Anita Kotwani, Associate Professor, was Advisor on the project and was elected as Chair, Working Group, National Medicine Policy Project-India.

A survey form was finalised to study the demographic profile of the participating countries and existence and implementation of NMP on the basis of EML for the public procurement, National Formulary, Standard Treatment Guidelines, Price and Availability of common essential medicines, Quality assurance and Data on substandard and fake products. Survey form was distributed to Chair of Working Group of participating countries to conduct the survey in their respective countries.

Filled forms will be received in the coordinating country, India. Data will be analysed, a detailed report will be prepared and the results will be discussed in the Annual Meeting of SEARPharm Forum.

8. Antimicrobial drug prescribing pattern in hospitalised patients of community-acquired pneumonia: a retrospective study

Community-acquired pneumonia (CAP) is a common infectious disease associated with significant mortality and morbidity. The lack of an aetiological diagnosis when antimicrobial treatment needs to be administered, the broad variety of antimicrobials available and the increasing resistance to antimicrobials among the common aetiological pathogens have led different scientific societies to publish clinical guidelines in the selection of the appropriate initial antimicrobial regimens.

A number of prospective and retrospective studies in Europe and the USA have been conducted to define the pattern of CAP and trends of antimicrobial use in outpatient and inpatient settings. However, there is scanty data for the pattern of antimicrobial use in CAP from Indian subcontinent where the rate of occurrence of CAP is more than the developed world and due to geographical differences. Therefore, this study was conducted at respiratory medicine departments of VPCI and Safdarjung Hospital of Delhi. This retrospective study evaluated the patterns of antimicrobial use in patients with CAP admitted and discharged during previous five consecutive periods from April 2007 to March 2012.

Results were analysed in detail using the Statistiscal Package for Social Sciences (SPSS). Data was analysed for the trends in antimicrobial prescription for CAP over five years (periods) in the two study hospitals. Chi-

square test of proportion was used to show whether there was any significant change in proportion of antimicrobial use over the five periods in study hospitals by comparing proportion of antimicrobials used in one period with the other period (between two periods).

9. Pharmacological studies on the possible role of nitric oxide (NO) and NO-mediated signalling pathways in the regulation of stress-induced immunological changes in rats

Stress is a condition that disrupts psychological / physiological homeostasis and an organism's ability to cope with the stressors are crucial for health and disease. Stress can occur in many ways, *viz*., physical, psychological or environmental. It can be acute or chronic, predictable or unpredictable – to name a few variants. Irrespective of the type / duration / intensity, the brain and its neural networks appears to play a central role in the stress effects. Complex neurochemical pathways regulate stress susceptibility and adaptation and a variety of interacting neurotransmitter systems have been implicated. Stress is detrimental to health particularly immune functions, through the actions of stress hormones (particularly glucocorticoids and catecholamines). Nitric oxide (NO) is a unique molecule with multidimensional effects and NO-modulators have been effectively used as experimental tools to study the NO-ergic mechanisms in both experimental and clinical situations. NO is an important neuro-modulator and its role has been suggested in neuro-behavioural states, neuronal toxicity, cognition and immune functions. A recent pre-clinical study showed that glutamate and NO play a causal role in stress-related behaviours. Though a plethora of data are available for acute stress responses, chronic stress mechanisms are relatively unexplored and hence poorly understood. Further, predictable and unpredictable stress may have differing influences on the organisms. In fact, chronic unpredictable stress is now recognised as a model for studying post-traumatic stress disorder, an anxiety like state frequently associated with real-life situations like war experience, imprisonment, mental trauma, etc. Since the mechanisms for such stress related anxiogenesis is not clearly defined, it was thought worthwhile to investigate the paradigms associated with this disorder by using the unpredictable stress model to device possible therapeutic strategies in this condition. This study evaluated the involvement of the NO and NO-mediated signalling pathways in chronic predictable stress (CPS) and chronic unpredictable stress (CUS) induced changes using behavioural and immunological markers and by employing standard pharmacological and biochemical techniques. In animal models of CPS, administration of PDTC (50mg / kg) resulted in increase in % OAT as well as % OAE by 25%, indicative of blockade of anxiogenic response to stress as observed earlier with L-arginine. The effects of aminogunidine (50 and 100mg / kg), a inducible nitric oxide synthase (iNOS) inhibitor also showed significant enhancement in the % OAE at both the dose levels and considerable augmentation of % OAT. To study the effect of drugs on delayed type immunological response to chronic predictable stress, we investigated the effects of PDTC and aminoguanidine on KLH-induced paw ooedema in rats. There was 28% inhibition of the percent change in paw ooedema by 15 days of treatment with PDTC. The reduction in DTH response was about 50% and 80% with 50 and 100mg / kg doses of aminoguanidine, respectively. The remarkable reduction in response may be due to complete suppression of the inflammatory component of the DTH as it leads to inhibition of inducible NO which plays a key role in inflammation and immunity. Similar experiments were repeated with the CUS and response to challenge dose of KLH was recorded in sensitised rats. PDTC and aminoguanidine reduced the percent increase in paw ooedema by 64% and 61%, respectively. The results of the study suggest that these drugs may differentially affect the DTH response during CPS and CUS.

The results of biochemical estimation of MDA, a standard marker of lipid peroxidation, showed that there were enhanced levels of lipid peroxidation following 15 days of CUS as indicated by raised MDA levels. The response was attenuated by both the NF-KB inhibitor and iNOS inhibitor by 37% and 10%, respectively. Further, measurement of stable metabolites of NO showed that NOx levels were elevated following 15 days of CUS in contrast to the reductions in NOx observed after 5 days of exposure to unpredictable stress. Prior treatment for 14 days with PDTC and aminoguanidine reduced the levels of NOx by 73% and 84%, respectively. The biochemical data with NOx confirms the activity of the two drugs on the NO system. In order to gain a better insight into the mechanism(s) of action of PDTC, effects on proinflammatory cytokines interleukin (IL)-1b and interferon (IFN)-gand TH_2 cytokine IL-4 were investigated. The levels of proinflammatory cytokines, IL-1b and IFN-gwere significantly elevated in the rats exposed to CUS. In contrast, the levels of these cytokines were significantly lower in PDTC-pre-treated rats. Althougu there was not much significant effect on the levels of IL-4 by CUS, but PDTC led to enhancement in the levels of this cytokine. Similarly the levels of IL-1b

and IFN-gwere significantly reduced by aminogunidine (50mg / kg). The results are parallel to the findings of Cuzzocrea *et al.*, 2002 who reported reduction in lipid peroxidation, iNOS activity and NO production, levels of IL-1b and tumour necrosis factor (TNF)-a. Taken together, our results clearly demonstrate that prevention of the activation of NF-kB by PDTC or iNOS inhibitor, aminogunidine reduces the development of neuro-behavioural suppression and immmunosuppression, therefore, NO may represent a novel approach for the therapy of inflammation.

10. Experimental studies on the possible role of nitric oxide (NO) during acute and chronic morphine in normal and stressed rats

The initial specific objective of the study was to study the effect of single and repeated morphine during restraint stress on (a) neuro-behavioural parameters in: (i) open field (OF) and (ii) elevated plus maze (EPM) tests. The neuro-endocrine parameters studied were plasma corticosterone levels. Immune responses: (i) humoral immunity (antibody titer in response to immunisation with sRBC) and (ii) cell-mediated immunity and cytokine assays (IL-4 and IFN-g) will be measured in response to opioids. The effects of opioids, *e.g.*, morphine and naltrexone were assessed on stress-induced neuro-behavioural and endocrinal parameters and their interactions with NO modulator, *i.e.*, L-arginine and L- NAME were studied. Restraint stress (RS) was used as experimental stressor to induce emotional stress in rodents. RS for one hour at room temperature was given for single or for 15 days. RS induced suppression of neuro-behavioural and exaggeration of endocrinal responses as compared to control group (no stress). Anxiety and emotionality i.e. neurobehavioral parameters were observed in EPM and OF test after RS and opioidergic and NO modulator agents. RS induced suppression of behavioural activity in the EPM which was attenuated by prior administration of morphine in a dose related manner. The neuro-endocrinal parameter measured was the plasma corticosterone which is a sensitive and reliable marker for stress. The plasma corticosterone level was elevated after RS and reversed / attenuated by morphine pre-treatment in a dose related manner. The opioid antagonist blocked the responses to morphine, thus supporting involvement of opioid receptors in these effects. In the interaction studies, pre-treatment with the NO precursor, L-arginine potentiated sub-threshold morphine dose effects on both EPM and OF tests, whereas, L-NAME, the NO synthase inhibitor, blocked higher dose opioid agonist induced effects. Neuro-behavioural suppression after RS was associated with reductions in brain NO metabolite (NOx) activity, and these were also reversed towards normalcy (control levels) after morphine. Potentiation of brain NOx activity was observed after combined treatment with (sub-threshold) morphine + L-arginine, whereas, L-NAME showed opposite nature of interaction with morphine (higher dose) on brain NOx activity. In the repeated (sub-chronic) RS studies, such stress induced reductions in behavioural suppression and the neuro-behavioural parameters returned to near control levels in the EPM test, indicating adaptation to stress. Such reversals in behavioural activity in the EPM was associated with parallel enhancements in brain NOx levels. Pretreatment with morphine in combination with repeated RS (x15) showed no significant effect on the attenuations seen after repeated RS alone. L-arginine treatment in combination with morphine (both at sub-threshold doses), had an enhancing effect on the RS (x15) induced behavioural changes, whereas, L-NAME blocked this effect. The behavioural effects after RS and the various opioidergic and nitrergic drug treatments were accompanied by similar nature of changes in the brain NOx levels. The overall nature of the results indicates that, opioid-NO interactions play an important regulatory role during stress responses. Thus, opioid-NO interactions may be helpful in finding new strategies for combating problems associated with opioid tolerance.

11. Experimental studies on the possible mechanisms involved in the effects of UNIM-352, a polyherbal, anti-asthmatic, Unani preparation

Bronchial asthma is characterised by inflammation of the airway wall, variable airway limitation and / or airway hyperreactivity (AHR). The presently available group of drugs although contribute to the therapeutic effects in bronchial asthma but are accompanied with some or other side effects. New drug development from herbal sources has been a thrust area and recently Govt. of India has started a Golden Triangle Project to encourage such research. Studies have indicated that indigenous plant products may be of some benefit in patients with obstructive airway disease. Herbal (plant based) preparations have the unique distinction of generally being effective and less toxic, but a clear scientific basis for their use has always been a shortcoming for some very effective drugs / preparations. Indian traditional medicines used in Unani, Ayurveda, Siddha and Homeopathic systems are all natural products mainly based on plant sources. UNIM-352 is a polyherbal,

anti-asthmatic Unani preparation consisting of following ingredients: *Linum usitatissimum* Linn (Alsi), *Trigonella foenum-graecum* (Methi), *Allium sativum* Linn (Seer), *Apis mellifera* Linn (Chillbenj), Honey, *Caesalpinia bonducello* Fleming (Magz-e-Karanjwa) and *Pongamia glabra* Vent (Magz-e-Karanj). The study was conducted to assess the possible anti-inflammatory and immunomodulatory effects of UNIM-352. Wistar rats (150-200g) were sensitised and challenged with ovalbumin. Post-sensitisation they were treated with UNIM-352 (200 and 400 mg / kg, per orally) and prednisolone (10 mg / kg, i.p.). After 24 hours of ovalbumin challenge, rats were anesthetised and blood and bronchoalveolar lavage (BAL) fluid were collected for the assay of cytokine levels (TNF-a and IL-4), eosinophil and neutrophil cell counts. The results were statistically analysed and interpreted. The results indicated that both doses of UNIM-352 significantly reduced the levels of TNF-a and IL-4 in both blood and BAL fluid as compared to vehicle treated ovalbumin sensitised and challenged control group. Further, UNIM-352 treated groups significantly decreased the number of eosinophil and neutrophil cells in both BAL fluid and blood, as compared to control group, in a dose-dependent manner. The precise mechanisms airway inflammation in asthma are incompletely known but are considered to be dependent on the sustained infiltration and activation of many inflammatory cells including lymphocytes, eosinophils, basophils, and macrophages, followed by synthesis and release of a variety of proinflammatory mediators and cytokines. Th2 lymphocytes are the key mediators of this inflammation, initiating and propagating inflammation through the release of their cytokines, IL-4 and TNF-*a* in turn recruiting and activating eosinophils, the effector cells in asthma. The reduction in the amount of TNF-*a* and IL-4 by UNIM-352 indicates that it may reduce / control the bronchial inflammation through this mechanism. These cytokines result in recruitment of eosinophils and neutrophils, the effector cells in asthma, which were also reduced by both the doses of UNIM-352. This further emphasised the role of the drug in reducing / controlling the airway inflammation associated with bronchial asthma.

12. Experimental studies on the cellular and molecular mechanisms in the effects of *Withania somnifera* during chronic stress responses in rats: possible role of nitric oxide

Withania somnifera, also known as *Ashwagandha*, Indian ginseng, and winter cherry, has been an important herb in the Ayurvedic and indigenous medical systems for over 3000 years. Historically, the plant has been used as an aphrodisiac, liver tonic, anti-inflammatory agent, astringent, and more recently to treat bronchitis, asthma, ulcers, emaciation, insomnia, and senile dementia. Clinical trials and animal research support the use of *Ashwagandha* for anxiety, cognitive and neurological disorders, inflammation, and Parkinson's disease. *Ashwagandha's* chemopreventive properties make it a potentially useful adjunct for patients undergoing radiation and chemotherapy. *Ashwagandha* is also used therapeutically as an adaptogen for patients with nervous exhaustion, insomnia, and debility due to stress, and as an immune stimulant in patients with low white blood cell counts. The major biochemical constituents of *Ashwagandha* root are steroidal alkaloids and steroidal lactones in a class of constituents called withanolides. At present, 12 alkaloids, 35 withanolides, and several sitoindosides from this plant have been isolated and studied. Majority of the constituents are withanolides (steroidal lactones with ergostane skeleton), glycowithanolides and alkaloids. These include withanone, withaferin A, withanolides, withasomidienone and alkaloids *viz.*, Much of *Ashwagandha's* pharmacological activity has been attributed to two main withanolides, withaferin A and withanolide D. The withanolides serve as important hormone precursors that can convert into human physiologic hormones as needed. *Ashwagandha* is thought to be amphoteric, *i.e.*, it can help regulate important physiologic processes. The theory is that when there is an excess of a certain hormone, the plant-based hormone precursor occupies cell membrane receptor sites so the actual hormone cannot attach and exert its effect. If the hormone level is low, the plant-based hormone exerts a small effect. *Ashwagandha* is also considered to be an adaptogen, facilitating the ability to withstand stressors, and has antioxidant properties as well. Other studies have shown that *Ashwagandha* have an immune-stimulatory effect. *Withania somnifera* does not have any significant side effects as reported in the medical literature, but long-term studies are not yet available. Keeping these things in view, this study has been designed. Stress in any form (physical, psychological and / or environmental) stimulus capable of altering physiological homeostasis, and the ability of an individual to cope with such stressful stimuli is a crucial determinant of health and disease. Complex neuro-chemical pathways in the central nervous system (CNS) have been implicated in stress mechanisms and it has been shown that NO may exert a significant regulatory influence during stress-related biological responses. NO, a gaseous free radical, is now recognised as an important biomodulator. Experimental data from our laboratory showed that stress-induced neuro-behavioural, endocrinal and immunological changes were

pharmacologically modulated by NO-ergic agents. RS induced suppressions in behavioural activity in both EPM and OF tests, which were attenuated by the NO precursor, L-arginine and NO releaser, isosorbide dinitrate. The plant has been purchased from Rehan Matab and authenticated from NISCAIR (National Institute of Sciene Communication and Information Resources, CSIR, Pusa, Delhi). Standardisation of hydromethanolic extract preparation is under process. Dried powdered *Withania somnifera* roots have been extracted with 80% methanol and 20% water in Soxhlet extractor for 48 hours at 60 ^{o}C. After extraction the solvent is evapourated to dryness at 40 ^{o}C and then kept in vaccum dessicator at 4 ^{o}C for oral gavage administration to rats for further studies.

Physiology

Research

1. Brain nitric oxide and high altitude pulmonary oedema

The role of higher nervous centers in the regulation of lung water content has been the subject of research for the last several decades. There is one study performed in India which has proposed that pulmonary oedema occurring at high altitude could be due to overactivity of the "oedema center" located in the posterior hypothalamus and/or underactivity of the "anti-oedema center" located at the pre-optic area of the hypothalamus (Selvamurthy *et al.*, 1978). No further study has been performed either to confirm or refute this view. Additionally, how the "cross talk" between these two areas happens has not been explored.

Hypothesis

I. Exposing the rats to an altitude of 5500 meters for 24 hours will result in pulmonary oedema.

II. The Oedema Centre is located in the posterior hypothalamus and the Anti-Oedema Centre is located in the anterior hypothalamus.

III. Pulmonary oedema is due to an increase in sympathetic nerve activity.

IV. Nitric oxide (NO) administered into the posterior hypothalamus would decrease pulmonary oedema by attenuating sympathetic outflow.

V. The activity of neurons in the posterior hypothalamus is under the influence of other neurotransmitters, such as GABA also.

Wister rats were used for the study and they were divided into 4 groups. In rats from *Group I* (a) (n=6), Sham operations were made and they were exposed to room air. In rats from *Group I*(b) (n=6), electrolytic lesions were made in the posterior hypothalamus and were exposed to room air. Rats from *Group I* (c) (n=6), served as Sham-operated controls and were exposed to high altitude (5500 m) for 24 hours. In rats from *Group I* (d) (n=6), electrolytic lesions were made in posterior hypothalamus and were exposed to the same high altitude for 24 hours. After the lesions, the rats were allowed to recover from the surgical trauma. Proper post-operative care was given and after 7 days, they were subjected to the respective exposures. Following the exposures, rats of all groups were anesthetised with urethane (1g/kg) and artificially ventilated. In each animal, an incision was made parallel to the vertebral column. The renal nerve was exposed and hooked to bipolar silver-silver chloride electrodes connected to a Tektronix pre-amplifier and a Windograf recording system. Arterial blood pressure and blood gases were measured in all the preparations. The sympathetic outflow was quantified using Powerlab software. Pulmonary oedema was quantified by wet weight/dry weight (W/D wt.) ratio and using Evans blue dye assay.

No detectable change was seen in any of the measured parameters between rats of *Groups I* (a) and 1(b). The renal sympathetic nerve activity (RSNA), mean arterial blood pressure (MABP), Evans Blue concentration and W/D wt. ratio in *Group I* (a) were 13.3$\pm$ 3.3 µV.s), 72.8 $\pm$ 12.7 mmHg, 7.1 $\pm$ 0.8 µg/mL and 4.8 $\pm$ 0.8 mg/mg dry tissue, respectively. The corresponding values in *Group I* (b) were 14.3 $\pm$ 3.5µV.s, 72.8 $\pm$ 12.7 mmHg, 7.1 $\pm$ 0.8µg/mL and 4.8 $\pm$ 0.8mg/mg dry tissue, respectively.

RSNA and MABP increased and pulmonary oedema developed in rats from *Group I* (c). In this Group, the RSNA was 29.4 $\pm$ 4.4µV.s) and MABP was 82.9 $\pm$ 13.5 mmHg. The Evans Blue concentration was 10.1 $\pm$ 1.2 µg/mL and the W/D wt. ratio was 6.6 $\pm$ 0.9 mg/mg dry tissue. Following lesion in posterior hypothalamus (*Group I* (d), there was a partial reversal of these responses — RSNA was 19.0 $\pm$ 5.1 µV.s, MABP was 73.0 $\pm$ 15.2 mmHg, Evans Blue concentration was 7.6 $\pm$ 1.2 µg/mL and W/D wt. ratio was 5.6 $\pm$ 0.7 mg/mg dry tissue.

This study confirms the involvement of posterior hypothalamus in causing neurogenic pulmonary oedema following high altitude exposure. Further studies are in progress to determine the role of various neurotransmitters for this response.

2. Modulation of hypoglossal motoneuron activity by NMDA receptors in rats exposed to chronic intermittent hypoxia

Collapsible upper airways during sleep is a prominent feature in patients with obstructive sleep apnoea. Repeated episodes of airway obstruction in these patients have been considered to be due to decrease in motor neuronal activity to the upper airway dilator muscles. A decrease in the hypoglossal motor neuronal activity promotes collapse of the upper airways and this decrease is precipitated by oxidative stress in the hypoglossal region of the medulla.

Aims

- To create an animal model of sleep apnea by giving chronic intermittent hypoxia (CIH).
- To record hypoglossal nerve activity in CIH model and compare it with control animals.
- To investigate the effects of various agonists and antagonists on hypoglossal nerve activity in the CIH model.

I. Simulation of chronic intermittent hypoxia model:

- Male Wistar rats (250-300 g) were placed within a plexiglass chamber. Flow rates of 99% pure nitrogen gas and air into the chambers were varied with an automated oxygen profile system (Seven Star Instruments, India), to result in episodic (120-second cycle length) reductions from an ambient oxygen level of 21 to 7%, where the 7% was maintained for just 10 seconds, followed by 480 seconds length normal air supply, using an established protocol. Briefly, 2 min of 99% N_2 followed by 8 min of 21% O_2 (room air) per episode, 6 episodes per hour and 8 hours per day was given for 30-35 days.
- Physiological monitoring of normal as well as CIH-exposed rats was also conducted. A catheter was placed in the femoral artery for measuring arterial blood pressure. It was also used for withdrawal of blood to determine arterial blood pH, PO_2 and PCO_2 using a blood gas analyser.
- Blood from the orbit was withdrawn at different time intervals from CIH group rats and it was found that oxygen saturation was reduced to 70-80% in rats exposed to 30 days of CIH.
- Blood glucose levels were also evaluated as per glucose tolerance test protocol to further establish the metabolic effects of CIH stress and it was observed that the fasting glucose levels were increased as well as the clearance was delayed, in both anaesthetised and conscious rats, significantly.

II. Recording of hypoglossal (XII) nerve activity:

Rats were anaesthetised and cannula for microinjections was implanted stereotaxically into the 12th nerve (hypoglossal) nucleus using coordinates as per Paxinos and Watson rat brain atlas (2004). Hypoglossal nerve was identified in the neck region and placed on bipolar platinum electrodes connected to a pre-amplifier and a recording device (Windograf). Hypoglossal nerve activity was quantified as the amplitude (µV) from peak respiratory activity to baseline end-expiratory activity using the rectified moving average of the whole nerve recording. Both agonists (serotonin and glutamate) and antagonists (GABA, MK-801 and glycine) are being injected into the nucleus and changes in the nerve activity are being observed.

3. Higher nervous control of pulmonary renal reflex

Our previous studies have demonstrated that an increase in pulmonary extravascular fluid volume caused by pulmonary lymphatic obstruction produces an increase in urine flow. This response termed as "pulmonary renal reflex" is abolished by vagotomy and by sectioning of the renal nerves. Thus, the afferent pathway for this reflex resides in the vagus and the efferent, in the renal sympathetic nerves. However, in the central nervous system, where the vagal afferent fibers project to and how these interact with renal sympathetic efferents have not been investigated.

Experiments were performed on anesthetised and artificially ventilated New Zealand white rabbits. Polyethylene catheters were introduced into the right femoral artery, right femoral vein, left femoral artery and left femoral vein. The right femoral artery catheter was used for recording aortic blood pressure and the

one on the left side was used for periodic withdrawal of arterial blood sample for measuring arterial blood gases. The arterial blood gas was maintained in the normal range by adjusting the ventilator and by infusing with sodium bicarbonate (8.5% w / v). Left venous catheter was used for giving maintenance doses of the anesthetic and / or infusions. A thermometer was introduced into the rectum and the body temperatures of the animals were maintained at 37 ± 1 °C. The right femoral venous catheter was advanced as far as the right atrium and used for measuring right atrial pressure.

Pulmonary lymphatic obstruction (PLO)

The lymph drainage from the rabbit lung is mainly *via* the right lymphatic duct. The right lymphatic duct opens into the right external jugular vein in the neck. A vascularly isolated pouch (length approximately 3 cm) was created in the neck region by tying off all the venous tributaries. A polyethylene catheter connected to a saline reservoir was inserted through the axillary vein and positioned in the pouch. PLO was achieved in a reversible manner by raising the fluid level of the reservoir to a height of 35 cm.

Collection of urine

A polyethylene catheter (i.d. 3 mm) was introduced into the urinary bladder through a mid-line suprapubic incision. The urine was drained into a collection chamber and was measured at 10 min intervals. The bladder was flushed with normal saline through this catheter periodically between experimental runs to ensure that there was no residual urine in it and to remove any clots and crystalline debris from the catheter itself.

Protocol I

Effects of PLO on urine flow

This protocol was completed in three rabbits. In all of them, 5% dextrose was infused at the rate 1.2 mL per minute. After completion of surgery, the animals were permitted to attain a steady state with respect to urine flow (approximately 30 min) before commencing an experimental run. Urine was collected over successive 10 min periods as follows: three collections before (initial control), three collections during and four collections after release of PLO. The three collections during PLO and the first collection following it were considered the experimental sample. The last three samples formed the final control.

Protocol II

Vagatomy (n=3)

After completion of the initial experimental run, bilateral cervical vagotomy was performed and protocol I was repeated.

Protocol III

Effect of PLO on urine flow and RSNA

In this protocol, along with the collections of urine during the control period, during PLO and after release of PLO, RSNA was also recorded. Bilateral cervical vagotomy was performed subsequently and the study repeated.

Recording of RSNA

For the recording from RSNA, renal nerves were exposed by making an incision parallel to the vertical column on the right side. Care was taken to minimise the bleeding. The right kidney was exposed. The renal nerve was identified, separated from the renal artery and a pouch was generated in such a way that it was sufficient to make a pool. This pool was filled with mineral oil, to make the environment around the nerve non-conducting and also to keep the nerve activity preventing it from drying. The nerve was cut as close to the hilum of the kidney as possible and the central end placed on recording electrodes for recording of nerve activity.

Recording set-up

Nerve activity was recorded using bipolar platinum electrodes. The neural signals were amplified by a pre-amplifier (Tektronix TM 503, USA) and fed into a thermal array recorder (WindoGraf, Gould, USA) and

PowerLab 4/25 ADInstruments for integration of RSNA. After recording was done, hexamethonium chloride was injected to authenticate the nerve recording.

Protocol IV

Effect of PLO on urine flow before and after lesion (n=3)

After anaesthesia and routine cannulations, rabbits were placed on stereotaxy apparatus. The cranium was exposed and para-ventricular nucleus (PVN) on either side was reached (A = 15.5, L= 1.6, DV= 12.0) by making holes inside the skull using drill. A current strength of 3-mA DC for 25 s via a concentric bipolar stainless steel electrode insulated to 0.5 mm of the tip was delivered to each PVN for producing electrolytic lesion by using lesion maker (INCO, Lesion Maker 505/LM-015). PLO and urine collection were done as described in Protocol I before and after lesion.

After completion of the experiment, the site of lesion was confirmed by perfusing and fixing of the brain. Using Leica Cryostat, 30 µm sections of PVN were cut. The temperature of chock holder (holding the brain) was maintained at -15 ºC and the temperature of the blade as well as cryostat chamber was maintained at -30 ºC. Areas of interest were directly taken on slide (prepared in subbing solution) for Haematoxylin-Eosin staining.

The following results were observed:

Effect of PLO on urine flow before vagotomy(n=3)

An increase in urine flow was observed during PLO. The urine flows (mL/10 min) during the three collection periods (before, during and after release of PLO) were 6.0 ± 0.1, 8.8 ± 0.2 and 6.4 ± 0.2, respectively.

Effect of PLO on urine flow after vagotomy

Vagotomy abolished the increase in urine flow observed during PLO. The urine flows (mL/10 min) during the three collection periods were 6.1 ± 0.3, 6.0 ± 0.3 and 5.7 ± 0.2, respectively.

Effect of PLO on urine flow and RSNA before (i) and after (ii) Vagotomy (n=3)

i. Before vagotomy

An increase in RSNA was observed during PLO (52.6 ±18.4 µV.s) compared with the activity recorded before PLO (37.1 ± 22.6 µV.s) and after releasing PLO (22.4 ± 5.4 µV.s).

ii. After vagotomy

Vagotomy abolished the increase in RSNA observed during PLO. The RSNA (µV.s) during the three recording periods were 26+.2 ± 3.1, 24.1 ± 5.4 and 28.2 ± 6.7, respectively.

Effect of PLO on urine flow (n=3)

i. Before lesion of PVN

An increase in urine flow was observed during PLO.

ii. After lesion of PVN

Lesion in PVN abolished the increase in urine flow observed during PLO.

The study is very much in progress. It has to be repeated in a larger number of animals and the results are to be evaluated statistically. The neurotransmitters involved in activating the sympathetic outflow from the posterior hypothalamus are to be identified.

4. Comparative evaluation of cardio-respiratory responses during six-minute walk test in chronic obstructive pulmonary disease and interstitial lung diseases

During functional capacity evaluation done by six-minute walk test (6MWT), patients with chronic obstructive pulmonary disease and interstitial lung diseases are likely to differ in their cardio-respiratory parameters due to differences in their aetiopathogenesis. Comparison of differences in these parameters in relation to disease severity can provide further insight into the pathophysiological aspects and development

of management strategies for these diseases. After standardisation of the technique, collection and analysis of data is in progress.

5. Effect of pulmonary rehabilitation on cardiac autonomic dysfunction in chronic obstructive pulmonary disease

Patients with chronic obstructive pulmonary disease (COPD) have around 30% mortality due to cardiovascular morbidities. Pulmonary rehabilitation has recently emerged as a new tool in the management of COPD. In addition to improvement in functional capacity and health-related quality of life, pulmonary rehabilitation is reported to improve cardiovascular parameters due to enhanced vagal tone. The technique for recording various physiological parameters has been standardised and data collection is in progress.

Respiratory Allergy and Applied Immunology

Research

1. Correlation of atopy and fractional exhaled nitric oxide in allergic rhinitis: an Indian study

Fractional exhaled nitric oxide (FeNO) is a non-invasive marker of airway inflammation. The literature on the effect of atopy on FeNO in allergic rhinitis is limited.

The objective of the study was to investigate the relationship between atopy and FeNO in patients with allergic rhinitis in Indian population.

Patients with allergic rhinitis were assessed for atopy and exhaled breath analysis of nitric oxide. Atopy was assessed by skin prick testing (SPT) against 58 common aero-allergens, with a wheal size of ³3 mm as compared to buffer saline being considered positive. Patients were labelled to be atopic if they had at least one SPT result positive. The measurement of FeNO level was done by using NIOX chemiluminescence analyser.

A total of 49 participants (23 females and 26 males) aged between 8-50 years were studied and 31 were found to be atopic. The average value of FeNO was 26.0±22.7 ppb (n=49) with significantly higher values in atopic group (34.2±24.3ppb) as compared to non-atopic group (11.9±9.0ppb) (p <0 .05).

In conclusion, the FeNO levels were significantly higher in atopic allergic rhinitis patients. Since FeNO is a marker of lower airway inflammation, it may be a predictor for onset of asthma in these patients.

2. Allergic bronchopulmonary aspergillosis: a clinico-serological correlation with radiologic profile

To study the different types of radiological presentations of allergic bronchopulmonary aspergillosis (ABPA) in a tertiary care clinic in Northern India and analyse them with respect to serological profile and clinical characteristics.

We performed a retrospective analysis of clinical, serological and radiological characteristics of ABPA patients registered at a unit of tertiary pulmonary care centre in North India. The patients were classified based on radiological presentation into ABPA-S, ABPA-CB and ABPA-CB-ORF and the differences in these groups were studied.

There were 112 patients with ABPA between age 6 and 75 years. About 8.9% (n=10) of patients had a history of smoking and 38.4% (n=43) had a history of prior anti-tuberculosis treatment. The median duration of symptoms was longest in the ABPA-CB-ORF group (15 yrs) followed by ABPA-CB (7 yrs) and ABPA-S (5 yrs). Mean serum total IgE level in the ABPA-CB-ORF group was 14,330 IU / mL followed by the APBA-CB (3,700 IU / mL) and ABPA-S (1,020 IU / mL) groups (p< 0.0001). The ABPA-CB-ORF group had the highest median specific anti-*Aspergillus fumigatus* immunoglobulin (Ig) E followed by ABPA-CB and ABPA-S groups (42.24 kU / L, 20.65 kU / L and 3.44 kU / L respectively) (p< 0.0001). ABPA-CB-ORF group had highest percentage of positive serum precipitins against *Aspergillus* spp. (92%) followed by ABPA-CB (79.6%) and ABPA-S (68%) (p< 0.05).

The patients with more pronounced lung damage in the form of ABPA-CB and ABPA-CB-ORF had higher serological parameters suggestive of increased systemic inflammation. Hence, ABPA may be categorised as mild (ABPA-S), moderate (ABPA-CB) and severe (ABPA-CB-ORF), which oscillate between remission and exacerbation phases.

3. Prevalence of food intolerance in bronchial asthma: an Indian study

Food intolerance (FI) is one of the frequent enigmas of modern medicines. However, epidemiologic data in this field is lacking. The present study was undertaken to know the prevalence of FI in patients with bronchial asthma (BA) attending outpatient Department at VPCI, Delhi.

Fifty patients with asthma and 15 non-asthmatics were recruited as control subjects. Asthma group comprises of 33 (66.0%) males and 17 (34.0%) females with a mean age of 28.9 years and average duration of illness was 4.9 years and non-asthmatics (control group) comprises of 11 (77.3%) males and 4 (26.7%) females with a mean age of 31.1 years. The sera were taken from the patients and control for estimation of specific IgG

for food. The specific IgG measurement was done by Genarrayt Microarray System using Genesis Diagnostic Kit, (UK) and results were graded as: >30 U / mL - elevated; 24-30 U / mL – Borderline, and <24-Normal.

A total of 221 tests for FI were performed against 14356 food items in this study. Elevated IgG level was observed in asthmatics for different food groups were: Vegetables group: 92%; Grain group: 74%; Fruit and Nut groups: 72%; Fish / Sea food group: 64%; Dairy and Herbs / Spices: 62%; other group: 58% and Meat group: 20%, respectively. Similarly, in control group, elevated IgG level was observed for different food groups were: Nuts: 93.3%; dairy, Grain and Herbs / Spices group: 80.0%; Fish / Sea food and Vegetables group: 73.3%; other group: 66.7%; Fruit: 60.0%, and Meat: 26.7%, respectively.

The elevated IgG level observed for different food groups in female asthmatics were: Vegetables group: 70.6%; Fish / Sea food, Grain group and Fruit group: 64.7%; Nut and dairy groups: 58.8%; Herbs / Spices: 52.9%; other groups: 47.1%; and Meat group: 11.8%, respectively; while in male asthmatics it was found as: Vegetables group: 97.0%; Grain and Nut group: 78.8%; Fruit groups: 75.8%; Herbs / Spices: 66.7%; Dairy, Fish / Sea and other group: 63.6%; and Meat group: 9.1%, respectively. The elevated IgG level was much higher in male as compare to female asthmatics.

The elevated IgG levels for different food groups in female non-asthmatics were: Nuts and Fish / Sea food group: 100.00%; Fruits, Grains, Herbs / Spices, Vegetables, and other groups: 75.0% and Meat groups: 25.00%, respectively. The elevated IgG levels for food male non-asthmatics were: Nuts group: 90.9%; dairy, grains, Herbs / Spices: 81.8%; Vegetables group: 72.7; Fish / Sea food and other group: 63.6%; Fruits group: 54.6%; and Meat group: 27.3%, respectively.

A wide variety of food items was cited as being responsible for food-related illnesses. Those with current asthma did not report food-related illness more frequently than those without asthma. These associations between respiratory symptoms and food intolerance require further prospective investigation and verification. The importance of using appropriate methodology in future studies for determining diet relationships was highlighted by this study.

4. Correlation between nasal nitric oxide and nasal airway resistance in patients with allergic rhinitis

Nasal airway resistance (NAR) is dependent upon the tone of the nasal vasculature which is regulated by endothelial derived nitric oxide (NO).

The study was planned to find out the relationship between nasal nitric oxide (nNO) levels and NAR in patients with allergic rhinitis (AR).

Patients with AR were assessed for nNO levels and NAR. The NAR was measured by 4-Phase-Rhinomanometry (4PR) using the RHINOTEST 1000, by examining flow and pressure in upper respiratory airway. The nNO levels were measured using NIOX chemiluminescence analyser.

Fifteen diagnosed patients with AR and 5 healthy volunteers as controls were included in the study. In the control group, the mean total NAR was 0.16±.08 kPa / l / s while in AR group, mean total NAR was 0.22±0.1 kPa / l / s (p=0.4). In AR group, mean left and right NAR was 0.50±0.3 kPa / l / s and 0.5±0.4 kPa / l / s, respectively and mean nNO levels from right and left nostrils were 291.2±122.9ppb and 251±171.2ppb (p=0.7). In AR group, there was no significant correlation between total NAR and the left nNO levels (r= -0.002, p=0.9) or total NAR and right nNO levels (rho=0.101, p=0.7). Also, no correlation was found between the left or the right unilateral NAR and left or right nNO levels, respectively. Atopic AR patients had higher NAR as compared to non-atopic patients (0.24±0.1 *vs* 0.17±0.02; p=0.1), also the nNO levels in atopic rhinitis were higher as compared to non-atopic rhinitis (292.1±154.1 *vs* 213.3±42.3, p=.342). Similarly, no significant correlation of NAR and NO levels were found in control group.

In our study, patients with AR had significantly higher NAR, but no correlation was found between nNO and NAR in either groups. The nNO was higher in patients with AR as compared to patients without AR.

5. Skin prick test and specific IgE: a comparative study in patients with bronchial asthma and rhinitis in India

Skin prick test (SPT) is the gold standard for the assessment of allergy due to inhalant allergens. Serum specific immunoglobulin (Ig) E levels (SSIgE) measurement by ImmunoCAP is a complementary test. The

antigen extract of both the tests are from different sources. Three common aeroallergens, cockroach, mosquito and housefly, frequently causes respiratory allergies. The SPT was performed with antigen extract from India and SSIgE was performed with extract derived from European antigen.

The aim is to find out correlation between SSIgE and gold standard SPT against cockroach, housefly and mosquito in Indian population.

Twenty (16 males and 4 females) patients with a mean age of 28.5 years (age range 15-50 years), diagnosed with bronchial asthma and / or AR underwent SPT and SSIgE levels at the same visit. Using SPT as a gold standard, sensitivity, specificity, positive and negative predictive values (PPV and NPV) were calculated. The correlation between SPT grading and SSIgE levels was also evaluated.

The sensitivity of each of the three aeroallergens was >85%. The PPV of cockroach and mosquito was > 85%; housefly had PPV of 68.7%. The specificity ranged between 37% to 67% and NPV ranged between 50% to 80%. The two tests were in agreement (*i.e.*, both positive and both negative) in 85% (cockroach), 90% (mosquito) and 55% (housefly). We observed a significant correlation between the grades of SPT and levels of SSIgE.

SSIgE has higher sensitivity and PPV, but lacks specificity. Higher sensitivity leads to increased false positive cases. Also, unlike in case of pollens, antigen extracts in case of insects from different regions gives comparable results. Hence, SSIgE obtained from an extract of different geographic regions can be used in the evaluation of allergy.

6. Correlation of fractional exhaled nitric oxide, nasal nitric oxide with atopic status in bronchial asthma, allergic rhinitis and bronchial asthma with allergic rhinitis

Fractional exhaled nitric oxide (FeNO) and nasal nitric oxide (nNO) are non-invasive bio- markers of airway inflammation. The effect of clinical atopic predisposes to higher levels of these markers.

The objective of the study was to find out the relationship between FeNO, n NO and atopy in patients of bronchial asthma and allergic rhinitis in Indian population.

Patients already diagnosed to have BA, AR and BA concomitant with AR was assessed for atopy, exhaled breath and nNO levels. Healthy controls were also taken for the purpose of study. Atopy was assessed by skin prick testing (SPT), with a wheal size of ^{3}3 mm as compared to buffer saline being considered positive. Patients were labelled to be atopic if they had at least one SPT result positive. The measurements of FeNO & nNO levels were done using NIOX chemiluminescence analyser.

A total of 90 patients (36 females and 54 males) aged between 6-38 years were studied. There were 25 patients in BA, AR and BA with AR groups; 15 healthy volunteers were enrolled as controls. Each group was divided into atopic and non-atopic on basis of SPT. There were total 54 atopics and 36 non-atopic patients. The FeNO levels were significantly high in BA and BA with AR group as compared to control group. The nNO levels were significantly high in AR and BA with AR group in comparison to control group. Atopic BA, BA with AR and AR subgroups had significantly raised FeNO against the non-atopic patients of same subgroup. The level of FeNO increases as the no of allergens positive on SPT increases. On contrary, n NO level did not significantly correlate with atopic status.

In conclusion, the FeNO levels were significantly higher in BA and BA with AR groups; it may be used as an objective evidence to support the diagnosis of asthma. Atopic status and no of positive responses on SPT significantly correlated with FeNO but not n NO levels.

7. Study of sinonasal symptoms, atopic status and its impact on quality of life in patients of interstitial lung disease

This study aims to look for the panairway involvement in interstitial lung diseases if any and correlation of the severity of the interstitial lung diseases (ILD).

Forty-five patients wiith ILD were categorised in three groups of 15 each, *Group I* sarcoidosis, *Group II* idiopathic pulmonary fibrosis (IPF) and *Group III* other ILDs. Detailed history was taken and investigations, like total immunoglobulin (Ig) E, non contrast computed tomography-paranasal sinuses (NCCT-PNS), skin

prick test (aeroallergens), nasal cytology and questionnaire (St. George Respiratory Questionnaire [SGRQ], Sinonasal Outcome Test [SNOT-22], Sinonasal Assessment Questionnaire [SNAQ], quality of well being- self administered [QWB-SA]) were done. Unpaired t-test, analysis of variance (ANOVA) and correlations were used for statistical analysis.

Out of 45 patients with ILD, 17 (37.8%) were males, 28 (62.2%) were females with a mean age of (Standard deviation [SD]) 47.7(12.6), 54.1(9.5), 50.5(12.3) years in *Group I*, *Group II* and *Group III*, respectively. Sneezing, nasal discharge in *Group I*, *Group II* and *Group III* reported by 80%, 66.6% 66.6% of patients respectively. Mean serum (SD) total IgE in *Group I*, *Group II* and *Group III* was 148.6 (141.8), 85.3 (71.6), 104.8 (93.7) IU / litres respectively (p=0.257). Mean (SD) NCCT PNS (Lund Mackay score) in *Group I*, *Group II* and *Group III* was 7.53 (4.0), 6.0 (4.7), 8.9 (7.5), respectively (p=0.385). Skin prick test with aeroallergens in *Group I*, *Group II* and *Group III*, 7.0 (46.67%), 5.0 (33.3%), 4.0 (26.67%) patients respectively, showed positive results. Mean (SD) SGRQ of *Group I*, *Group II* and *Group III* was 57.9 (14.7), 71.7 (6.7), 64.3 (16.7), respectively, difference was significant (p=0.02). Mean (SD) SNOT-22 *Group I*, *Group II* and *Group III* patients was 36.8 (26.9), 38.3 (30.8), 52.3 (40.1), respectively, difference was not significant (p=0.373) statistically.

ILD patients with nasal symptoms had significantly higher total IgE, CT-PNS score, nasal cytology eosinophils, SNOT-22, SNAQ. nasal symptoms caused no significant effect on SGRQ and QWB-SA, and pulmonary function test. SNOT-22, SNAQ positively correlated with NCCT PNS and nasal eosinophils.

Thirty-two out of 45 (71.1%) of ILD patients had sinonasal symptoms out of which 16 (35.6%) were found atopic, patients with nasal symptom have higher total IgE, NCCT-PNS abnormalities, nasal eosinophils and significant impact on quality of life than patients without nasal symptoms. Severity of ILD was not affected by nasal symptoms.

8. Pattern of skin sensitivity to various aeroallergens in patients of bronchial asthma and/or allergic rhinitis in India

Nine hundred and eighteen patients with bronchial asthma (BA) and / or allergic rhinitis (AR) including 548 (59.7%) males and 370 (40.3%) females with a mean age of 30.1 years were studied for skin sensitivity to various aeroallergens by skin prick test. The maximum numbers of patients (261; 28.43%) were between age group of 20 to 29 years. Patients diagnosed with BA were 191 (20.81%), AR 305 (33.22%) and both BA and AR 422 (46.0%). Significant skin positive reactions (2+ and above) were found in 657 (71.6%) subjects which included 130 (14.2%) of BA patients, 208 (22.7%) of AR patients and 319 (34.8%) of both. The younger adults aged 20-29 years were the most commonly affected group with 197 (21.5%) significant skin positive patients. Insects (43.9%) followed by various types of weed pollens (21.8%), tree pollens (15.1%), dust (14.5%), house dust mite (12.4%), fungal spores (12.0%), grass pollens (7.7%), kapok cotton (2.1%), silk (1.3%) and wool (0.8%) were the offending allergens.

Among individual allergens, most common aeroallergen was moth (33%) and least common was *ehretia* (0.5%). Among grass pollens, *Cynodon* (3.05%) followed by *Cenchrus* (2.0%) were most common, and least common grass pollen aeroallergen was *Pennisetum* (1.7%). Among weed pollens, *Ageratum* (5.4%) followed by *Brassica* (4.9%) were most common, and least common was *Chenopodium album* (1.53%). Among tree pollens, *Holoptelia* (5.01%), followed by *Salvadora* (4.4%) were most common, and least common was *Ehretia* (0.5%). Among dust, the wheat dust (8.3%) was the most common, followed by house dust (7.1%) and least common was paper dust (1.5%). Among the fungal spores, *Aspergillus fumigatus* (4.3%) followed by *Rhizopus* (3.8%) were the most common and least common was *Candida* (1.1%). Among insects, moth (33%) followed by mosquito (31.9%) were the most common and least common was rice weevil (12.8%). When compared with the pattern of our study, there was significantly increased in sensitisation to various allergens.

9. Effect of pulmonary rehabilitation on systemic inflammatory markers, muscle cross- section area and functional parameters in ILD

Interstitial Lung Diseases (ILDs) are chronic debilitating diseases and pulmonary rehabilitation (PR) has an important role in their management. The aim of this study was to evaluate the effect of PR on systemic inflammatory markers, muscle cross-sectional area and other functional parameters in patients of ILDs.

To evaluate the levels of C-reactive protein (CRP), Matrix Metalloproteinase 9 (MMP9), Tissue Inhibitor of Metalloprotinase (TIMP), 6 minute walk distance (6MWD), Mid thigh Cross Sectional Area on CT ($MTCSA_{CT}$) and Carbon Monoxide Diffusion Capacity (DLCO) before and after pulmonary rehabilitation in patients of ILD.

All parameters were studied in 14 patients of ILD at baseline and after 4 weeks of standard therapy. Supervised PR along with standard medications was then given for further 8 weeks and all parameters studied at the end.

Mean values of CRP changed from $5.8_{\pm}5.1$ to 2.21.0 mg/L after rehabilitation [p=0.02]. MMP9 was 838.1252.4 before and 547.9168.6 ng/mL after PR [p=0.05]. Mean values of TIMP changed from 182.1105.1 to 660.4354.9 ng/mL after PR [p=0.04].

The Mean values of 6MWD changed from 379.4347.94 to 493.7847.47 m after rehabilitation [p=0.01]. Levels of DLCO changed from 6.232.45 to 13.873.85 mL/min/mmHg after PR [p=0.05]. Mean values of $MTCSA_{CT}$ changed from 8026.11142.0 to 10182.001752.1 mm^2 after PR [p=0.02]

Significant correlation was obtained between MMP9 and $MTCSA_{CT}$ [r=0.702, p=0.005] and between 6MWT and DLCO [r=-0.764, p=0.001].

PR causes significant improvement in systemic inflammatory markers, muscle cross sectional area and functional parameters in ILD patients along with significant improvement in gas exchange.

Respiratory Medicine

The Department is involved in the patient care (Outdoor and Indoor) at Viswanathan Chest Hospita (VCH), the clinical wing of VPCI. The faculty is involved in individual research and thesis work on different aspects of respiratory diseases as well as teaching of the postgraduate students in the subject – Pulmonary Medicine (DM, MD and DTCD) of University of Delhi. The Department conducts routine lectures, clinical demonstrations along with seminars, clinical meetings and journal clubs, ICU meetings, mortality meetings etc., regularly, as a part of teaching curriculum.

Research

1. Occurrence and effects of nasal polyps in patients with bronchial asthma and/or allergic rhinitis

The occurrence of nasal polyps (NP) in bronchial asthma (BA) and / or allergic rhinitis (AR) remains largely undiagnosed and adversely affects quality of life (QoL).

The study comprised 220 consecutive patients (males / females, 123 / 97), 15 to 60 years with BA and / or AR enrolled from outpatient department of VPCI. BA / AR was diagnosed according to GINA / ARIA guidelines respectively. *Group 1* comprised 35 patients with BA, *Group 2*, 43 patients with AR and *Group 3*, 142 patients with both diseases. Computed tomography-Paranasal sinuses done in all patients, assessed CRS / NP and was scored with Lund Mackey Score (LMS). To assess the effect of NP, asthmatics responded to asthma QoL questionnaire (MiniAQLQ), and the 15-17 years to MiniPAQLQ. Rhinitis responded to rhino-conjunctivitis QoL questionnaire (RQLQ) and the 15-17 years to AdolRQLQ. Patients with nasal symptoms responded to Sinonasal Outcome Test 22 (SNOT 22) and Visual Analogue Scale (VAS).

Of the 220 patients, 190 (86.4%) had CRS. Of these, 138 (72.6%) had NP. CRS was seen in 26 / 35 (74.3%) patients in *Group 1*, 38 / 43 (88.4%), in *Group 2* and 126 / 142 (88.7%), in *Group 3*. NP was seen in 18 / 26 (69.2%), 30 / 38 (78.9%) and 90 / 126 (71.4%) in Groups 1, 2 and 3, respectively. The presence of NP increased mean LMS score from 5 in CRS to 8(P=0.005) in CRS / NP patients. In *Group 2*, occurrence of NP increased mean Global VAS score from 5 to 7 (P=0.029), SNOT 22 scores from 43 to 44 (P=0.029) and in RQLQ scores, activities score rose from 1.7 to 3.1 (P=0.007), nasal symptom score from 3.9 to 4.1 (P=0.033), non hayfever symptom score from 2.3 to 3.5 (P=0.045) and RQLQ overall scores from 2.4 to 3.1 (P=0.023). In *Group 3*, NP increased mean SNOT 22 scores from 39 to 42 (P= 0.002), RQLQ nasal symptom score from 4.2 to 4.4 (P=0.001) and RQLQ troubled sleep score from 1.7 to 1.9 (P=0.021). There were no significant differences in *Group 1*. In all three groups, presence of NP increased mean RQLQ activities score from 3 to 3.3 (P=0.033) and RQLQ troubled sleep score from 1.7 to 2 (P=0.010).

Nasal polyps were seen in nearly two-third (62.7%) of the patients with BA and / or AR. QoL was maximally impaired when AR was complicated with NP followed by patients with both the diseases.

After taking over as Director, VPCI, Prof. Rajendra Prasad moved into his new OPD Chamber on 21 December 2012

Governing Body Meeting of the Institute. Prof. P.N. Tandon, Chairman, GB addressing the Committee members

Republic Day was celebrated on 26th January 2013

A Spirometry Technicians Training Workshop was organised at the Institute by the Department of Cardio - respiratory Physiology from 14 - 15 March 2013

Respiratory Virology

Research

1. Catalytic nucleic acid mediated gene silencing of M2 ion channel of influenza viruses

The influenza A virus M2 ion channel protein is highly conserved among different viral strains and is essentially required during the trafficking, assembly and budding processes of virus, thus an attractive target for designing antiviral drugs. Several 10-23 DNAzymes (Dz) targeting different regions of the matrix gene (M2) of influenza A viruses were designed and analysed for their ability to specifically cleave the target ribonucleic acid (RNA) in both cell-free systems as well as in cell culture using transient transfections. Real-time polymerase chain reaction (RT-PCR) and real-time RT-PCR assays showed significant 75% inhibition of M2 gene of influenza A viruses upon specific Dz treatment. The transfection of MDCK cells with Dz considerably reduced the cytopathic effect caused by influenza A virus (A / PR / 8 / 34-H1N1) and considerably reduced the M2 protein expression. Our study, for the first time, has documented antiviral potential of Dz against M2 transcript of influenza A virus. Thus, we propose that the 10-23 DNAzymes may be used as selective and effective inhibitor of viral RNA replication, and can be explored further for development of a potent therapeutic agent against influenza infection.

2. Study of antigenic diversity and cross reactive antibody generation to influenza virus in human samples

As per the project objectives and protocol, a total of 401 respiratory samples were collected from patients with influenza like symptoms at Base Hospital, Delhi Cantonment and Kalawati Saran Children Hospital, Delhi throughout the year and also some samples were collected during the endemic period of northern India. The viral RNA from all the clinical samples was isolated and screened for influenza virus by real-time PCR. Of the 401 samples screened, 78 were found positive for influenza A virus of which 38 were positive for pandemic H1N1 and 40 for seasonal influenza strain. The positive samples were amplified by conventional PCR for HA gene of influenza A virus and further sequenced for phylogenetic analysis by MEGA with NJ method having 100 bootstraps. Haemagglutination inhibition (HAI) assay was performed on the patient sera collected 21 days after the infection. The antigens used for this assay were H1 (2009)-A / California / 7 / 2009, H1-A / N.Caledonia / 20 / 99 and H3-A / Panama / 207 / 99, which are the control antigens provided by World Health Organization. HAI was performed to check the cross-reactivity of antibodies against influenza A virus in serum samples. It was found that mostly the patients had a sufficiently high antibody titer against infected strain and less cross-reactivity to other strains. While the serum antibodies of patients infected with pH1N1 / 09 virus or seasonal H1N1 virus were found to cross-react with the H3 and / or sH1 antigen at 2- to 4- fold lower titers, the cross-reactive antibody titer of the H3N2 positive sample was 4- fold higher with sH1 antigen.

3. Nano-therapeutic application of small interfering RNA and micro RNA against human influenza virus

Many recent reports implicate oxygen-free radicals as a mediator of ischaemia-reperfusion injury, in which xanthine oxidase (XO), which generates toxic oxygen as a metabolite, could be responsible for tissue injuries in biological systems. In this pathological system, enhancement of cellular adenosine catabolism (after ATP degradation) yields high levels of hypoxanthine and xanthine, resulting coincidentally in effective supply of a substrate for XO. On the other hand, conversion of xanthine dehydrogenase (XD) to XO is also accelerated. Thus, these two simultaneous processes seem to accelerate the generation of free radicals and remarkably elevated production of oxygen becomes possible. Furthermore, there is now evidence that the level of XO in plasma is elevated in acute respiratory distress syndrome and that XO mediates lung injury by neutrophil-elastase and hyperoxia. These suggestive data prompted to hypothesise that XO causes oxygen generation, which could produce highly toxic –OH in the pathogenesis of influenza virus infection. The potential siRNA has been designed against XO gene which is up regulated during influenza virus infection. Currently, the HeLa cell line is being established for down-regulation studies

4. Evaluation of antiviral activity of medicinal plant extracts against influenza A virus

In this study, the inhibitory potential of *Azadirachta indica* Juss (*neem*) leaves on influenza A virus replication was assessed. Different dilutions of the extract of *neem* leaves were prepared and tested for their

antiviral potential against influenza A virus. Cytotoxic concentration of the extract was determined under *ex vivo* conditions and analysed for effective inhibition concentration. About 80% down regulation of HA gene was achieved by the extract as observed by real-time PCR. The efficacy of the extract is currently being evaluated under *in vivo* conditions.

5. Generation, characterisation and biological relevance of human monoclonal antibodies against pandemic influenza 2009 (H1N1) and seasonal influenza virus

Human monoclonal antibodies were generated from the PBMC's of influenza vaccinated individuals / infected individuals. The peripheral blood mononuclear cells were fused with myeloma cells and cultured in the presence of the HAT selection media. The clones that were generated were tested for influenza positive antibody by enzyme-linked immunosorbent assay and the neutralisation activity was checked by haemagglutination inhibition reaction. The positive clones will further be cultured by serial dilution in order to generate monoclonal antibodies.

6. Generation, characterisation and epitope mapping of recombinant monoclonal antibodies against pandemic influenza 2009 (H1N1)

The project aims to generate influenza virus neutralising antibodies using phage display technology. The antibody phage display library was constructed from B cells of Balb / c mice hyper-immunised with inactivated pandemic H1N1 influenza virus. The antibody expression has been localised in the bacterial cells and the respective fraction has been purified. The antibodies will be used for epitope mapping of HA antigen of influenza A virus.

7. Construction and characterization of functional ScFv antibodies against nucleocapsid protein and non-structural proteins of pandemic influenza H1N1 (2009) virus

The nucleocapsid protein (NP) and the non-structural protein (NS1) of influenza A virus are among the two very important proteins for virus propagation in the host cell and have been targeted for the development of recombinant antibodies. The recombinant antibody library has been prepared from the total mRNA of the spleen cells of hyper-immunised mice and is currently being screened for selection of antigen-specific antibody clones.

Postgraduate Training and Teaching

The Institute was initially started with a Diploma course in Tuberculosis and Chest Diseases (DTCD). Later the MD and PhD courses were started. The Institute continues to conduct the MD and PhD courses in pulmonary medicine, biochemistry, microbiology, pharmacology and physiology, and DTCD. The Institute is also running DM course in Pulmonar Medicine.

DTCD

Session 2011 - 2013	Session 20112- 2014
Dr Shekhar Varshney	Dr Vikas Jaiswal
Dr Neetima	Dr Neethu Sukumaran
Dr Gunjan Khunger	Dr Upasna Jelia
Dr Santosh Jha	Dr Anupriya Aggarwal
Dr Ankur Agarwal	Dr Davinder Kumar Kundra
Dr Anup Shilpi Khalkho	Dr Sachin Baliyan
Dr Mahammed Zuhaib	Dr Subhankar Choudhary*

* : Left on 16.11.2012.

MD Degrees (Awarded)

(Session: 2009-2012)

Name	Discipline
Dr Mir Elias	Pulmonary Medicine
Dr Brijesh Prajapat	Pulmonary Medicine
Dr Loveleen Sharma	Pulmonary Medicine
Dr Suresh Sharma	Pulmonary Medicine
Dr Chandrakant Raosaheb Tarke	Pulmonary Medicine
Dr Ashima Jain	Microbiology
Dr Saurabh Bhatia	Pharmacology
Dr Rajeev Ranjan Mishra	Physiology

MD Theses (Submitted)
(Session: 2010-2013)

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)
1.	Dr Kshitiz Aggarwal (Pulmonary Medicine)	Sensitisation with selected fungi in patients of asthma and chronic obstructive pulmonary disease and its correlation with skin prick testing and clinical presentation	Prof. S.N. Gaur and Dr Anuradha Chowdhary
2.	Dr Swati Behera (Pulmonary Medicine)	To determine the occurrence and effect of nasal polyps in patients with bronchial asthma and / or allergic rhinitis	Prof. Ashok Shah
3.	Dr Seema Kumari (Pulmonary Medicine)	Effect of pulmonary rehabilitation on systemic inflammation, muscle mass and functional status in post tuberculosis sequelae	Dr B.K. Menon Dr V.K. Vijayan Dr Vishal Bansal and Dr Ritu Kulshrestha
4.	Dr Swapna Ramaswamy (Pulmonary Medicine)	Effect of ipratropium and salbutamol on heart rate variability in chronic obstructive pulmonary disease	Prof. S.K. Chhabra and Dr Vishal Bansal
5.	Dr Mayank Saxena (Pulmonary Medicine)	Study of sinonasal involvement in patients of interstitial lung diseases	Prof. Raj Kumar and Dr Ritu Kulshrestha
6.	Dr Jitender Sharma (Biochemistry)	Adenosine metabolism in bronchial asthma: a study on adenosine deaminase and 5'-nucleotidase activity and adenosine level in serum, lymphocytes and erythrocytes	Prof. S.K. Bansal Dr V.K. Vijayan and Dr B.K. Menon
7.	Dr Dabet Rynga (Microbiology)	Phenotypic and molecular characterisation of clinical isolates of *Acinetobacter* spp	Dr Malini Shariff and Dr Monorama Deb (V.M.M.C. & Safdarjung Hospital, New Delhi)
8.	Dr Razi Akhtar (Pharmacology)	A clinical study to evaluate the safety and efficacy of theophylline and its modulation by ascorbic acid in patients of bronchial asthma	Dr Kavita Gulati Prof. A. Ray and Prof. S.N. Gaur
9.	Dr Puneet Kumar (Physiology)	Role of some inflammatory markers in obstructive sleep apnoea: effect of grape seed extract	Prof. K. Ravi and Dr V.K. Vijayan

MD Theses (Pursued)
(Session: 2011-2014)

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)
1.	Dr Devi Jyoti Das (Pulmonary Medicine)	Endothelial dysfunction in chronic obstructive pulmonary disease	Prof. S.K. Chhabra and Dr Vishal Bansal
2.	Dr Gaki Nima (Pulmonary Medicine)	Evaluation of vitamin D in asthma: its effect on inflammatory markers and impact on management	Prof. S.N. Gaur and Dr B.K. Menon
3.	Dr Nitesh Gupta (Pulmonary Medicine)	Correlation of fractional exhaled nitric oxide, nasal nitric oxide with atopic status in bronchial asthma, allergic rhinitis	Prof. S.N. Gaur and Prof. Raj Kumar
4.	Dr Shweta Paul (Biochemistry)	A study to correlate the activity of ADAM33 gene protein with oxidative stress in asthma	Dr Vishwajeet Rohil Prof. Ashok Shah Prof. S.K. Bansal and Dr M. Rahman
5.	Dr Anshu Mittal (Microbiology)	Detection, identification and profiling of mycobacterial isolates from patients of pulmonary and lymph node tuberculosis in Delhi	Dr Mandira Varma-Basil and Prof. Mridula Bose
6.	Dr Poornima Sen (Microbiology)	Role of TLR expression in innate activity during virus infection in acute asthma	Dr Madhu Khanna and Prof. S.N. Gaur
7.	Dr Sandeep Madhukar Wankhede (Microbiology)	Phenotypic and molecular characterisation of clinical isolates of *Candida* species with special reference to *Candida dubliniensis*	Dr Anuradha Chowdhary
8.	Dr Santosh Kumar (Pharmacology)	Antimicrobial drug prescribing pattern in hospitalised patients of community-acquired pneumonia: a retrospective study	Dr Anita Kotwani and Prof. S.N. Gaur

MD-Ist Year
(Session: 2012-2015)

	Name	Discipline
	Dr Puneet Agarwal	Pulmonary Medicine
	Dr Ankit Mittal	Pulmonary Medicine
	Dr Kamal Kumar	Pulmonary Medicine
	Dr Jayanthi G.	Microbiology
	Dr Ruby Stella R.	Physiology

DM Theses (Pursued)
(Session: 2011-2014)

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)
1.	Dr Vikas Dogra (Pulmonary Medicine)	Body mass index and quality of life in different CT phenotypes in male patients of COPD: a comparative study	Prof. S.N. Gaur and Dr B.K. Menon

DM Theses (Pursued)
(Session: 2012-2015)

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)
1.	Dr Mandeep Singh (Pulmonary Medicine)	Effect of obesity and metabolic syndrome on severity, quality of life, sleep quality and inflammatory markers in patients of bronchial asthma	Prof. Raj Kumar and Prof. S.N. Gaur
2.	Dr Pawan Gupta (Pulmonary Medicine)	Characterisation of nocturnal hypoxemia in chronic obstructive pulmonary disease	Prof. S.K. Chhabra

PhD Awarded/Submitted

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)	Status
1.	Mr Rajesh Sinha (Microbiology)	Functional analysis of *mce1a* and *mce4a* gene of *Mycobacterium tuberculosis* H37Rv using over-expression approach	Prof. H.G. Raj Prof. Mridula Bose and Dr A.K. Prasad (Chemistry Deptt, University of Delhi)	Awarded
2.	Mr Rakesh Pathak (Microbiology)	Role of *IspA* gene in the biology and pathogenesis of *Mycobacterium tuberculosis*	Prof. Mridula Bose and Prof. Daman Saluja (ACBR, University of Delhi)	Awarded
3.	Ms Sreemanti Guhathakurta (Pharmacology)	Studies on the possible mechanisms involved in the effects of UNIM-352, a polyherbal, anti-asthmatic unani preparation in experimental animals	Prof. A. Ray Dr V.K. Vijayan Dr Kavita Gulati and Prof. B.D. Banerjee (UCMS, Delhi)	Awarded
4.	Mr Anirudh Vashisht (Physiology)	Behaviour of pulmonary vagal sensory receptors with myelinated afferents during free radicals induced airway hyper-reactivity and its modulation by anti-oxidants in guinea pigs	Prof. K. Ravi Prof. S.K. Chhabra and Prof. B.D. Banerjee (UCMS, Delhi)	Awarded
5.	Abhimanyu (Microbiology)	Genetic variants in the host innate and acquired immune response: search for risk loci in north Indians	Prof. Mridula Bose Dr Mandira Varma-Basil and Dr J.N. Banavalikar (RBIPMT, Delhi)	Submitted

PhD Theses (Pursued)

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)	Year of Registration
1.	Ms Ruchi Sundryal (Biochemistry)	Identification of single nucleotide polymorphism in CRHR1 and GR receptor genes, their association and role in expression of inflammatory cytokines in asthma	Prof. S.K. Bansal Prof. Rajendra Prasad Prof. S.N. Gaur and Dr B.K. Menon	2013
2.	Mr Manoj Kumar (Biochemistry)	Studies on erythrocyte membrane protein profile and oxidant and antioxidant status of blood in bronchial asthma	Prof. S.K. Bansal Prof. Rajendra Prasad and Prof. S.K. Chhabra	2013
3.	Mr Binod Kumar (Microbiology)	Catalytic nucleic acid mediated gene silencing of M2 ion channel of influenza viruses	Dr Madhu Khanna and Dr M.K. Daga (MAMC, New Delhi)	2009
4.	Ms Kushal Garima (Microbiology)	Expression analysis and protein profiling of drug efflux transporters in clinical isolates of *M. tuberculosis*	Prof. Mridula Bose and Dr Mandira Varma-Basil	2009
5.	Ms Nisha Rathore (Microbiology)	Regulation of expression of *mce4* operon of *M. tuberculosis*: search for upstream promoter activity and regulatory proteins	Prof. Mridula Bose and Dr Mandira Varma-Basil	2009
6.	Mr Anupam Prakash (Microbiology)	A study of *Cryptococcus* species in immunocompromised patients	Dr Anuradha Chowdhary and Prof. H.S. Randhawa	2010
7.	Ms Latika (Microbiology)	Generation, characterisation and biological relevance of human monoclonal antibodies against pandemic H1N1 (2009) and seasonal influenza virus	Dr Madhu Khanna and Dr Sunil K. Lal (ICGEB, New Delhi)	2010
8.	Ms Roopali Rajput (Microbiology)	Construction and characterisation of functional scfv antibodies against nucleocapsid protein and non-structural 1 proteins of pandemic influenza H1N1 (2009) virus	Dr Madhu Khanna and Dr H.K. Pradhan (WHO, New Delhi)	2010

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)	Year of Registration
9.	Mrs Shallu Kathuria (Microbiology)	*Histoplasma capsulatum*: A study of its natural reservoirs and role in respiratory and systemic infections in immunocompromised patients	Dr Anuradha Chowdhary and Prof. H.S. Randhawa	2010
10.	Ms Anshika Narang (Microbiology)	Efflux mechanism in *Mycobacterium tuberculosis:* to study the effect on drug susceptibility profile	Dr Mandira Varma-Basil and Prof. Mridula Bose	2011
11.	Mr Dibya Ranjan Pati (Microbiology)	Nano-therapeutic application of small interfering ribonucleic acid (RNA) and micro RNA against human influenza virus	Dr Madhu Khanna and Dr A.C. Banerjee (NII, New Delhi)	2012
12.	Mr Naresh Kumar (Microbiology)	Expression analysis of an array of genes of *Mycobacterium tuberculosis* clinical isolates from pulmonary tuberculosis and lymph node tuberculosis: search for mycobacterial factors associated with different clinical manifestations	Dr Mandira Varma-Basil and Prof. Mridula Bose	2012
13.	Ms Pooja Singh (Microbiology)	Utilisation of cholesterol by *mce4A* (Rv3499) overexpressed *M. tuberculosis* H37Rv and the effect of calcium blockers	Dr Mandira Varma-Basil and Prof. Mridula Bose	2012
14.	Ms Cheshta Sharma (Microbiology)	Molecular mechanisms of triazole antifungal resistance in *Aspergillus fumigatus* and *Aspergillus flavus* originating from clinical and environmental sources	Dr Anuradha Chowdhary	2013
15.	Mr Pradeep Kumar Singh (Microbiology)	Phenotypic and molecular characterisation, antifungal susceptibility profiles and clinical significance of *Basidiomycetes* molds occurring in patients with respiratory disorders	Dr Anuradha Chowdhary and Prof. S.N. Gaur	2013
16.	Mr Dhirendra K. Singh (Pharmacology)	Experimental studies with chelidonic acid, a molecule of plant origin, with possible therapeutic potential in bronchial asthma	Prof. A. Ray and Dr Kavita Gulati	2010

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)	Year of Registration
17.	Mr Jagdish Josh (Pharmacology)	Experimental studies on the possible role of nitric oxide during acute and chronic morphine in normal and stressed rats	Dr Kavita Gulati and Prof. A. Ray	2011
18.	Ms Meenakshi Sharma (Pharmacology)	Studies on the possible role of nitric oxide in high altitutde stress induced neurobehavioural and immunological changes in rats	Prof. A. Ray Prof. K. Ravi and Dr Kavita Gulati	2011
19.	Mr Nishant Rai (Pharmacology)	Experimental studies on the cellular and molecular mechanisms of action of UNIM-352, a polyherbal Unani preparation to validate its use in bronchial asthma	Dr Kavita Gulati and Prof. A. Ray	2011
20.	Mr Md. Shamsuzzaman (Pharmacology)	Pharmacological studies on the possible mechanisms involved in theophylline induced cardiotoxicity in rats	Prof. A. Ray and Dr Kavita Gulati	2012
21.	Mr Tarun Takhur (Pharmacology)	Pharmacological studies on the possible role of nitric oxide (NO) and NO mediated signalling pathways in the regulation of stress-induced immunomodulation in rats	Prof. A. Ray and Dr Kavita Gulati	2012
22.	Dr Ritu Kulshrestha (Physiology)	Pathophysiological studies in bleomycin induced pulmonary hypertension and fibrosis in rat model	Prof. K. Ravi and Prof. A.K. Dinda (AIIMS, New Delhi)	2009
23.	Mr Ravindra Sharma (Physiology)	Hypothalamic regulation of high altitude pulmonary oedema	Prof. K. Ravi Prof. A. Ray and Dr P.K. Reddy (DIPAS, Delhi)	2011
24.	Mr Rishabh Charan Choudhary (Physiology)	Higher nervous control of the pulmonary renal reflex	Prof. K. Ravi and Dr Kavita Gulati	2011

Faculty Members Associated as Co-supervisors for PhD Theses of Other Institutions

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)	Status
1.	Ms Monica Joon (Microbiology)	Functional genomics of *mce* operons through the analysis of clinical isolates and knock out strains	Prof. Vani Brahmachari (ACBR, University of Delhi) and Prof. Mridula Bose	Awarded
2.	Ms Adila Parvin (Physiology)	Free radical mediated cardiovascular dysfunction in chronic heart failure: molecular and systemic mechanisms	Prof. Rashmi Babbar (MAMC, New Delhi) and Dr Anita Kotwani	Awarded
3.	Ms Anju Sharma (Biochemistry)	To investigate the effect of histone hyperacetylation on the expression of genes involved in lung carcinogenesis	Prof. Jayashree Bhattacharjee (Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi) and Dr Viswajeet Rohil	Pursued
4.	Ms Karuna Sharma (Biochemistry)	Genetic polymorphism of matrix metalloproteinases-9 (MMP-9) and its correlation with the maternal serum level of biomarkers (PAPP-A, free â-hCG) and proinflammatory cytokines in preeclampsia in north Indian population	Prof. Ritu Singh (Dept. of Biochemistry, Lady Harding Medical College, New Delhi, Prof. Jayashree Bhattacharjee (Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi) and Dr Viswajeet Rohil	Pursued
5.	Mr Jamal Ali Moiz, (Physiotherapy)	Effect of the addition of balance training to pulmonary rehabilitation for patients with COPD	Prof. M. Ezaj Hussain Prof. S.N. Gaur and Dr Vishal Bansal	Pursued

Distinguished Visitors

- Prof. Sami L. Bahna, former President, American College of Allergy, Asthma & Immunology (ACAAI), USA (April 2012).

- Dr Jajesh Kanuga, Chair, Allergy and Asthma India Initiative (AAII), USA (April 2012).

- Dr U.C. Chaturvedi, former Head, Department of Microbiology, King George's Medical University, Lucknow, Uttar Pradesh, participated in a scientific interaction with the Virology Research Group (25th April 2012).

- Prof. Narayan Rishi, Director, Amity Institute of Virology and Immunology, Amity Campus, Amity University, Noida, Uttar Pradesh, participated in a scientific interaction with the Virology Research Group (21st May 2012).

- Dr Jacques F. Meis, Senior Consultant, Deptartment of Medical Microbiology and Infectious Diseases, Canisius Wilhelmina Hospital, Nijmegen and Deptartment of Medical Microbiology, Radboud University, Nijmegen Medical Centre, The Netherlands. Guest Lecture on "Molecular Epidemiology of azole resistant *Aspergillus fumigatus"* (21st November 2012).

- Prof. Cecilia Stalsby Lundborg, Karolinska Institute, Stockholm, Sweden participated in a discussion on modalities of moving ahead in the Indo-Swedish Project on Antimicrobial Resistance (29th January 2013).

Awards/Honours

Prof. Rajendra Prasad

- **President,** 67th National Conference on Tuberculosis and Chest Disease (NATCON-2012) at Patna from 8th-10th February 2013.
- **Chairman,** Standing Technical Committee, Tuberculosis Association of India.
- **Vice-Chairman**, National Task Force RNTCP for involvement of medical colleges.
- **Editor-in-Chief and Publisher**, *Indian Journal of Chest Diseases and Allied Sciences*, an official publication of the V.P. Chest Institute and the National College of Chest Physicians (India) (26th November 2012 onwards)**.**
- **Editorial Advisor**, *Journal of Clinical Epidemiology and Global Health* of IndiaClen since May 2012.

Prof. S.N. Gaur

- **"Agnihotri-Jamil Memorial Oration"** 2012.
- **Secretary,** National College of Chest Physicians (India).
- **Expert Member**, Committee on Prevention, Abatement and Control of Pollution of Ministry of Environment and Forest, Govt. of India.
- **Member**, Working Group, Ministry of Environment and Forest, Govt. of India, 2012.
- **Member**, National Advisory Committee, 32nd Annual Convention of the Indian Association for Cancer Research, New Delhi, held from 13th-16th February 2013.
- **Editor-in-Chief and Publisher**, *Indian Journal of Chest Diseases and Allied Sciences*, an official publication of the V.P. Chest Institute and the National College of Chest Physicians (India) (till 25th November 2012).
- **Editor,** *Indian Journal of Allergy, Asthma and Immunology*, an official publication of the Indian College of Allergy, Asthma and Applied Immunology.

Prof. A. Ray

- **Invited Member,** DBT-Task Force on Medicinal and Aromatic Plants, New Delhi.
- **Member**, Institutional Ethical Committee, Rajan Babu Institute for Pulmonary Medicine & Tuberculosis, Delhi.
- **Chairman,** Selection Committee for ICMR-CCRAS (Dept. of AYUSH) Ministry of Health & Family Welfare, Govt. of India, New Delhi.
- **Member**, Expert Committee, CCRAS (AYUSH), Ministry of Health & Family Welfare, Govt. of India, New Delhi.
- **Member**, Expert Committee, CCRH (AYUSH), Ministry of Health & Family Welfare, Govt. of India, New Delhi.
- **Member,** ICMR-Fellowship Expert Group, New Delhi.
- **Member,** Interdisciplinary Doctoral Committee, Jamia Hamdard, New Delhi.
- **Chairperson,** Expert Committee Meeting of National Innovation Foundation (a DST-ICMR initiative), New Delhi.

Prof. Mridula Bose

- **Patent**: Obtained a national patent for ant-TB compound No. 983/DEL/2011. International patent application filed.
- **Member**, Editorial Board, *International Journal of Mycobacteriology*.
- **Constituent Member**, Asian - African Society for Mycobacteriology.
- **Member,** Editorial Board, *the Indian Journal of Chest Diseases and Allied Sciences*, an official publication of the V.P. Chest Institute and the National College of Chest Physicians (India).

Prof. Ashok Shah

- **Indian Chest Society Oration Award** 2012.
- **President**, Indian College of Allergy, Asthma and Applied Immunology for the years 2010-12.
- **Council Member**, Asia Pacific Association of Pediatric Allergy, Respirology and Immunology (APAPARI).
- **Member Society Representative,** Asia Pacific Association of Allergy, Asthma and Clinical Immunology (APAAACI) for 2011-2013.
- **Co-Chair**, Local Organising Committee, 2nd WISC of the WAO. The World Allergy Organisation's International Scientific Conference (2nd WISC) held at Hyderabad, India from 6-9 December 2012.
- **Member**, World Allergy Organisation Education Council for 2012-13.
- **Editor**, *Indian Journal of Chest Diseases & Allied Sciences*, an official publication of the V.P. Chest Institute and the National College of Chest Physicians (India).
- **Associate Editor,** *Indian Journal of Tuberculosis*, an official publication of the Tuberculosis Association of India.
- **Associate Editor,** *Indian Journal of Allergy, Asthma and Immunology*, an official publication of the Indian College of Allergy, Asthma and Applied Immunology.
- **Section Editor (Infectious Diseases),** *Lung India*, an official publication of the Indian Chest Society.
- **Member,** Editorial Board, *European Respiratory Journal* of the European Respiratory Society.
- **Member,** Editorial Board, *European Respiratory Reviews* of the European Respiratory Society.
- **Member,** Editorial Board, *Clinical and Molecular Allergy*, a Biomedical Central Journal.
- **Member,** Editorial Board, *Asian Pacific Allergy Journal* of the Asia Pacific Association of Allergy, Asthma and Clinical Immunology (APAAACI).
- **Member,** Editorial Board, *Open Allergy Journal.*
- **Member,** Editorial Advisory Board, *Chest* (Indian Edition), an official publication of the American College of Chest Physicians, USA.
- **Member,** Editorial Board, *Current Medical Trends.*
- **Member**, Subgroup - Respiratory Medicine, Core Committee of Experts, for Standard Treatment Guidelines, Ministry of Health and Family Welfare, Government of India.
- **Member**, National Committee on "*Bibliographic Biomedical Database from Indian Literature*", Indian Council of Medical Research - National Informatics Centre, New Delhi.
- **Assessor,** Medical Council of India for inspection of S.N. Medical College and Hospital, Jodhpur, under the Rajasthan University of Health Sciences Jaipur for increasing the seat in MD (Respiratory Medicine) course.

- **Assessor,** Medical Council of India for inspection of Gauhati Medical College and Hospital, Guwahati, under the Srimanta Sankaradeva University of Health Sciences Assam, Guwahati for starting MD (Respiratory Medicine) course.

Prof. S.K. Chhabra

- **Editor**, *Indian Journal of Chest Diseases & Allied Sciences*, an official publication of the V.P. Chest Institute and the National College of Chest Physicians (India).
- **Member,** Editorial Board, *Indian Journal of Allergy, Asthma and Immunology*, an official publication of the Indian College of Allergy, Asthma and Applied Immunology.
- **Section Editor (Pulmonary Circulation),** *Lung India*, an official publication of the Indian Chest Society.
- **Best Reviewer Award,** *Lung India*, an official publication of the Indian Chest Society.

Prof. K. Ravi

- **Visiting Consultant**, College of Medicine and Health Sciences, Sultan Qaboos University, Muscat, Oman.

Prof. S.K. Bansal

- **Vice President**, Association of Clinical Biochemists of India (Delhi Chapter).
- **Member, Executive Council (Ex-Officio)**, Biotechnology Society of India.
- **Vice-Chancellor's Nominee,** Doctoral Research Committee, Department of Biochemistry, Inter-disciplinary Sciences, University of Delhi South Campus, University of Delhi, Delhi.
- **Member**, Academic Council, University of Delhi, Delhi.

Prof. Raj Kumar

- **"NCCP (I) - Lupin Chest Oration"** 2012.
- **Excellence Award** for incredible contribution in the field of Medical Education, Mahatma Gandhi University, Meghalaya.
- **Organising Secretary**, Workshop on 'Respiratory Allergy' jointly organized by the Association of Pulmonologists, Sri Lanka and the National Center of Respiratory Allergy, Asthma and Immunology, V.P. Chest Institute, University of Delhi, Delhi at Sri Lanka on 20, August 2012.
- **Member**, Editorial Board**,** *International Journal of Occupational and Environmental Health*, USA.
- **Member,** Editorial Board, *Indian Journal of Chest Diseases & Allied Sciences*, an official publication of the V.P. Chest Institute and the National College of Chest Physicians (India).
- **Assistant Editor,** *Indian Journal of Allergy, Asthma and Immunology*, an official publication of the Indian College of Allergy, Asthma and Applied Immunology.
- **Section Editor (Occupational Disorders and Research Methods),** *Lung India*, an official publication of the Indian Chest Society.
- **Member,** Editorial Board, *Current Allergy and Asthma Report*.
- **Member,** Editorial Board, *Tobacco Control Bulletin*, an official publication of the Society for Tobacco Control, Delhi.
- **Member,** Review Committee on Genetic Manipulation (RCGM), Department of Biotechnology, Government of India, New Delhi.
- **Cental Committee Member**, Tuberculosis Association of India, New Delhi.
- **Nodal Officer,** Anti-Smoking Campaign of the Institute.

- **Secretary**, Society for Tobacco Control.
- **Joint Secretary,** Indian College of Allergy, Asthma and Applied Immunology, Delhi.
- **Treasurer,** South Asia Associacion of Asthma, Allergy & Clinical Immunology.
- **Member,** National Academy of Sciences India (NASI).
- **Member,** National Academy of Medical Sciences (NAMS).
- **Member,** American Academy of Allergy, Asthma & Immunology.
- **Governing Council Member,** South Asia Thoraric Society (SATS).
- **Governing Council Member,** National College of Chest Physicians (India).
- **Governing Body Member,** Indian Chest Society.
- **Fellow,** Indian Chest Society.

Dr Madhu Khanna

- **Editor**, *Indian Journal of Virology*.
- **Editor**, *Journal of Virology Research*.
- **Editor**, *International Journal of Immunology Research*.
- **Secretary General**, Biotechnology Society of India.
- **Joint Secretary**, International Association of Medical and Pharmaceutical Virologists.

Dr Anuradha Chowdhary

- **Deputy Editor**, *Mycoses*, an official Journal of the Europeon Confedration of Medical Mycology.
- **Member,** Editorial Board, *Indian Journal of Chest Diseases and Allied Sciences*, an official publication of the V.P. Chest Institute and the National College of Chest Physicians (India).
- **Member Expert** for developing Phaeohyphomycosis, the Black fungi, Joint Guidelines on Diagnosis and Management of Emerging Fungal Diseases by European Society of Clinical Microbiology and Infectious Diseases (ESCMID) and European Confederation of Medical Mycology (ECMM), 2012-2013.
- **NAWOPIA Dr Pankajalakshmi V. Venugopal Prize** for Best paper in Mycology 2012.

Dr Mandira Varma-Basil

- **ICMR International Fellowship** to work in the Department of Infectious Diseases, University of Medicine and Dentistry, New Jersey, U.S.A., from February 25 – July 26, 2012).
- **Treasurer**, Indian Association of Mycoplasmologists.

Dr Anita Kotwani

- **Advisor,** National Medicine Policy Project of SEARPharm Forum for South-East Asian Region countries.
- **Secretary,** International Society for Pharmacoeconomics & Outcome Research (India Chapter).
- **Chair,** Working Group, National Medicine Policy Project-India.
- **Rashtriya Gaurav Award,** Certificate of Excellence for meritorious services, outstanding performance and remarkable role by India International Friendship Society.
- **Member,** International Advisory Board, *Southern Med Review*.

- **Member,** Institute Ethical Committee, Dr Ambedkar Center for Biomedical Research, University of Delhi, Delhi.
- **Member,** Institute Ethics Committee, Micro Insurance Academy (MIA).
- **Member,** Institute Ethics Committee, Clinical Studies of Apollo Hospital, New Delhi.
- **Member,** Core Group and Sub-Committee on Methodology to assess the programmes in rational use of medicines in different states of India.
- **Expert,** Indo-Swedish Project on antimicrobial resistance and rational use of antibiotics.
- Invited by Swedish Institue for Communicable Diseases as an **Expert** to develop a project under Indo-Swedish Project on 'Antimicrobial Resistance and Rational Use of Antibiotics.
- Invited by WHO, Geneva as an **Expert** for a workshop on transparency and good governance in the pharmaceutical sector.

Dr Kavita Gulati

- **Treasurer**, Society of Nitric Oxide and Allied Radicals (SNOAR).
- **Expert** for review of projects and progress at Central Council for Research in Homeopathy, AYUSH (Govt. of India).

Dr Vishwajeet Rohil

- **Executive Member,** Biotechnology Society of India.
- **Expert,** Sixth Executive Board Meeting to review the progress of XIFYP project; "Human performance enhancement under different operational environment", DIPAS, Delhi.

Dr Vishal Bansal

- **Fellow**, American College of Chest Physicians (ACCP), USA.
- **Member**, Editorial Board, *Journal of Krishna Institute of Medical Sciences University*, an official publication of Krishna Institute of Medical Sciences University, Karad, Maharashtra.
- **Expert,** DRTC Assessment Board- 2012, Centre for Personnel Talent Management, DRDO, Ministry of Defence, Govt. of India.
- **External Technical Expert,** Specification Evaluation Committee, Defence Institute of Physiology and Allied Sciences (DIPAS), Delhi.

Dr M. Rahman

- **Member,** Editorial Board, *Indian Journal of Chest Diseases & Allied Sciences*, an official publication of the V.P. Chest Institute and the National College of Chest Physicians (India).

Mr Abhimanyu (PhD Student)

- **Best Poster** presentation received at and the "38th Annual Conference of the Indian Society of Human Genetics: Genomics and Community Health", 2012.

Mr Binod Kumar (PhD Student)

- Lars Haaheim Scholarship from Welcome Trust to attend Summer School on Influenza, 2012 in Sienna, Italy, on July 16-20, 2012.

Sponsored Research Projects

Sl No.	Faculty Member (Department)	Title of Project	Funding Agency, Date of Sanction/Implementation and Duration	Budget (in Rs.)
1.	Prof. S.K. Bansal (Biochemistry)	Pharmacogenomics of bronchial asthma: a study on polymorphism in $\hat{a}_2$ adrenoceptor (*ADR*B2) and corticotrophin releasing hormone receptor 1 (*CRHR1*) genes in responders and non-responders to salbutamol and budesonide	D.B.T. March 22, 2010 (Three years)	62.31 Lakhs
2.	Prof. S.K. Chhabra (Cardio-respiratory Physiology)	Heart rate variability in chronic obstructive pulmonary disease: association with systemic inflammation and clinical implications	D.S.T. February 18, 2010 (Three years)	31.67 Lakhs
3.	Dr Vishwajeet Rohil (Clinical Biochemistry)	Studies on implications of epigenetic modulation due to histone hyperacetylation in tumour cells induced by drugs targeting protein acetylation system through a novel mechanism	U.G.C. January 18, 2010 (Three years)	9.90 Lakhs
4.	Dr Vishwajeet Rohil (Clinical Biochemistry)	To evaluate the molecular mechanism of development of COPD in smokers in north Indian population	I.C.M.R. March 29, 2010 (Three years)	17.28 Lakhs
5.	Dr Anuradha Chowdhary (Medical Mycology)	A study of genetic heterogeneity and molecular ecology of *Cryptococcus neoformans* and *Cryptococcus gattii*	D.S.T. June 3, 2009 (Three years)	39.35 Lakhs
6.	Dr Anuradha Chowdhary (Medical Mycology)	Fungal infections in HIV positive patients in Manipur state: a phenotypic and molecular study of aetiologic agents, antifungal susceptibility pattern and therapeutic management	D.B.T. March 1, 2011 (Three years)	35.15 Lakhs
7.	Dr Anuradha Chowdhary (Medical Mycology)	*Histoplasma capsulatum*: a study of its natural reservoirs and role in respiratory and systemic infections in India	I.C.M.R. August 1, 2012 (Three years)	16.38 Lakhs

Sl No.	Faculty Member (Department)	Title of Project	Funding Agency, Date of Sanction/Implementation and Duration	Budget (in Rs.)
8.	Dr Anuradha Chowdhary (Medical Mycology)	Multi-laboratory evaluation of a synthetic peptide based ELISA (AfuPEPLISA) for detection of *Aspergillus fumigatus* specific antibodies in patients of asthma and pulmonary tuberculosis	D.B.T. September 24, 2012 (Three years)	10.50 Lakhs
9.	Prof. Mridula Bose (Microbiology)	Role of *lspA* gene in the biology and pathogenesis of *M. tuberculosis*	I.C.M.R. September 28, 2010 (Two years)	20.80 Lakhs
10.	Prof. Mridula Bose (Microbiology)	Functional analysis of *Mce4A* and *Mce1A* protein of *M. tuberculosis*: role in cholesterol transport and phagolysome fusion inside macrophages	I.C.M.R. December 9, 2011 (One year)	7.28 Lakhs
11.	Prof. Mridula Bose (Microbiology)	SP110 gene varients in defining susceptibility to tuberculosis in north Indians	I.C.M.R. February 16, 2012 (One year)	9.36 Lakhs
12.	Dr Mandira Varma-Basil (Microbiology)	Drug resistance profiling and molecular typing of *M. tuberculosis* isolates from different community settings in North Delhi	I.C.M.R. March 22, 2010 (Three years)	41.91 Lakhs
13.	Dr Mandira Varma-Basil (Microbiology)	Expression profile of efflux related pumps in drug resistant *M. tuberculosis*	D.B.T. October 21, 2011 (Three years)	42.47 Lakhs
14.	Dr Ritu Kulshrestha (Pathology)	Role of angiogenesis, vascular remodelling, pulmonary receptor changes and their inhibition by phosphodiesterase-5 inhibitors in bleomycin-induced pulmonary hypertension and fibrosis	D.S.T. (Fast Track Project) June 30, 2010 (Three years)	19.98 Lakhs
15.	Dr Ritu Kulshrestha (Pathology)	The study of molecular mechanisms of epithelial myoepithelial transition in pathogenesis of pulmonary fibrosis	C.S.I.R. April 2, 2012 (Three years)	23.64 Lakhs
16.	Dr Ritu Kulshrestha (Pathology)	Molecular mechanisms of pulmonary vascular hypertension associated with respiratory diseases and hypoxia	I.C.M.R. August 23, 2012 (Three years)	20.92 Lakhs

Sl No.	Faculty Member (Department)	Title of Project	Funding Agency, Date of Sanction/Implementation and Duration	Budget (in Rs.)
17.	Prof. A. Ray (Pharmacology)	Pharmacological studies on the role of nitric oxide (NO) and NO mediated signalling pathways in acute and chronic hypoxia induced behavioural and immunological changes in rats	D.R.D.O. May 6, 2011 (Two years)	7.00 Lakhs
18.	Prof. A. Ray (Pharmacology)	Calcium phosphate nano particles co en-capsulating neuro therapeutic gene and drug for targeted therapy of neurodegenerative disorders	D.B.T. June 24, 2011 (Three years)	24.28 Lakhs
19.	Prof. A. Ray (Pharmacology)	Pharmacological studies on the effects of stress on inflammation and immunity in rats	U.G.C. June 29, 2011 (Three years)	6.33 Lakhs
20.	Dr Kavita Gulati (Pharmacology)	Pharmacological studies on the possible role of nitric oxide (NO) and NO-mediated signalling pathways in the regulation of stress induced immunological changes in rats	I.C.M.R. September 29, 2009 (Three years)	15.01 Lakhs
21.	Dr Kavita Gulati (Pharmacology)	Experimental studies on the possible role of nitric oxide (NO) during acute and chronic morphine in normal and stressed rats	C.S.I.R. November 1, 2010 (Three years)	14.91 Lakhs
22.	Dr Kavita Gulati (Pharmacology)	Experimental studies on the cellular and molecular mechanism of action of UNIM-352, polyherbal Unani formulation, to validate its use as a drug for bronchial asthma	C.C.R.U.M. April 28, 2011 (Three years)	14.00 Lakhs
23.	HoDs (Pharmacology and Respiratory Medicine)	To augment the post-graduate teaching and research facilities in the Departments of Pharmacology and Respiratory Medicine, VPCI under FIST Programmeme	D.S.T. January 19, 2011 (Five years)	29.50 Lakhs
24.	Prof. K. Ravi (Physiology)	Brain nitric oxide and high altitude stress	D.I.P.A.S. February 9, 2010 (Three years)	59.00 Lakhs
25.	Prof. K. Ravi (Physiology)	Higher nervous control of the pulmonary renal reflex	C.S.I.R. December 19, 2011 (Three years)	6.75 Lakhs

Sl No.	Faculty Member (Department)	Title of Project	Funding Agency, Date of Sanction/Implementation and Duration	Budget (in Rs.)
26.	Prof. Raj Kumar (Respiratory Allergy and Applied Immunology)	To study the prevalence of obstructive sleep apnoea amongst middle aged chronic obstructive airway disease (COPD and asthma) patients by a home-based sleep study and atopy	U.G.C. December 3, 2009 (Three years)	11.55 Lakhs
27.	Prof. Raj Kumar (Respiratory Allergy and Applied Immunology)	Genetic association study of polymorphisms related to chronic obstructive pulmonary disease (COPD) and its measures in north Indian population: COPD Genetics Consortium	D.B.T. September 29, 2011 (Three years)	8.66 Lakhs
28.	Dr Madhu Khanna (Respiratory Virology)	Generation, characterisation and epitope mapping of recombinant human monoclonal antibodies against pandemic influenza 2009 (H1N1)	D.S.T. January 1, 2011 (Three years)	43.53 Lakhs
29.	Dr Madhu Khanna (Respiratory Virology)	Study of antigenic diversity and cross-reactive antibody generation to influenza virus in human samples	D.R.D.O. April 6, 2011 (Three years)	45.21 Lakhs
30.	Dr Madhu Khanna (Respiratory Virology)	Profile of antibody responses and duration of protection following influenza vaccination in adults >65 years of age	Asia-Pacific Alliance for the Control of Influenza (APACI) December 19, 2012 (Two years)	30604 USD
31.	Mr Binod Kumar SRF, ICMR Fellow	Catalytic nucleic acid mediated gene silencing of M2 ION channel of influenza virus	I.C.M.R. December 22, 2010 (Three years)	1.58 Lakhs
32.	Dr Ashima Anand (Principal Investigator) DST Project	Evaluation of a physiological intervention for reducing exercise induced breathlessness in healthy patients with interstitial lung disease (ILD) patients with Eisenmenger Syndrome	D.S.T. November 16, 2010 (Three years)	64.25 Lakhs
33.	Prof. H.S. Randhawa (INSA Honorary Scientist)	*Cryptococcus neoformans:* a study of its natural habits, serotypes and reappraisal of selective isolation techniques	I.N.S.A. January 1, 2001 (Thirteen years)	4.75 Lakhs

Orations/Guest Lectures

Sl No.	Faculty Member	Title of Lecture	Organiser(s)	Conference, Place and Date
1.	Prof. Rajendra Prasad	• Delivered the Presidential Address • Management of MDR-TB • COPD: current issues	Tuberculosis Association of India and Bihar Tuberculosis Association	67th National Conference on Tuberculosis and Chest Diseases (NATCON-2012) Patna February 8-10, 2013
2.	Prof. Rajendra Prasad	Lung cancer: Indian scenario	Era Medical College	Era Medical College Lucknow February 12, 2013
3.	Prof. Rajendra Prasad	Lung cancer: Indian scenario	Indian Association for Cancer Research and Dr B.R. Ambedkar Centre for Biomedical Research (ACBR)	32nd Annual Convention of Indian Association for Cancer Research Delhi February 13-16, 2013
4	Prof. Rajendra Prasad	Respiratory allergy: clinical diagnosis	Bangladesh Lung Foundation, South Asia Association of Allergy, Asthma & Clinical Immunology (SAAAACI) and South Asian Thoracic Society (SATS)	3rd International Conference on Lung Health (Pulmocon 2013) Dhaka, Bangladesh February 19-20, 2013
5.	Prof. S.N. Gaur	Immunotherapy – subcutaneous	Indian College of Allergy, Asthma and Applied Immunology and Institute of Medical Sciences, Banaras Hindu University	46th Annual Convention of the Indian College of Allergy, Asthma and Applied Immunology Varanasi November 2-4, 2012
6.	Prof. S.N. Gaur	Indian guidelines for allergy practice in India	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2012) Bhubaneswar November 17-20, 2012
7.	Prof. S.N. Gaur	Agnihotri-Jamil Memorial Oration: "Allergen immunotherapy: Indian scenario and the guidelines"	King George's Medical University	King George's Medical University Lucknow December 29, 2012

Sl No.	Faculty Member	Title of Lecture	Organiser(s)	Conference, Place and Date
8.	Prof. S.N. Gaur	Effect of global warming on respiratory tract	American Association Physicians of Indian Origin (AAPI)	Global Healthcare Summit (GHS) 2013 Kochi January 1-3, 2013
9.	Prof. A. Ray	Neuroimmunomodulation by herbal adaoptogens	The Federation of European Pharmacological Societies	6th European Congress of Pharmacology (EPHAR 2012) Granada, Spain July 17-20, 2012
10.	Prof. A. Ray	Advances in herbal drug research	Chettinad Hospital and Research Institute	Southern Region IPS Conference Chennai September 7-9, 2012
11.	Prof. A. Ray	Nitric oxide: an endogenous adaptogen	Indian Pharmacological Society (IPS)	45th Annual Conference of IPS (IPSCON-2012) and International Conference on Navigating Pharmacology Towards Safe and Effective Therapy Nagpur January 5-7, 2013
12.	Prof. Mridula Bose	Awareness towards tuberculosis control and treatment	Miranda House, University of Delhi	Miranda House Delhi July 11, 2012
13.	Prof. Mridula Bose	Understanding tuberculosis: population genetics as a tool	Biotechnology Society of India	Dr B.R. Ambedkar Centre for Biomedical Research (ACBR) Delhi October 29, 2012
14.	Prof. Mridula Bose	Decoding population genetics: impact on tuberculosis control and treatment	Indian Association of Medical Microbiologists	XXXVI National Conference of Indian Association of Medical Microbiologists (MICROCON-2012) Delhi November 22-25, 2012

Sl No.	Faculty Member	Title of Lecture	Organiser(s)	Conference, Place and Date
15.	Prof. Ashok Shah	Allergic bronchopulmonary aspergillosis: usual problem often missed	Aditya Respiratory, Sleep Medicine and Pulmonary Rehabilitation Centre	Respiratory and Critical Care Update 2012 Lucknow April 8, 2012
16.	Prof. Ashok Shah	Indian Chest Society Oration (Assam Chapter): "Bronchial anthracofibrosis: an emerging pulmonary disorder" • Introduction to respiratory allergic disorders • Rationale of anti-tuberculous therapy	Gauhati Medical College	Respiratory Update 2012 Guwahati, Assam May 6, 2012
17.	Prof. Ashok Shah	• Respiratory allergic disorders in India: an overview • Upper airways allergic inflammatory disorders	Indian College of Allergy, Asthma and Applied Immunology and Institute of Medical Sciences, Banaras Hindu University	46th Annual Convention of the Indian College of Allergy, Asthma and Applied Immunology Varanasi November 2-4, 2012
18.	Prof. Ashok Shah	*Aspergillus* associated hypersensitivity respiratory disorders	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2012) Bhubaneswar November 17-20, 2012
19.	Prof. Ashok Shah	• Allergic bronchopulmonary aspergillosis • Patient education and self-management in asthma	World Allergy Organization	World Allergy Organization's International Scientific Conference (WISC 2012) Hyderabad December 6-9, 2012
20.	Prof. Ashok Shah	Allergic bronchopulmonary aspergillosis: an uncommonly diagnosed common disease	Department of Pulmmonary Medicine, A.I.I.M.S.	AIIMS-PULMOCRIT 2012 New Delhi December 15-16, 2012
21.	Prof. Ashok Shah	Bronchial anthracofibrosis: an emerging pulmonary disorder	Bangladesh Lung Foundation, South Asia Association of Allergy, Asthma and Clinical Immunology (SAAAACI) and South Asian Thoracic Society (SATS)	3rd International Conference on Lung Health (Pulmocon 2013) Dhaka, Bangladesh February 19-20, 2013

Sl No.	Faculty Member	Title of Lecture	Organiser(s)	Conference, Place and Date
22.	Prof. Ashok Shah	Allergic bronchopulmonary aspergillosis	Department of Respiratory Medicine, Government Medical College	XXII - NCCP – RAJPULMOCON 2013 Kota February 23-24, 2013
23.	Prof. S.K. Chhabra	Health effects of air pollution	The Energy and Research Institute (TERI) and Karnataka State Pollution Control Board	Civic Forum on Clean Vehicles and Fuels: Opportunities and Challenge Bengaluru July 2, 2012
24.	Prof. S.K. Chhabra	Public health challenges of air pollution	Centre for Science and Environment	Solutions to Pollution and Mobility Crisis for Liveable Cities New Delhi August 30-September 1, 2012
25.	Prof. S.K. Chhabra	Health effects of air pollution	Toxics Link and India International Centre	The Smog in Delhi: Causes and Concerns New Delhi November 29, 2012
26.	Prof. S.K. Chhabra	Impacts of outdoor and indoor air pollution on allergic airway disease in India	World Allergy Organization	World Allergy Organization's International Scientific Conference (WISC 2012) Hyderabad December 6-9, 2012
27.	Prof. S.K. Chhabra	Ozone air pollution	Centre for Science and Environment, Indian Council of Medical Research and Health Effects Institute	Global Burden of Disease: Air Pollution Among Top Killers in India New Delhi February 13, 2013
28.	Prof. K. Ravi	A vagal sensory mechanism for the dyspnoea of acute heart failure	College of Medicine and Health Sciences, Sultan Qaboos University, Muscat	College of Medicine and Health Sciences, Sultan Qaboos University, Muscat June 4, 2012
29.	Prof. K. Ravi	High altitude simulation, lung neuropeptides and airway rapidly adapting receptor (RAR) activity	Institute of Genomics and Integrative Biology (IGIB)	The Lung at High Altitude: From Cellular Acclimatization to Clinical Disease Leh August 3-7, 2012

Sl No.	Faculty Member	Title of Lecture	Organiser(s)	Conference, Place and Date
30.	Prof. K. Ravi	Effect of oral anti-oxidants on the diuresis and natriuresis occurring in patients with obstructive sleep apnoea syndrome	Defence Institute of Physiology & Allied Sciences	Global Hypoxia Summit and 4th International Conference on Chronic Hypoxia Delhi August 9-12, 2012
31.	Dr Raj Kumar	• Allergic rhinitis: guideline- based management • Management of chronic stable COPD	Gauhati Medical College	Respiratory Update 2012 Guwahati, Assam May 6, 2012ss
32.	Dr Raj Kumar	Clinic based tobacco cessation model, need for integration of cessation services in the health care delivery system	Johns Hopkins Bloomberg School of Public Health-India (JHSPH-INDIA)	India Tobacco Control Leadership Programmeme New Delhi November 9, 2012
33.	Dr Raj Kumar	NCCP(I)–Lupin Chest Oration: "Smoking cessation: Indian perspective"	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2012) Bhubaneswar November 17-20, 2012
34.	Dr Raj Kumar	Food allergy in South Asia: special reference to asthma	Bangladesh Lung Foundation, South Asia Association of Allergy, Asthma and Clinical Immunology (SAAAACI) and South Asian Thoracic Society (SATS)	3rd International Conference on Lung Health (Pulmocon 2013) Dhaka, Bangladesh February 19-20, 2013
35.	Dr Balakrishnan Menon	HRCT of the chest	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2012) Bhubaneswar November 17-20, 2012
36.	Dr Mandira Varma-Basil	Relevance of NTM: importance of identification of mycobacterial species in clinical settings	Baroda Medical College	TB- Back to the Basics Vadodara, Gujarat March 24, 2013
37.	Dr Anuradha Chowdhary	Cryptococcosis	Radboud University	Medical Mycology Course Nijmegen, The Netherlands June 19, 2012

Sl No.	Faculty Member	Title of Lecture	Organiser(s)	Conference, Place and Date
38.	Dr Anuradha Chowdhary	Antifungal susceptibility: Indian scenario	Hospital Infection Society – India, Delhi and NCR Chapter	Indraprastha Apollo Hospitals New Delhi March 10, 2013
39.	Dr Anita Kotwani	Challenges in gate keeping role for rational dispensing of antibiotics	SEARPharm Forum	Benefits of Good Practices in Pharmacy-Setting Standards for Delivery of Safe Medicines to Patients in WHO-SEA Region New Delhi April 27, 2012
40.	Dr Anita Kotwani	Asthma management and illness perception: studies from India	Department of Population Medicines, Harvard Medical School, Boston	Pharmaceutical Policy Research Seminar Boston, USA May 16, 2012
41.	Dr Anita Kotwani	Medicines pricing in India: policy, profit, practice and access	Department of Pharmacology, V.C.G.G. Medical College and Research Institute	V.C.G.G. Medical College and Research Institute Srikot, Uttarakhand June 27, 2012
42.	Dr Anita Kotwani	Antibiotic overuse in India: recommendations for action	International Society for Pharmacoeconomics and Outcome Research (ISPOR)-India	International Conference of International Society for Pharmacoeconomics and Outcome Research (ISPOR)-India New Delhi November 23-24, 2012
43.	Dr Kavita Gulati	Experimental studies on the involvement of brain oxidative and nitrosative stress in methylxanthine induced neurobehavioural toxicity	The Federation of European Pharmacological Societies	6th European Congress of Pharmacology (EPHAR 2012) Granada, Spain July 17-20, 2012
44.	Dr Kavita Gulati	Translational research and herbal drug development	Chettinad Hospital and Research Institute	Southern Region IPS Conference Chennai September 7-9, 2012
45.	Dr Kavita Gulati	Indian regulations: protecting human participants	Association for the Accreditation of Human Research Protection Programmes and Manipal Hospitals	Practical Solutions to Challenges in Research Ethics: A Focus on Human Research Protection Programmeme Bengaluru November 3-4, 2012

Sl No.	Faculty Member	Title of Lecture	Organiser(s)	Conference, Place and Date
46.	Dr Kavita Gulati	Translational research in respiratory pharmacology: a focus on methylxanthines	Indian Pharmacological Society (IPS)	45th Annual Conference of IPS (IPSCON-2012) and International Conference on Navigating Pharmacology Towards Safe and Effective Therapy Nagpur January 5-7, 2013
47.	Dr Vishal Bansal	• Role of oxygen in pulmonary rehabilitation • Pulmonary rehabilitation in interstitial lung diseases	Romanian Society of Pneumology	22nd Congress of the Romanian Society of Pneumology on "The Lung –Target or Cause" Poiana Brasov, Romania May 30-June 2, 2012

Conferences/Symposia/Seminars/Workshops/CMEs

Sl No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
1.	Prof. Rajendra Prasad	Lecture on: Diagnosis and treatment of MDR and XDR tuberculosis	Indian Medical Association (Gorakhpur Chapter)	CME Gorakhpur January 19, 2013
2.	Prof. Rajendra Prasad	Lecture on: RNTCP update of north zone	DDG, Ministry of Health and Family Welfare, Govt. of India	National Task Force Workshop of RNTCP Jaipur January 31, 2013
3.	Prof. Rajendra Prasad	Presented a paper on Treatment outcome of MDR-TB patients Chaired a session on Diagnosis of TB	Tuberculosis Association of India and Bihar Tuberculosis Association	67th National Conference on Tuberculosis and Chest Diseases (NATCON-2012) Patna February 8-10, 2013
4.	Prof. Rajendra Prasad	Chaired a session on Molecular diagnostics	Indian Association for Cancer Research and Dr B.R. Ambedkar Center for Biomedical Research (ACBR)	32nd Annual Convention of Indian Association for Cancer Research Delhi February 13-16, 2013
5.	Prof. Rajendra Prasad	Chaired a session on Asthma	Bangladesh Lung Foundation, South Asia Association of Allergy, Asthma & Clinical Immunology (SAAAACI) and South Asian Thoracic Society (SATS)	3rd International Conference on Lung Health (Pulmocon 2013) Dhaka, Bangladesh February 19-20, 2013
6.	Prof. Rajendra Prasad	Chaired a session on Medical education in India	India Clinical Epidemiology Network (IndiaCLEN) and King Geoge's Medical University	Annual IndiaCLEN Conference-2013 Lucknow March 2-3, 2013
7.	Prof. S.N. Gaur	Lectures on: • History taking, clinical aspects of respiratory allergy • Subcutaneous immunotherapy • Personal experience of immunotherapy	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	37th Workshop on Respiratory Allergy: Diagnosis and Management New Delhi April 2-6, 2012

Sl No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
8.	Prof. S.N. Gaur	Participated in a panel discussion on Koch's diagnosis and treatment protocol in Indian scenario	Indian Medical Association	Indian Medical Association New Delhi December 11, 2012
9.	Prof. S.N. Gaur	Subcutaneous immunotherapy	V.P.C.I., University of Delhi and Institute of Genomics & Integrative Biology	38th Workshop on Respiratory Allergy: Diagnosis and Management New Delhi March 18-22, 2013
10.	Prof. S.N. Gaur	Member, Organising Committee	Indian College of Allergy, Asthma and Applied Immunology	46th Annual Convention of the Indian College of Allergy, Asthma and Applied Immunology Varanasi November 2-4, 2012
11.	Prof. S.N. Gaur	Member, Organising Committee	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2012) Bhubaneswar November 17-20, 2012
12.	Prof. S.N. Gaur	Chaired a session on Allergy and immunology / lung health	American Association Physicians of Indian Origin (AAPI)	Global Healthcare Summit (GHS) 2013 Kochi January 1-3, 2013
13.	Prof. A. Ray	Lecture on: Pharmacovigilance	Deptartment of Pharmacology, Kasturba Medical College	CME on Clinical Trials and Statistics Manipal September 5, 2012
14.	Prof. A. Ray	Lecture on: Ethics in clinical research	Central Council for Research in Unani Medicine (CCRUM)	Training Workshop on Ethical Issues and Ethics Committee in Clinical Trials New Delhi November 20, 2012
15.	Prof. Mridula Bose	Organising Secretary	Indian Association of Medical Microbiologists and Departments of Microbiology, Medical Mycology, Respiratory Virology, V.P.C.I., University of Delhi	Pre-conference Workshop on Molecular Diagnostic Methods in Respiratory Infections (MICROCON-2012 Conference) Delhi November 21, 2012

Sl No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
16.	Prof. Ashok Shah	Lecture on: Allergic bronchopulmonary aspergillosis	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	37th Workshop on Respiratory Allergy: Diagnosis and Management New Delhi April 2-6, 2012
17.	Prof. Ashok Shah	Lecture on: Bronchial asthma: an overview	Department of Respiratory Medicine, Max Superspeciality Hospital	CME on Bronchial Asthma Delhi May 26, 2012
18.	Prof. Ashok Shah	Chaired a session on "Workshop - Lifestyle and asthma: an EAACI Task Force Consensus"	European Academy Allergology and Clinical Immunology (EAACI)	XXXI Congress of the European Academy Allergology and Clinical Immunology (EAACI 2012) Geneva, Switzerland June 16-20, 2012
19.	Prof. Ashok Shah	Lecture on: Respiratory allergic disorders in India: an overview	Indian College of Allergy, Asthma and Applied Immunology and the National Allergy Asthma Bronchitis Institute	9th CME on Respiratory Allergy Kolkata July 1, 2012
20.	Prof. Ashok Shah	Lecture on: Pathophysiology and diagnosis of bronchial asthma Participated in a panel discussion on Treatment of bronchial asthma	Indian Academy of Allergy	National Level Physician Training Workshop on Allergy, Asthma and Applied Immunology Bengaluru August 22-26, 2012
21.	Prof. Ashok Shah	Participated in a panel discussion on Bronchial asthma Chaired a session on Non invasive ventilation	Department of Pulmonary Medicine and Sleep Diorders, A.I.I.M.S.	AIIMS PG Pulmonary Update for Post Graduate Students New Delhi September 8-9, 2012
22.	Prof. Ashok Shah	Lecture on: Bronchial asthma: how to differentiate from COPD	American College of Chest Physicians (North India Chapter) and the National Institute of Tuberculosis and Respiratory Diseases	Workshop on Bronchial Asthma New Delhi September 16, 2012

Sl No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
23.	Prof. Ashok Shah	Chaired the "DN Shivpuri Oration" session Chaired the" Sundarama Award" session Chaired the" UCB-ICAAI Award" session	Indian College of Allergy, Asthma and Applied Immunology and Institute of Medical Sciences, Banaras Hindu University	46th Annual Convention of the Indian College of Allergy, Asthma and Applied Immunology Varanasi November 2-4, 2012
24.	Prof. Ashok Shah	Participated in a panel discussion on COPD Chaired and judged the "NAPCON Free Paper Award" session	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2012) Bhubaneswar November 17-20, 2012
25.	Prof. Ashok Shah	Chaired the Indian College of Allergy, Asthma, and Applied Immunology Symposium on "Highlights of airways diseases in India"	World Allergy Organization	World Allergy Organization's International Scientific Conference (WISC 2012) Hyderabad December 6-9, 2012
26.	Prof. Ashok Shah	Participated in a panel discussion on MDR-tuberculosis: diagnosis and management	East Delhi Physicians Association	CME 2012 Delhi December 16, 2012
27.	Prof. Ashok Shah	Lecture on: Pulmonary sarcoidosis: a physician's approach to diagnosis and management	Jaipur Chest Forum	Quarterly Meeting of the Jaipur Chest Forum Jaipur January 19, 2013
28.	Prof. Ashok Shah	Chaired a session on Bronchial anthracofibrosis: an emerging pulmonary disorder	Bangladesh Lung Foundation, South Asia Association of Allergy, Asthma and Clinical Immunology (SAAAACI) and South Asian Thoracic Society (SATS)	3rd International Conference on Lung Health (Pulmocon 2013) Dhaka, Bangladesh February 19-20, 2013
29.	Prof. Ashok Shah	Chaired a session on Role of surgery in COPD	Department of Respiratory Medicine, Government Medical College	XXII - NCCP – RAJPULMOCON 2013 Kota February 23-24, 2013

Sl No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
30.	Prof. Ashok Shah	Lecture on: Bronchial anthracofibrosis: a bronchoscopic diagnosis Chaired a session on Tracheal surgery	Indian Association for Bronchology and the Metro MAS Heart Care and Multi Specialty Hospital	Broncho CME 2013 (Bronchoscopic workshop cum CME Jaipur March 15-16, 2013
31.	Prof. Ashok Shah	Lecture on: Allergic bronchopulmonary aspergillosis	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	38th Workshop on Respiratory Allergy: Diagnosis and Management New Delhi March 18-22, 2013
32.	Prof. Ashok Shah	Chaired a session on "Sleep in critical care"	Department of Neurology, A.I.I.M.S.	Annual Meeting of the Indian Sleep Disorders Association (SLEEPCON 2013) New Delhi March 29-31, 2013
33.	Prof. Ashok Shah	Participated as a panelist	Chest Research Foundation	Workshop on Conference of Heads of Departments of Respiratory Medicine of Government Medical Colleges in India Pune March 30, 2013
34.	Prof. S.K. Chhabra	Lecture on: Epidemiology of respiratory allergy Practical demonstrations on Pulmonary function tests	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	37th Workshop on Respiratory Allergy: Diagnosis and Management New Delhi April 2-6, 2012
35.	Prof. S.K. Chhabra	Lecture on: Case studies in spirometry	Chest Research Foundation	31st Refresher Course on Obstructive Airways Diseases New Delhi September 15-16, 2012
36.	Prof. S.K. Chhabra	Chairperson, Poster Session	World Allergy Organization	World Allergy Organiztions´ International Scientific Conference (WISC 2012) Hyderabad December 6-9, 2012

Sl No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
37.	Prof. S.K. Chhabra	Participated as a Member	Post Graduate Institute of Medical Education and Research	Workshop for Development of Indian Guidelines for Diagnosis and Management of COPD Chandigarh February 23-24, 2013
38.	Prof. S.K. Chhabra	Lecture on: Epidemiology of respiratory allergy (Difficult asthma) Practical demonstrations on Pulmonary function tests	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	38th Workshop on Respiratory Allergy: Diagnosis and Management New Delhi March 18-22, 2013
39.	Prof. S.K. Chhabra	Chaired a session on Sleep in critical care	Indian Sleep Disorders Association	SLEEPCON 2013 New Delhi March 29-31, 2013
40.	Prof. S.K. Bansal	Participated in the Interactions of Academic Congress	University of Delhi	Academic Congress on Enabling the Young: Redefining Education
41.	Prof. Raj Kumar	Lecture on: Food allergy Hands on practical training: Skin prick test	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	37th Workshop on Respiratory Allergy: Diagnosis and Management New Delhi April 2-6, 2012
42.	Prof. Raj Kumar	Lectures on: • Principles, indications and methods of immunotherapy • Practical aspects of immunotherapy including prescription writing Hands on practical training on Allergy testing and immunotherapy	Indian College of Allergy, Asthma and Applied Immunology and National Allergy Asthma Bronchitis Institute	9th CME on Respiratory Allergy Kolkata July 1, 2012

Sl No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
43.	Prof. Raj Kumar	Lectures on: • History, clinical aspect of allergy testing • Allergy diagnosis *in vivo* (Skin Prick Test / Intradermal Test) • Immunotherapy • Spectrum of allergic diseases in India Hands on practical training on Skin prick test / Intradermal test	Association of Pulmonologists, Sri Lanka and National Centre of Respiratory Allergy Asthma and Immunology (NCRAAI), V.P. Chest Institute, University of Delhi, Delhi	Workshop on Respiratory Allergy Sri Lanka August 20, 2012
44.	Prof. Raj Kumar	Lecture on: Role of pharmacists in tobacco cessation	Society for Tobacco Control	CME for Pharmacist Delhi August 25, 2012
45.	Prof. Raj Kumar	Lectures on: • Clinical differentiation between asthma and COPD • Smoking cessation	Chest Research Foundation	31st Refresher Course on Obstructive Airways Diseases New Delhi September 15-16, 2012
46.	Prof. Raj Kumar	Lecture on: Role of pharmacist in tobacco control and tobacco cessation	Society for Tobacco Control	CME for Pharmacist New Delhi November 28, 2012
47.	Prof. Raj Kumar	Chaired a session on Bronchial asthma	Bangladesh Lung Foundation, South Asia Association of Allergy, Asthma and Clinical Immunology (SAAAACI) and South Asian Thoracic Society (SATS)	3rd International Conference on Lung Health (Pulmocon 2013) Dhaka, Bangladesh February 19-20, 2013
48.	Prof. Raj Kumar	Lectures on: • Food allergy in bronchial asthma • Allergy testing Hands on practical training on Skin prick test	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	38th Workshop on Respiratory Allergy: Diagnosis and Management New Delhi March 18-22, 2013

Sl No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
49.	Dr Balakrishnan Menon	Lecture on: Pharmacology of asthma	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	37 th Workshop on Respiratory Allergy: Diagnosis and Management New Delhi April 2-6, 2012
50.	Dr Balakrishnan Menon	Presented papers on • Evaluation of real-time polymerase chain reaction, adenosine deaminase and interferon gamma in tubercular pleural effusions • Evaluation of real-time polymerase chain reaction in tubercular mediastinal lymphadenopathy • Effect of pulmonary rehabilitation on systemic inflammatory markers, muscle cross-section area and functional parameters in interstitial lung disease	European Respiratory Society	22nd European Respiratory Society Annual Congress (ERS-2012) Vienna, Austria September 5, 2012
51.	Dr Balakrishnan Menon	Lecture on: Interpretation of chest X-ray and CT scans	Indian Medical Association	Radiology Workshop Dehradun December 9, 2012
52.	Dr Mandira Varma-Basil	Lecture on: Rapid molecular diagnostic techniques used in TB diagnosis	Miranda House, University of Delhi	Workshop on Biotechnology Delhi September 11, 2012
53.	Dr Mandira Varma-Basil	Lecture on: Real-time PCR	Indian Association of Medical Microbiologists and Departments of Microbiology, Medical Mycology, Respiratory Virology, V.P.C.I., University of Delhi, Delhi	Pre-conference Workshop on Molecular Diagnostic Methods in Respiratory Infections (Part of the MICROCON-2012 Conference) Delhi November 21, 2012

Sl No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
54.	Dr Anuradha Chowdhary	Presented papers on • Molecular characterisation and *in vitro* antifungal susceptibilities of 75 clinical zygomycetes isolated in Delhi, India • First environmental isolation of *Cryptococcus gattii*, molecular type VGIII / AFLP 5 from decayed wood inside trunk hollows of a *Manikara hexandra* tree in Delhi, India • Blastomycosis in India: report of an imported case and current status • *Schizophyllum commune* an emerging fungal pathogen in India	International Society for Human and Animal Mycology (ISHAM)	18th Congress of the International Society for Human and Animal Mycology 2012 (ISHAM 2012) Berlin, Germany June 11-15, 2012
55.	Dr Anuradha Chowdhary	Lecture on: Molecular diagnosis of pathogenic fungi	Indian Association of Medical Microbiologists and Departments of Microbiology, Medical Mycology, Respiratory Virology, V.P.C.I., University of Delhi, Delhi	Pre-conference Workshop on Molecular Diagnostic Methods in Respiratory Infections (Part of the MICROCON-2012 Conference) Delhi November 21, 2012
56.	Dr Anuradha Chowdhary	Presented papers on • Identification and antifungal susceptibility of *Candida* species in vulvovaginal candidiasis • Molecular identification of clinically significant non-sporulating basidiomycetes moulds		
		Presented a poster on Molecular characterisation of germ tube positive *Candida* species with special reference *Candida africana*	Indian Association of Medical Microbiologists	XXXVI National Conference of Indian Association of Medical Microbiologists (MICROCON-2012) Delhi November 22-25, 2012

Sl No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
57.	Dr Madhu Khanna	Presented a paper on A combinatorial antiviral approach against influenza A virus using ribozyme and siRNA	International Centre for Genetic Engineering and Biotechnology (ICGEB)	III ICGEB Workshop of Human RNA Viruses Buenos Aires, Argentina April 3-5, 2012
58.	Dr Anita Kotwani	Presented papers on • Medicine supply chain price tracking identifies who benefits from the free market in India • Rapporteur for one of the workshops, "Medicines safety"	University of Sydney, Australia and WHO	Asia Pacific Conference on National Medicines Policies Sydney, Australia May 26-29, 2012
59.	Dr Anita Kotwani	Lecture on: Pharmaceutical policy, transparency and access to medicines in India	World Health Organization	Workshop on Transparency and Good Governance in the Pharmaceutical Sector World Health Organization Geneva July 11-13, 2012
60.	Dr Anita Kotwani	Prepared a draft protocol for measuring antibiotic use in India and for future monitoring of antibiotic Use in India Presented the data work on antibiotic use in the community from New Delhi, India	Swedish Insitute for Communicable Disease Control, Sweden and National Centre for Disease Control, Delhi	Workshop on Antimicrobial Resistance and Antibiotic Use Stockholm, Sweden, October 1-5, 2012
61.	Dr Anita Kotwani	Member, Organising Committee Chairperson Symposium on Preserving antibiotics for future generations	International Society for Pharmacoeconomics and Outcome Research (ISPOR)-India	International Conference of International Society for Pharmacoeconomics & Outcome Research (ISPOR)-India New Delhi November 23-24, 2012
62.	Dr Kavita Gulati	Participated as Faculty in the Workshop on Integration of traditional and modern medicine	The Federation of European Pharmacological Societies	6th European Congress of Pharmacology (EPHAR 2012) Granada, Spain July 17-20, 2012

Sl No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
63.	Dr Kavita Gulati	Lecture on: Clinical trials and their regulatory issues	Department of Pharmacology, Kasturaba Medical College	CME Programmeme on Clinical Trials and Statistics Manipal September 5, 2012
64.	Dr Kavita Gulati	Participated in a panel discussion on Future: what needs to be done to ensure credibility of India in research ethics?	Association for the Accreditation of Human Research Protection Programmes and Manipal Hospitals	Practical Solutions to Challenges in Research Ethics: A Focus on Human Research Protection Programmeme Bengaluru November 3-4, 2012
65.	Dr Kavita Gulati	Chaired a session on Pharmacokinetic drug-drug interaction studies: in pursuit of safer and effective therapy Judge for Gulati Prize for best paper on Autocoids Reviewer for Poster session	Indian Pharmacological Society (IPS)	45th Annual Conference of IPS (IPSCON-2012) and International Conference on Navigating Pharmacology Towards Safe and Effective Therapy Nagpur January 5-7, 2013
66.	Dr Vishwajeet Rohil	Presented a paper on to study the effects of oxidative Presented a poster on Effect of polyphenolic acetates on NF-KB gene expression in lung cancer	Association of Clinical Biochemists of India (Jharkhand Branch)	39th National Conference of Association of Clinical Biochemists of India (XXXIXth ACBICON 2012) Ranchi December 11-14, 2012
67.	Dr Vishwajeet Rohil	Presented a poster on Effect of polyphenolic acetates on apoptosis in lung	Dr B.R. Ambedkar Center for Biomedical Research (ACBR), University of Delhi	32nd Annual Convention of Indian Association of Cancer Research Delhi February 13-16, 2013
68.	Dr Vishal Bansal	Moderator of a session on respiratory rehabilitation and lung disease management	Romanian Society of Pneumology	22nd Congress of the Romanian Society of Pneumology on: "The Lung –Target or Cause" Poiana Brasov, Romania May 30-June 2, 2012

Sl No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
69.	Dr Vishal Bansal	Lecture on: Pulmonary rehabilitation: role in COPD	American College of Chest Physician (ACCP) USA, (North India Chapter)	Respiratory Workshop on COPD New Delhi July 15, 2012
70.	Dr Vishal Bansal	Lecture on: Pulmonary rehabilitation in management of COPD	Chest Research Foundation	31st Refresher Course on Obstructive Airways Disease New Delhi September 15-16, 2012
71.	Dr Vishal Bansal	Lecture on: Role of pulmonary rehabilitation in management of COPD	L.R.S. Institute of Tuberculosis and Respiratory Disease	Guest Faculty Lecture for DNB Course New Delhi November 22, 2012
72.	Dr Ritu Kulshrestha	Organising Secretary Lectures on: • Pleural infections • Gross pleural pathology	V.P.C.I., University of Delhi, Delhi	Worksop on Pleural Pathology (WOPP 2012) Delhi July 20, 2012
73.	Dr Ritu Kulshrestha	Presented papers on • Anthracotic pigment in transbronchial lung biopsy: an innocent bystander or pathogenic agent for parenchymal lung disease • Diffuse parenchymal lung disease in a 36 year male worker from metal polish industry	Indian National Science Academy	International Conference on Environment and Human Health XXV Annual Conference New Delhi November 28-29, 2012
74.	Dr Ritu Kulshrestha	Presented papers on • Correlation of pleural biopsy histopathological patterns with fluid analysis in pleural tuberculosis • Differential diagnosis of granulomatous lung inflammation on transbronchial lung biopsy: a two-year study	Tuberculosis Association of India and Bihar Tuberculosis Association	67th National Conference of Tuberculosis and Chest Diseases (NATCON-2012) Patna February 8-10, 2013

Sl No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
75.	Dr Anshu Mittal (MD Student) *(Guide:* Dr Mandira Varma-Basil*)*	Presented a paper on Identification of *Mycobacterium* spp in patients of pulmonary and lymph node tuberculosis by a rapid molecular assay	Indian Association of Medical Microbiologists (IAMM)	1st Quarterly Meet of IAMM-Delhi and NCR Chapter New Delhi March 23, 2013
76.	Dr Dabet Rynga (MD Student) *(Guide:* Dr Malini Shariff*)*	Presented a poster on Multilocus sequence typing of resistant strains of *Acinetobacer baumanii*	Indian Association of Medical Microbiologists	XXXVI National Conference of Indian Association of Medical Microbiologists (MICROCON-2012) Delhi November 22-25, 2012
77.	Dr Jitender Sharma (MD Student) *(Guide:* Prof. S.K. Bansal*)*	Presented a paper on Serum adenosine deaminase and its isoenzyme activity in bronchial asthma	Association of Clinical Biochemists of India, Jharkhand Branch	39th National Conference of Association of Clinical Biochemists of India (XXXIXth ACBICON 2012) Ranchi December 11-14, 2012
78.	Mr Ravindra Sharma (PhD Student) *(Guide:* Prof. K. Ravi*)*	Presented a poster on Proteomic approach to study high altitude hypobaric hypoxia	Institute of Genomics and Integrative Biology	The Lung at High Altitude: from Cellular Acclimatization to Clinical Disease Leh August 3-7, 2012
79.	Mr Ravindra Sharma (PhD Student) *(Guide:* Prof. K. Ravi*)*	Presented a poster on Preliminary studies on hypothalamic regulation of high altitude pulmonary oedema	Defence Institute of Physiology & Allied Sciences	Global Hypoxia Summit and 4th International Conference on Chronic Hypoxia Delhi August 9-12, 2012
80.	Dr Puneet Kumar (MD Student) *(Guide:* Prof. K. Ravi*)*	Presented a poster on Beneficial effect of grape seed extract in obstructive sleep apnoea	Association of Physiologists and Pharmacologists of India and Subharti Medical College	58th Annual Conference of Physiologists and Pharmacologists of India Meerut December 18-20, 2012
81.	Mr Anirudh Vashisht (PhD Student) *(Guide:* Prof. K. Ravi*)*	Presented a poster on Rapidly adapting receptors (RAR), oxidative stress (OS) and airway hyperresponsivness (AHR)	The Association of Physiologists and Pharmacologists of India and Subharti Medical College	58th Annual Conference of Physiologists and Pharmacologists of India Meerut December 18-20, 2012

Sl No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
82.	Ms Nisha Rathor (PhD Student) *(Guide:* Prof. Mridula Bose*)*	Presented a poster on Expression of mammalian cell entry (*mce*) operon of *M. tuberculosis* is modulated by intracellular stress	Indian Association of Medical Microbiologists	XXXVI National Conference of Indian Association of Medical Microbiologists (MICROCON-2012) Delhi November 22-25, 2012
83.	Mr Abhimanyu (PhD Student) *(Guide:* Prof. Mridula Bose*)*	Presented a poster on Pulmonary and extrapulmonary TB: role of host genetic variability on different clinical manifestation of the disease	Indian Society of Human Genetics and Centre for Genetic Disorders	"International Symposium on Developmental & Complex Disorders" and the "38th Annual Conference of the Indian Society of Human Genetics: Genomics and Community Health" Varanasi December 9-11, 2012
84.	Mr Abhimanyu (PhD Student) *(Guide:* Prof. Mridula Bose*)*	Received hands on training on next generation sequencing	Institute of Genomics and Integrative Biology	Hands-on Training Programmeme on Next Generation Sequencing as a part of Genomeet 2013 Delhi March 12-16, 2013
85.	Ms Kushal Garima (PhD Student) *(Guide:* Prof. Mridula Bose*)*	Presented a poster on Drug efflux pumps: an emerging mechanism of drug resistance in *M. tuberculosis*	Indian Association of Medical Microbiologists	XXXVI National Conference of Indian Association of Medical Microbiologists (MICROCON-2012) Delhi November 22-25, 2012

Participation in Advanced and Specialised Training Programme by Faculty Members

Sl No.	Participant (Department)	Course Title/ Topic	Training Duration	Host
1.	Dr M. Rahman (Biostatistics)	Bioinformatics Training Programmeme for Delhi University Teachers	February 7-9, 2013	Venkateswara College, Universty of Delhi, Dhaula Kuan, New Delhi
2.	Dr Vishwajeet Rohil (Clinical Biochemistry)	Real-time PCR	June 4-6, 2012	Applied Biosystems / Invitrogen Bioservices India Pvt. Ltd. Gurgaon (Haryana)
3.	Dr Vishwajeet Rohil (Clinical Biochemistry)	Ion PGM (Next Generation Genome Sequencer)	January 30-31, 2013	Invitrogen Bioservices India Pvt. Ltd. Gurgaon (Haryana)
4.	Prof. A. Ray (Pharmacology)	Seminar-cum-Workshop on Herbal Products: Regulatory Aspects	June 29-30, 2012	T.N. Medical College and Nair Hospiotal, Mumbai
5.	Dr Anita Kotwani (Pharmacology)	Workshop on Antimicrobial Resistance and Rational Use of Antibiotics	May 28, 2012	Asia Pacific Conference on National Medicines Policies Sydney, Australia
6.	Dr Kavita Gulati (Pharmacology)	Seminar cum Workshop on Herbal Products: Regulatory Aspects	June 29-30, 2012	T.N. Medical College and Nair Hospital, Mumbai
7.	Ms Uma Tyagi (Librarian)	Refresher Course on Library Information Science	June 28-July 18, 2012	UGC-ASC (Academic Staff College), CPDHE, University of Delhi, Delhi

Short Term Specialised Trainings Imparted by Faculty Members

Sl No.	Name, Subject and University/Institute/College	Course Title/Topic	Faculty Member (Department)	Period
1.	Mr Ashish Kumar BTech (Biotechnology) University School of Biotechnology, Guru Gobind Singh Indraprastha University, Dwarka, New Delhi	Techniques in biochemistry	Prof. S.K. Bansal (Biochemistry)	June 1 – July 31, 2012
2.	Mr Kamal Srivastava MSc (Biotechnology) Amity Institute of Biotechnology, Amity University, Gurgaon (Haryana)	Techniques in biochemistry	Prof. S.K. Bansal (Biochemistry)	June 1 – July 31, 2012
3.	Mr Roshan Kumar Singh MSc (Biotechnology) Amity Institute of Biotechnology, Amity University, Gurgaon (Haryana)	Techniques in biochemistry	Prof. S.K. Bansal (Biochemistry)	June 1 – July 31, 2012
4.	Ms Prema Adhikari MSc (Biochemistry) Department of Chemistry, C.C.S. University, Meerut (Uttar Pradesh)	Clinical biochemistry and biotechnology	Dr Vishwajeet Rohil (Clinical Biochemistry)	February 16 - June 15, 2012
5.	Mr Indresh Kumar Singh MSc (Biochemistry) Department of Chemistry, C.C.S. University, Meerut (Uttar Pradesh)	Clinical biochemistry and biotechnology	Dr Vishwajeet Rohil (Clinical Biochemistry)	February 16 - June 15, 2012
6.	Mr Sanjay Tevatiya MSc (Biochemistry) Department of Biosciences Jamia Milia Islamia, New Delhi	Clinical biochemistry and biotechnology	Dr Vishwajeet Rohil (Clinical Biochemistry)	March 7- June 6 2012

Sl No.	Name, Subject and University/Institute/College	Course Title/Topic	Faculty Member (Department)	Period
7.	Mr Navneet Shukla MSc (Biotechnology) A.P.S. University Rewa (Madhya Pradesh)	Clinical biochemistry and biotechnology	Dr Vishwajeet Rohil (Clinical Biochemistry)	March 11-June 30, 2013
8.	Mr Dhanraj Singh Patel MSc (Biotechnology) A.P.S. University Rewa (Madhya Pradesh)	Clinical biochemistry and biotechnology	Dr Vishwajeet Rohil (Clinical Biochemistry)	March 11-June 30, 2013
9.	19 Partcipants from Delhi, Haryana and Uttar Pradesh	Spirometry Technicians Training Workshop	Prof. Rajendra Prasad (Respiratory Medicine) and Prof. S.K. Chhabra(Cardio-respiratory Physiology)	March 13-14, 2013
10.	Ms Ineet Kaur BTech (Biotechnology) Amity University, Noida (Uttar Pradesh)	Cloning of *mce1E* Gene of *M. tuberculosis* in pET-28a(+) Expression Vector	Prof. Mridula Bose	March 1- May 31, 2012
11.	Ms Vaishali Vashisth MTech (Biotechnology) Amity Institute of Biotechnology, Amity University, Noida (Uttar Pradesh)	Cloning of *CFP-10* Gene of *M. tuberculosis* in pET-28a+ Expression Vector	Prof. Mridula Bose (Microbiology)	April 1- May 31, 2012
12.	Ms Swati Kumari MSc (Clinical Microbiology) Lovely Professional University (Punjab)	Expression and purification of *mce4A* protein of *Mycobacterium tuberculosis*	Prof. Mridula Bose (Microbiology)	February 15- May 15, 2012

Sl No.	Name, Subject and University/Institute/College	Course Title/Topic	Faculty Member (Department)	Period
13.	Ms Komal MSc (Biomedical Science) Dr B.R. Ambedkar Centre for Biomedical Research (ACBR), University of Delhi, Delhi	Genetic analysis of IL17 gene polymorphism in pulmonary tuberculosis and lymph node tuberculosis patients from north India by ARMS-PCR method	Prof. Mridula Bose (Microbiology)	January 20- May 30, 2012
14.	Mr Kamal Srivastava MSc (Biotechnology) Amity Institute of Biotechnology, Amity University, Gurgaon (Haryana)	Rapid identication of *Mycobacterium tuberculosis* and non-tuberculous mycobacteria in a clinical microbiology laboratory by PCR restriction analysis	Dr Mandira Varma-Basil (Microbiology)	January 1- April 30, 2013
15.	Mr Roshan Kumar Singh MSc (Biotechnology) Amity Institute of Biotechnology, Amity University, Gurgaon (Haryana)	Correlation of MIC to Streptomycin with mutations in the *rpsL* gene	Dr Mandira Varma-Basil (Microbiology)	January 1- April 30, 2013
16.	Ms Ekta Vishnoi MSc (Biotechnology) Amity Institute of Biotechnology, Amity University, Noida (Uttar Pradesh)	Cloning and characterisation of the putative efflux gene (RV1458c)	Dr Mandira Varma-Basil (Microbiology)	December 10, 2012- May 10, 2013
17.	Ms Chanchal Mony BTech (Biotechnology) Amity Institute of Biotechnology, Amity University, Noida (Uttar Pradesh)	Traing on pathology techniques	Dr Ritu Kulshrestha (Pathology)	June 12 – July 11, 2012

Sl No.	Name, Subject and University/Institute/College	Course Title/Topic	Faculty Member (Department)	Period
18.	12 Paramedical Professionals from PGIMS, Rohtak, AIIMS, New Delhi, PGIMER, Chandigarh, PS Medical College, Gujarat and VPCI	COPD Genetic Consoritum Training DBT Programmeme	Prof. Raj Kumar (Head, NCRAAI and Respiratory Allergy and Applied Immunology)	May 21-23, 2012
19.	Mrs R. Eshwari Technician Mahavir Hospital and Research Centre, Hyderabad (Andhra Pradesh)	Allergy testing	Prof. Raj Kumar (Head, NCRAAI and Respiratory Allergy and Applied Immunology)	July 16-31, 2012
20.	Ms Preeti Mehndiratta MSc (Biotechnology) Amity Institute of Biotechnology Amity University, Gurgaon (Haryana)	Evaluation of antiviral activity of *Azadirachta indica* leaf extract against influenza A virus	Dr Madhu Khanna (Respiratory Virology)	January-June, 2013
21.	Ms Maria MSc (Virology) Amity Institute of Virology and Immunology, Amity University, Noida (Uttar Pradesh)	To study the genetic evolution of hemagglutinin (HA) of pandemic influenza A 2009 (H1N1) virus	Dr Madhu Khanna (Respiratory Virology)	January-June, 2013

List of Publications

Journals

1. Abhimanyu, Bose M, Jha P; Indian Genome Variation Consortium. Footprints of genetic susceptibility to pulmonary tuberculosis: cytokine gene variants in North Indians. *Indian J Med Res* 2012;135: 763-70.
2. Abhimanyu, Bose M. Reporting genetic association studies: the roadblocks and guiding rules for robust results. *Lung* 2012;190:587-8.
3. Agarwal K, Chowdhary A, Gaur SN. A rare case of allergic bronchopulmonary aspergillosis in a patient with chronic obstructive pulmonary disease. *Indian J Allergy Asthma Immunol* 2012;26:20-4.
4. Ahmad I, Siddiqui H, Rastogi SK, Khan MI, Patil G, Jamal MA, Prasad R. Respiratory toxicity in bone-based industrial workers in India. *Arch Environ Sci* 2012;6:50-6.
5. Chhabra SK, Chhabra P. Estimating prevalence of chronic obstructive pulmonary disease: from questionnaires to spirometry. *Indian J Chest Dis Allied Sci* 2012;54:155-8.
6. Chhabra SK, Ramaswamy S, Gupta M. A large bulla simulating diaphragmatic eventration. *Indian J Chest Dis Allied Sci* 2012;54:117-8.
7. Chhabra SK. Test of reversibility of airways obstruction: time for a review? *Lung India* 2013;30:3-4.
8. Chowdhary A, Agarwal K, Kathuria S, Kumar P, Roy P, Gaur SN, Rodrigues AM, deHoog GS, Meis JF. First human case of pulmonary fungal ball due to a *Perenniporia*-like species (Basidiomycetes). *J Clin Microbiol* 2012;50:3786-91.
9. Chowdhary A, Agarwal K, Kathuria S, Singh PK, Roy P, Gaur SN, de Hoog GS, Meis JF. Clinical significance of filamentous basidiomycetes illustrated by isolates of the novel opportunist *Ceriporia lacerata* from the human respiratory tract. *J Clin Microbiol* 2013;5: 585-90.
10. Chowdhary A, Agarwal, K, Randhawa HS, Kathuria S, Gaur SN, Najafzadeh MJ, Roy P, Arora N, Khanna G, Meis JF. A rare case of allergic bronchopulmonary mycosis caused by *Alternaria alternate. Med Mycol* 2012;50:890-6.
11. Chowdhary A, Kathuria S, Singh PK, Agarwal K, Gaur SN, Roy P, Randhawa HS, Meis JF. Molecular characterization and *in-vitro* antifungal susceptibility profile of *Schizophyllum commune*: an emerging basidiomycete in bronchopulmonary mycoses. *Antimicrobial Agents Chemother* 2013;57:2845-8.
12. Chowdhary A, Randhawa HS, Kathuria S, Gaur SN, Roy P, Klaassen CH, Meis JF. *Schizophyllum commune* as an emerging fungal pathogen: a review and report of two cases. *Mycoses* 2013;56:1-10.
13. Chowdhary A, Randhawa HS, Prakash A, Kathuria S, Hagen F, Klaassen CH, Meis JF. First environmental isolation of *Cryptococcus gattii*, genotype AFLP5, from India and a global review. *Mycoses* 2013;56:222-8.
14. Chugh T, Goel N, Bhargava SK, Kumar R. Correlation of physiological and radiological characteristics in chronic obstructive pulmonary disease. *Indian J Chest Dis Allied Sci* 2012;54:235-42.
15. Espinel-Ingroff A, Aller AI, Canton E, Castañón-Olivares LR, Chowdhary A, Cordoba S, Cuenca-Estrella M, Fothergill A, Fuller J, Govender N, Hagen F, Illnait-Zaragozi MT, Johnson E, Kidd S, Lass-Flörl C, Lockhart SR, Martins MA, Meis JF, Melhem MS, Ostrosky-Zeichner L, Pelaez T, Pfaller MA, Schell WA, St-Germain G, Trilles L, Turnidge J. *Cryptococcus neoformans-Cryptococcus gattii* species complex: an international study of wild-type susceptibility endpoint distributions and epidemiological cutoff values for fluconazole, itraconazole, posaconazole and voriconazole. *Antimicrob Agents Chemother* 2012;56:5898-906.

16. Gangopadhyay S, Vijayan VK, Bansal SK. Lipids of erythrocyte membranes of COPD patients: a quantitative and qualitative study. *COPD* 2012;9:322-31.

17. Garg R, Singh A, Prasad R, Sahar S, Jabeed P, Verma R. A comparative study on the clinical and polysomnographic pattern of obstructive sleep apnea among obese and non-obese subjects. *Ann Thorac Med* 2012;7:26-30.

18. Govindaraj D, Gaur SN, Arora N. Characterization of recombinant per a 10 from *Periplaneta* americana. *Clin Vaccine Immunol* 2013;20:262-8.

19. Guhathakurta S, Gulati K, Shakir JS, Vijayan VK, Ray A, Banerji BD. Experimental studies on the mast cell stabilizing and bronchorelaxant effects of UNIM-352, a polyherbal unani preparation, with therapeutic potential in bronchial asthma. *Medicinal Plants* 2012;4:83-9.

20. Gupta M, Roshan R, Chhabra SK. Allergic bronchopulmonary aspergillosis without asthma complicating pulmonary tuberculosis. *Lung India* 2012;29:286-8.

21. Gupta P, Tripathi AK, Jain A, Prasad R, Singh KP, Vaish AK, Mishra RP. Effects of IRIS development on survival in HIV-TB patients on antiretroviral therapy among north Indian population. *Indian J Commun Health* 2012;24:129-33.

22. Gupta P, Singh KP, Tripathi AK, Jain A, Prasad R. Role of polymerase chain reaction as a diagnostic tool in pulmonary tuberculosis. *J Rec Advan Appl Sci* 2013;28:19-24.

23. Jain A, Dixit P, Prasad R. Pre-XDR and XDR in MDR and Ofloxacin and Kanamycin resistance in non-MDR *Mycobacterium tuberculosis* isolates. *Tuberculosis* 2012;92:404-6.

24. Khanna M, Saxena L, Gupta A, Kumar B, Rajput R, Gaur SN. Influenza pandemics of 1918 and 2009: a comparative account. *Future Virology* 2013;8:335-42.

25. Kotwani A. Psychiatric medicines in India: why public healthcare facilities and a thriving generics industry cannot assure access and affordability. *Intl Psychiatry* 2012;9:34-6.

26. Kotwani A, Wattal C, Katewa S, Joshi PC, Holloway K. Irrational use of antibiotics and role of pharmacists: an insight from a qualitative study in New Delhi, India. *J Clin Pharm Ther* 2012;37: 308-12.

27. Kotwani A, Shendge S. Asthma self-management: a study in an emergency room of a chest hospital in Delhi, India. *Southern Med Review* 2012;2:20-5.

28. Kumar B, Kumar P, Rajput R, Daga MK, Singh V, Khanna M. Comparative reproducibility of SYBR Green I and TaqMan real-time PCR chemistries for the analysis of matrix and hemagglutinin genes of Influenza A viruses. *Intl J Collaborative Res Internal Med Pub Health* 4: 2012;1346-52.

29. Kumar Raj. Allergy: the menace. *Life Science India* 2012;1:68-9.

30. Kumar Raj, Behera D. Smoking and tuberculosis. *Indian J Tuberc* 2012;59:125-9.

31. Kumar R, Goel N, Gaur SN. Sarcodosis in North Indian population: retrospective study. *Indian J Chest Dis Allied Sci* 2012;54:99-104. (Erratum in *Indian J. Chest Dis. Allied Sci*.2012;54:203).

32. Kumar R, Sharan N, Kumar M, Bisth I, Gaur SN. Pattern of skin sensitivity to various aeroallergens in patients of bronchial asthma and/or allergic rhinitis in India. *Indian J Allergy Asthma Immunol* 2012;26:66-72.

33. Kumari D, Arora N, Kasera R, Sridhara S, Kumar R, Singh BP. Isolation and charactertaion of a 28KDa major allergen from black gram (*Phaseolus Mungo*). *Immunobiology* 2012;217:895-904.

34. Kushal G, Varma-Basil M, Pathak R, Kumar S, Narang A, Rawat KS, Chaudhary A, Nair D, Ramachandran VG, Bose M. Are we overlooking infections owing to non-tuberculous mycobacteria during routine conventional laboratory investigations? *Intl J Mycobacteriol* 2012;1:207-11.

35. Maurya V, Gupta AG, Dewan RK, Jain S, Shah A. Spontaneous resolution of an inflammatory pseudotumour of the lung subsequent to wedge biopsy. *Arch Bronconeumol* 2013;49:31-4.

36. Mir E, Panjabi C, Shah A. Impact of allergic rhinitis on school going children. *Asia Pac Allergy* 2012; 2:93-100.

37. Mishra A, Mukherjee A, Roy A, Singh G, Shrestha P, Singh RR, Rohil V, Baral N, Majhi S, Dash D. Distribution and ethnic variation of â- thalassemia mutations in Nepal. *Nepal Med Coll J* 2012; 14: 49-52.

38. Mittal V, Shah A. Situsinversustotalis: the association of Kartagener's syndrome with diffuse bronchiolitis and azoospermia. *Arch Bronconeumol* 2012;48:179-82.

39. Patil G, Khan MI, Patel DK, Sultana S, Prasad R, Iqbal A. Evaluation of cytotoxic, oxidative stress, proinflammatory and genotoxic responses of micro and nano-particles of dolomite on human lung epithelial cells A_{549}. *Environ Toxicol Pharmacol* 2012;34:436-45.

40. Pati DR, Khanna M, Kumar B, Kumar P, Rajput R, Saxena L, Sharvani, Gaur SN. Clinical presentation of patients with seasonal influenza and pandemic influenza A (H1N1-2009) requiring hospitalization. *Indian J Chest Dis Allied Sci* 2013;55:15-9.

41. Prasad Rajendra. Community acquired pneumonia: clinical manifestations. *J Assoc Physicians India* 2012;60:10-2.

42. Prasad R. Management of drug resistant and multidrug resistant tuberculosis. In: Kamath Sandhya, editor. *Medicine Update* 2012;22:42-53.

43. Prasad R. Multidrug and extensively drug-resistant tuberculosis management: evidences and controversies. *Lung India* 2012;29:154-9.

44. Prasad R, Ahmad I, Kushwaha RAS, Ali W, Gupta MK, Saleem M. Vitamin A and zinc alter the immune function in tuberculosis. *Kuwait Med J* 2012;44:183-9.

45. Prasad R, Verma SK, Garg R, Jain A, Anand SC, Hosmane GB, Verma RK, Kushwaha NS, Kant S. Durg susceptibility pattern of *Mycobacterium tuberculosis* isolates from patients of Category-II failure of pulmonary tuberculosis under directly observed treatment short-course from north India. *Bio Science Trends* 2012;6:110-4.

46. Prasad R, Kumar R. Allergy situation in India: what is being done? *Indian J Chest Dis Allied Sci* 2013;55:7-8.

47. Rajput R, Khanna M, Kumar P, Kumar B, Sharma S, Gupta N, Saxena L. siRNA targeting the nonstructural gene (NS1) transcript inhibits influenza A virus replication in experimental mice. *Nucleic Acid Ther* 2012;22:414-22.

48. Randhawa HS, Chowdhary A, Kathuria S, Roy P, Misra DS, Jain S, Chugh TD. Blastomycosis in India: report of an imported case and current status. *Med Mycol* 2013;185-92.

49. Rynga D, Shariff M, Deb M. Multi-locus sequence types of *Acinetobacter baumanii* clinical isolates from India. *J Infect Dev Ctries* 2013;7:358-60.

50. Shah A. Plagiarism: the bête noire of scientific communication. *Indian J Chest Dis Allied Sci* 2012;54: 87-8.

51. Shariff M, Choudhary J, Zahoor S, Deb M. Characterization of *Streptococcus pneumoniae* isolates from India with special reference to their sequence types. *J Infect Dev Ctries* 2013; 7:101-9.

52. Sharma C, Wankhede S, Muralidhar S, Prakash A, Singh PK, Kathuria S, Kumar DA, Khan N, Randhawa HS, Meis JF, Chowdhary A. *Candida nivariensis* as an etiologic agent of vulvovaginal candidiasis in a tertiary care hospital of New Delhi. *Diagn Microbiol Infect Dis* 2013;76:46-50.

53. Sharma M, Bose M, Abhimanyu, Sharma L, Diwakar A, Kumar S, *et al*. Intracellular survival of *Mycobacterium tuberculosis* in macrophages is modulated by phenotype of the pathogen and immune status of the host. *Intl J Mycobacteriol* 2012;1:65-74.

54. Shendge S, Deka B, Kotwani A. A cross-sectional evaluation of illness perception about asthma among asthma patients at a referral tertiary care public chest hospital in Delhi, India. *Intl J User-Driven Healthcare* 2012;2:32-43.

55. Shrewastwa MK, Thanpari C, Yadav NK, Mittal RK, Rohil V. Dyslipidemia in type-2 diabetes mellitus patients in western of Nepal: a hospital based study. *Bali Medical Journal* 2013;2:46-50.

56. Shrewastwa MK, Yadav NK, Rohil V, Mittal RK. A study of oxidative stress in premature rupture of membrane. *J Nepalgunj Medical College* 2012;10:16-21.

57. Singh V, Pandey S, Singh A, Gupta R, Prasad R, Negi MPS. Study pattern of snoring and associated risk factors among medical students. *BioScience Trends* 2012;6:57-62.

58. Srivastava V, Khanna M, Sharma S, Kumar B. Resolution of immune response by recombinant transforming growth factor-beta (rTGF-â) during influenza A virus infection. *Indian J Med Res* 2012;136:641-8.

59. Vashisht A, Chhabra SK, Banerjee BD, Ravi K. Rapidly adapting receptor activity during oxidative stress induced airway hyperresponsiveness. *Respir Physiol Neurobiol* 2013;186:273-84.

Books

1. Desiraju K, Dharmshaktu NS, Gamlin S, Jain DC, Kumar R, Swasticharan L, Pusp A, Kaur J, Negi RS, Mathur A, Munish VG, Gupta P, Sinha PK, Singh R, Dutta A, Konar P, Singh N, Rastogi S, Prasanna K, Panjiyar A, Mazumdar K, Rinkoo AV, Vashisth RP, Mukhopadhya B, Arora M, Kumar R, editors. *Operational Guidelines – National Tobacco Control Programmeme.* National Tobacco Control Cell, Ministry of Health and Family Welfare, Govt. of India, 2012.

2. Kulshrestha R. *Pathology of Pleural Diseases*. Delhi: VidyanilyamPrakashan; 2012.

3. Ravi K, editor. *Anti-oxidant Therapy in Obstructive Sleep Apnea Syndrome.* Lambert Academic Publishing Company, Germany.2012; pp 1-68.

4. Ray A, Gulati K, editors. *Translational Research and New Drug Development*, Delhi: Vidyanilayam Publications, 2012.

Chapters in Books

1. Gulati K, Ray A. Pharmacology of the pleura: basic and applied concepts. In: Kulshrestha Ritu, editor. *Pathology of Pleural Diseases*. Delhi: Vidyanilyam Prakashan, pp119-34, 2012.

2. Gulati K, Anand R, Joshi JC, Ray A. Opioidergic mechanisms during stress and its regulation by Nitric oxide (NO). In: Ray A, Gulati Kavita, editors. *Translational Research in New Drug Development*. Delhi:Vidyanilyam Prakashan, 2012: pp 159-84.

3. Gulati K, Guhathakurta S, Siddiqui MK, Vijayan VK, Ray A. Translational studies with a polyherbal agent in bronchial asthma: a reverse pharmacology approach. In: Ray A, Gulati Kavita, editors. *Translational Research in New Drug Development* Delhi: Vidyanilyam Prakashan, 2012: pp 255-68.

4. Kulshrestha R. Adequacy and reporting of the pleural biopsy. In: Kulshrestha Ritu, editor. *Pathology of Pleural Diseases*. Delhi: VidyanilyamPrakashan; 2012; pp 47-58.

5. Kulshrestha R. Pleural fibrosis. In: Kulshrestha Ritu, editor. *Pathology of Pleural Diseases*. Delhi: VidyanilyamPrakashan; 2012; pp 145-56.

6. Kulshrestha R. Processing of the pleural biopsy. In: Kulshrestha Ritu, editor. *Pathology of Pleural Diseases*. Delhi: VidyanilyamPrakashan; 2012; pp 43-6.

7. Kumar R, Gupta N. Thoracoscopy and pleural biopsy technique. In: Kulshrestha Ritu, Editor. *Pathology of Pleural Diseases*. Delhi: Vidyanilyam Prakashan, 2012: pp 33-42.

8. Ravi K. The physiology of pleura. In: Kulshrestha Ritu, editor. *Pathology of Pleural Diseases*. Delhi: Vidyanilyam Prakashan, 2012: pp 11-19.

9. Ray A, Gulati K, Vijayan VK. Clinical and experimental studies on the safety pharmacology of theophylline: a translational approach. In: Ray A, Gulati Kavita, editors. *Translational Research in New Drug Development*. Delhi: Vidyanilyam Prakashan, 2012: pp221-34.

10. Shah A, Panjabi C. Anaerobic bacterial infections of the lungs and the pleura. In: Jindal SK, editor. *Handbook of Pulmonary and Critical Care Medicine*. Delhi: Jaypee Brothersn Medical Publishers Pvt Ltd., 2012: pp 214-9.

11. Soundarya D, Kulshrestha R. Pleural mesothelial cells and cellular interactions in the pleura. In: Kulshrestha Ritu, editor. *Pathology of Pleural Diseases*. Delhi: VidyanilyamPrakashan; 2012: pp 59-70.

Release of Souvenir on the occasion of 38th Workshop on Respiratory Allergy: Diagnosis and Management, held from 18-22 March 2013. Dignitaries on the dais (from left): Prof. Rajendra Prasad, Director, VPCI; Prof. A.B. Singh, IGIB, Delhi; Prof. V.K. Arora, Vice-Chancellor, Santosh University, Ghaziabad, Uttar Pradesh and Prof. Raj Kumar, Organising Secretary of the Workshop

Prof. Rajendra Prasad, Director, VPCI distributing certificate to a delegate at 38th Workshop on Respiratory Allergy: Diagnosis and Management

Vallabhbhai Patel Chest Institute
University of Delhi, Delhi-110 007, India