ANNUAL REPORT
2015-16

Vallabhbhai Patel Chest Institute
University of Delhi, Delhi, India

New ward was inaugurated by The Chairman, Governing Body, VPCI on September 22, 2015

A Training Workshop for Ventilation Management of Influenza was held on November 23, 2015. Prof. S.N. Gaur, Director of the Institute with Officer-in-Charge of ICUs of State Medical Colleges.

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Vallabhbhai Patel Chest Institute
University of Delhi, Delhi, India

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From the Director's Desk

It is with great pleasure I am presenting the Annual Report of the Vallabhbhai Patel Chest Institute (VPCI) for the year 2015-16. The report provides an overview of the wide range of activities and achievements of the Institute in the areas of post-graduate medical education, research and patient-care.

Postgraduate medical education is one of the thrust areas of the Institute. Students are trained for DM, MD, DTCD and PhD courses in Pulmonary Medicine, 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 including summer training. 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 specialization.

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 and Allied Sciences*, in collaboration with the National College of Chest Physicians (India). The Journal has wide national and international circulation. Besides, the Institute continued to publish the *VPCI Newsletter* (Half-yearly) which highlights the latest activities of the Institute. The Institute updates its website to enable the general public to get the latest ongoing activities of the Institute.

The Institute organised number of Orations, Conferences, Workshops, Public Lectures and other programmes during the year. These includes: 17th Prof. Raman Viswanathan-VPCI Oration and Symposium on Nitric Oxide: From Research to Applications (6th April 2015), International Clinical Trails Day (14th May 2015), World Environment Day (5th June 2015), International Yoga Day [21st June 2015], Swachha Bharat Abhiyaan (Cleanliness Drive Week) (22nd - 26th June 2015), Workshop on Sleep Study (6th July 2015), Independence Day (15th August 2015), Teachers' Day Celebration (4th September 2015), Inauguration of New Ward in VCH (22nd September 2015), 11th Prof. Autar Singh Paintal Memorial Oration (24th September 2015), Swachha Bharat Abhiyaan (28th September - 2nd October 2015), 1st Dr V.K. Vijayan Oration (26th October 2015), Institute Day Celebration (12th January 2016) and 2nd Prof. H. S. Randhawa Oration (12th January 2016).

The National Center of Respiratory Allergy, Asthma and Immunology (NCRAAI), Allergy Clinic, Tobacco Cessation Clinic, Cardio-pulmonary Rehabilitation Clinic, Sleep Lab., Yoga Therapy Research Centre continues to play their important roles in effective VCH functioning. The Institute 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 with Respiratory Diseases at Viswananthan Chest Hospital (VCH). During the year under review, the Institute has played a vital role in conducting investigations for the pandemic influenza H1N1 virus as per the directive of the Government of India.

The Institute has also established the Multi-disciplinary Research Unit approved by the Department of Health Research (DHR), Ministry of Health and Family Welfare, Goverment of India. In an attempt to improve our diagnostic services, we have also established an anaerobic laboratory and started providing services of GeneXpert and Line-probe assay for the diagnosis of tuberculosis (TB). We have also applied for patents for an antituberculosis drug and molecular diagnostic assay for TB.

The Institute has planned shortly to set up a National Tobacco Quitline service with due approval from the Ministry of Health and Family Welfare, Goverment of India.

Prof. S.N. Gaur

ANNUAL REPORT (2015-16)

CONTENTS

MILESTONES OF INSTITUTE

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 Prof. 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 renamed 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.
July	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-named 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 the 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. 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 [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 and Family Welfare, Govt. of India.
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.
	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 started.
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 has been re-named as "Viswanathan Chest Hospital" in honour of the Founder-Director of the Institute and the Golden Jubilee Auditorium has been 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 started.
September 18,	2007	Cardio-pulmonary Rehabilitation Clinic was started.
September 17,	2009	Approval by the University of Delhi to start Superspeciality DM Course in Pulmonary 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 and Clinical Immunology in VPCI with an intake of two seats per year.
February 12,	2011	National Centre of Respiratory Allergy, Asthma and Immunology was started.
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.
May 7,	2013	DOTS Centre was started.
August 18,	2013	DMA Centenary Institution Award received from Mrs Sheila Dikshit, the Hon'ble Chief Minister, Govt. of NCT Delhi for the "Outstanding Contribution in the Field of Patient Health Care".
August 23,	2013	New Ward (44 beds) was started.
		VPCI Newsletter was started.
January 6,	2015	In the memory of Prof. A.S. Paintal, a museum was opened, which was dedicated to Prof. Paintal's life and contributions in the world of science, inspiring young scientis, reserechers and academicians.

17th Prof. Raman Viswanathan Oration was delivered by Prof. K.C. Mohanty, Ex-Director-Professor, Department of Chest and TB, K.J. Somaiya Medical College and Hospital, Mumbai

In the memory of Prof. Autar Singh Paintal, 11th Oration was held on 24th September 2015. Dr Soumya Swaminathan, Secretary, Department of Health Research, Ministry of Health and Family Welfare, Government of India and Director-General, ICMR, New Delhi, was the Chief Guest. Prof. A.K. Prasad, Chairman, Influenza Foundation of India and former Professor and Head, Department of Respiratory Virology, VPCI delivered the oration.

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.
15th Oration	April 6, 2013	Dr W. Selvamurthy, Former Distinguished Scientist and Chief Controller (R and D) (LS and IC), DRDO, Ministry of Defence, Government of India, New Delhi.
16th Oration	April 6, 2014	Prof. P.S. Shankar, Emeritus Professor of Medicine, Rajiv Gandhi Institute of Health Sciences, Bangalore, Karnataka.

17th Oration	April 6, 2015	Prof. K.C. Mohanty, former Director-Professor, Department of Chest and TB, K.J. Somaiya Medical College and Hospital, Mumbai.

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.
9th Oration	September 24, 2013	Prof. Samir K. Brahmachari, Director General, CSIR and Secretary, Government of India, Department of Scientific and Industrial Research, New Delhi
10th Oration	September 24, 2014	Prof. M. Fahim, former Professor & Head, Dept. of Physiology, VPCI and Adjunct Research Professor, Dept. of Physiology, Hamdard Institute of Medical Sciences & Research, Jamia Hamdard, New Delhi.
11th Oration	September 24, 2015	Prof. A.K. Prasad, Chairman, Influenza Foundation of India, and President, Indian Virological Society and former Professor and Head, Department of Respiratory Virology, VPCI.

63rd Institute Day of the Institute was celebrated on January 12, 2016. On this occasion 2nd Prof. H.S. Randhawa oration was delivered by Prof. Indra Nath, former Professor and Head, Department of Biotechnology, AIIMS, New Delhi.

1st Dr V.K. Vijayan Oration was delivered by Prof. Soumya Swaminathan, Secretary, Department of Health Research, Ministry of Health and Family Welfare, Government of India and Director-General, ICMR, New Delhi, Prof. S.N. Gaur, Director of the Institute is presenting a memento to Prof. Swaminathan.

Prof. H.S. Randhawa Orations

1st Oration	January 12, 2015	Prof. Ziauddin Khan, Chairman, Department of Microbiology, Kuwait University, Kuwait.
2nd Oration	January 12, 2016	Prof. Indira Nath, former Faculty Member, Department of Pathology, All India Medical Institute of Medical Sciences, New Delhi.

Dr V.K.Vijayan Oration

1st Oration	October 26, 2015	Dr Soumya Swaminathan, Secretary, Department of Health Research, Ministry of Health and Family Welfare, Goverment of India, and Director-General, ICMR, New Delhi.

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, Pulmonary Medicine and Thoracic Surgery. These Departments along with Outdoor/Indoor patient care services and Respiratory 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.

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
MEMBERS	
Treasurer, University of Delhi (*Ex-Officio*)	**Mr T.S. Kripanidhi**
Two members nominated by the Executive Council, University of Delhi	**Prof. V.K. Chaudhary** **Prof. Devesh K. Sinha**
Dean, Faculty of Medical Sciences, University of Delhi	**Prof. Reva Tripathi**
Three members nominated by the Ministry of Health and Family Welfare, Government of India, New Delhi	**Mrs Vijaya Srivastava** Additional Secretary and Financial Advisor
	Shri Anshu Prakash *(till 11.08.2015)* Joint Secretary
	Shri K.C. Samria *(12.08.2015 onwards)* Joint Secretary
	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, New Delhi
	Dr Yogendra Singh *(07.03.2015 onwards)* Chief Scientist, CSIR-Institute of Genomics and Integrative Biology, Delhi
One Professor of the Institute by rotation according to seniority for a period of one year	**Prof. Raj Kumar** *(till 02.11.2015)* **Prof. Malini Shariff** *(03.11.2015 onwards)*
One Reader or Lecturer of the Institute by rotation according to seniority for a period of one year	**Dr Madhu Khanna** *(till 02.11.2015)* **Dr Vishwajeet Rohil** *(03.11.2015 onwards)*
Representative of Non-teaching Staff (as Special Invitee) of the Institute by rotation, according to seniority for a period of one year	**Mr R.C. Narang** *(till 06.11.15)* **Mrs Sushil Batra** *(07.11.15 onwards)*
MEMBER-SECRETARY	
Director Vallabhbhai Patel Chest Institute, University of Delhi, Delhi (*Ex-Officio*)	**Prof. S.N. Gaur**

Standing Finance Committee

Additional Secretary and Financial Advisor — *Chairman*
Ministry of Health and Family Welfare
Government of India
Nirman Bhawan
New Delhi-110 001

Joint Secretary or Nominee — *Member*
Ministry of Health and Family Welfare
Government of India
Nirman Bhawan
New Delhi-110 001

Prof. K. Ravi — *Member*
Department of Physiology
V.P. Chest Institute
University of Delhi, Delhi-110 007

Joint Registrar — *Member*
V.P. Chest Institute
University of Delhi, Delhi-110 007

Director — *Member-Secretary*
V.P. Chest Institute
University of Delhi, Delhi-110 007

Scientific Advisory Committee

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Formerly, Head, Department of Pulmonary Medicine
Post Graduate Institute of Medical Education and
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Chandigarh-160 012

DDG (M) — *Member*
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Government of India
New Delhi-110 001

Principal — *Member*
University College of Medical Sciences (UCMS)
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Prof. S.N. Gaur — *Member*
Department of Pulmonary Medicine
V.P. Chest Institute
University of Delhi, Delhi-110 007

Prof. K. Ravi — *Member*
Department of Physiology
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University of Delhi, Delhi-110 007

Prof. Y.K. Gupta — *Member*
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Prof. Randeep Guleria — *Member*
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Sleep Disorders
All india Institute of Medical Sciences
New Delhi-110 029

Director — *Member-Secretary*
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University of Delhi, Delhi-110 007

Human Ethics Committee

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Sleep, Allergy and Critical Care Medicine
Metro Centre for Respiratory Diseases
Metro Group of Hospitals
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Noida (Uttar Pradesh)

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Dean, Faculty of Law
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Head, Department of Social Work
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Dean/Principal,
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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-110 007

Director — *Member-Secretary*
V.P. Chest Institute
University of Delhi, Delhi-110 007

Animal Ethics Committee

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V.P. Chest Institute
University of Delhi, Delhi-110 007

Dr Anuradha Chowdhary — *Member*
Associate Professor, Department of Medical Mycology
V.P. Chest Institute
University of Delhi, Delhi-110 007

Dr Ritu Kulshrestha — *Member*
Assistant Professor, Department of Pathology
V.P. Chest Institute
University of Delhi, Delhi-110 007

Prof. 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
Aruna Asaf Ali Marg
New Delhi-110 067
(in the event of non availability of Prof. D.N. Rao)

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

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

Dr Rajinder Bajaj — *Member*
Veterinarian
V.P. Chest Institute
University of Delhi, Delhi-110 007

Prof. K. Ravi — *Member-Secretary*
Head, Department of Physiology
V.P. Chest Institute
University of Delhi, Delhi-110 007

ORGANISATIONAL STRUCTURE

DIRECTOR *(Acting)*

S.N. GAUR, MD, PhD (Medicine), FCCP (USA), FNCCP (I), FCAI

Biochemistry

S.K. Bansal, MSc, PhD
Professor

Biostatistics

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

Cardio-respiratory Physiology

S.K. Chhabra, MD
Professor

Clinical Biochemistry

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Assistant Professor

Pharmacology

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(Mrs) Kavita Gulati, MSc, PhD
Associate Professor

Physiology

K. Ravi, MSc, PhD
Professor

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

Pulmonary Medicine

S.N. Gaur, MD, PhD (Medicine), FCCP (USA), FNCCP (I), FCAI
Director (Acting)

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

Dr Shweta Bansal, MD
Assistant Professor (Adhoc) (till 31.12.2015)

Respiratory Allergy and Applied Immunology

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

Balakrishnan Menon, MD, DMRD
Associate Professor

Dr Nitin Goel, MD
Assistant Professor (Adhoc)

Respiratory Virology

(Mrs) Madhu Khanna, MSc, PhD
Associate Professor

Viswanathan Chest Hospital

Officer-in-Charge

S.N. Gaur
Director (Acting)

Library

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

Animal House

Rajinder Bajaj, BVSc and AH
Veterinarian

Administration

P.R. Santhanam, MA (Public Admn), MHRM, MBA, LLB, PGDPM
Joint Registrar

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.

- Pulmonary Medicine
- Radiodiagnosis and Imaging
- Clinical Laboratories of Biochemistry, Microbiology and Pathology
- Anaesthesia
- Thoracic Surgery

Facilities 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
- Cardio-pulmonary Rehabilitation Clinic
- Sleep Laboratory
- Allergy and Applied Immunology Laboratory
- Clinical Hematology and Pathology Laboratory
- Clinical Biochemistry Laboratory
- Microbiology Laboratory
- 64 Slice MDCT Scan Center
- Picture Archiving and Communication Systems (PACS)
- Tobacco Cessation Clinic
- Yoga Therapy and Research Centre

Specialized Investigations at VCH

- Fibreoptic bronchoscopy
- Guided FNAC/Biopsy
- Medical thoracoscopy
- Respiratory allergy skin tests
- Clinical immunology
- BACTEC system for tuberculosis

Detailed data of patients attending VCH during the year:

Number of new OPD patients	:	12143
Number of follow-up OPD patients	:	60334
Total		**72477**

Number of indoor patients:

General Wards	:	2411
Emergency Wards	:	2383
Total		**4794**
Emergency treatment provided	:	21905
Total number of patients treated in ICU	:	429

Number of routine and specialised investigations done at VCH during the year:

Pulmonary function tests	:	24351
Arterial blood gases	:	13903
Bronchoscopy	:	322
Bronchoalveolar lavage	:	114
CT scans	:	3688
X-rays	:	26287
Electrocardiogram	:	6655
Polysomnogram	:	266
HIV testing	:	1007
Clinical biochemistry	:	64191
Serum Ig E test performed	:	5210
ANA	:	476
c-ANCA	:	268
p-ANCA	:	269
SCL-70	:	292
HBsAg	:	327
HCV	:	321

Mycology (VPCI and other hospitals)

Nature of Specimen		*No.*
Sputa	:	1661
Blood specimen	:	1381
Bronchial lavage/aspirate/washings/endotracheal aspirate/pleural fluid	:	745
Blood culture	:	127
Tissue biopsies/nasal polyps/skin scrapings/ nail scrapings	:	127
CSF		53
Urine		29
Miscellaneous (swabs/urine/CSF/FNAC) discharge/pus)	:	269
Total	**:**	**4852**

Pathology

Section		*No.*
Haematology	:	34743
Coagulation	:	1783
Histopathology	:	217
Cytopathology	:	610
Clinical pathology	:	671

Cell Culture Laboratory

The cell culture laboratory was established and made fully functional during this period. Research work on the A549 human alveolar epithelial cell line is presently being performed. The Insulin Growth factor signalling pathway, IGFBP5, IGF-1, SP-C, TGF-β levels are being studied by immunocytochemistry, semi quantitative PCR and real-time PCR.

Tobacco Cessation Clinic

The Institute started Tobacco Cessation Clinic (TCC) in November 2001. The activities of TCC were expanded 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 comprehensive programme Centre. Further, the TCC was upgraded in the year 2009 as Resource Centre for Tobacco Control.

TCC provides its service from 9.00 AM to 5.00 PM on every working day. Anybody who is willing to quit tobacco use may register himself at the reception counter free of cost. Counselling session, medicine prescription and few test such as CoHb level, pulmonary function test are being performed here. Registered person is being called for regular follow-up at an interval of 2 weeks followed by 1 month, 2 months, 3 months, 6 months and 1 year.

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

The TCC supplies educational materials in the form of booklets, pamphlets, stickers, etc, for physicians and general public. During the year under report 7006 new tobacco users and 2741 follow-up tobacco users were availed the services; and 535 new tobacco users came for tobacco cessation in TCC, 191 for follow-up.

During the year, a one-day tobacco cessation camp was organized at Dujana Village, Gautam Budh Nagar, Greater Noida (U.P.), as a part of Respiratory Health Camp. More than 200 people visited the camp. 25 of them registered themselves for tobacco cessation, including men, women and even children who were totally unaware of the fact that how much tobacco consumption is harmful to health. A 7-year-old child also reported of having tobacco addiction.

Yoga Therapy and Research Centre

The Yoga Therapy and Research Centre conducted yoga classes in collaboration with the Morarji Desai National Institute of Yoga (MDNIY), New Delhi from Monday to Saturday during 8 AM to 4 PM in different batches at VPCI.

Yoga sessions are especially designed for the management and eradication of different health disorders, like bronchial asthma, hypertension, stress, obesity etc the patients first reports to yoga OPD at VPCI during the period 9 AM to 3 PM Monday to Friday to Doctors and Yoga training staff. After obtaining the case history of the patient, the patient is advised to undergo yoga training and educational session according to individual's health problems for a particular period. The patient is re-examined to note the improvement made by him/her by the yoga Therapist. Then patient is advised for a regular 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. Special yoga sessions for staff of VPCI are also arranged time to time.

The first International Day of Yoga programme on 17th June 2015 was organised in collaboration with Morarji Desai National Institute of Yoga, New Delhi, Department of Ayush, Government of India under the supervision of Dr B.K. Menon, Nodal Officer and Prof. S.N. Gaur, Director *(Acting)* and Mr Manoj Kumar, Yoga Therapist at VPCI at Paintal Memorial Golden Jubilee Auditorium. At this function yoga team follow the common yoga protocol and imparted training to all staff and students of VPCI and other yoga students, Delhi Police staff. Nearly 200 persons participated in this event.

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

Outdoor patients	1189
Indoor patients	1270
Promotional health programme	675
Total	**3134**

Outdoor Patients

Bronchial asthma	192
Stress	95
Chronic obstructive pulmonary disease	145
Hypertension	121
Obesity	242
Cervical spondylitis	35
Migraine	18
Backache	157
Allergic rhinitis	60
Arthritis	45
Diabetes	72
Tuberculosis	7

Indoor Patients

Bronchial asthma	355
Chronic obstructive pulmonary disease	625
Interstitial lung disease	95
Sinusitis	82
Pneumonia	32
Tuberculosis	81

Cardio-pulmonary Rehabilitation Clinic

Cardio-pulmonary Rehabilitation Clinic at VCH, VPCI is involved in management of patients with chronic respiratory diseases who have disability in activities of daily living and exercise limitation due to shortness of breath despite being on optimal pharmacological treatment.

Patients are encouraged to enrol in supervised rehabilitation programme which includes topics on energy conservation, lung health, bronchial hygiene, chest physiotherapy, nutrition, optimization of medication intake, domiciliary oxygen usage, stress management, breathing retraining, inspiratory muscle training and strength and endurance training of upper and lower limbs.

Clinic Timings: Monday to Friday: 9 A.M. to 1 P.M.

Numbers of patients attended in Cardio-pulmonary Rehabilitation Clinic:

- Breathing retraining and education : 197
- Chest physiotherapy : 974
- Completed supervised rehabilitation programme (Intensive and Maintenance) : 97

Division of Sleep Medicine

Over the years, our structure for Sleep Medicine has evolved to reflect our commitment to Sleep Medicine as a truly inter-disciplinary endeavor. The Division is the structure to develop the academic aspects of our programme. The Division of Sleep Medicine is the clinical arm of Institute. It is also a multi-disciplinary entity. Our clinical programme is growing rapidly. Sleep Medicine is fundamentally a knowledge-based chronic disease management discipline, not a diagnostic discipline.

Division of Sleep Medicine of VPCI, features a state of the art Sleep laboratory specializing in the diagnostic, evaluation and management of all sleep disorders. Sleep studies were done in the sleep laboratory, seven days a week in the night.

Since the Division of Sleep Medicine was established in 2001, there has been dramatic growth in clinical activity. The number of patient visits has increased approximately five-fold from fiscal year 2002 to the present. Similarly, the number of sleep studies performed has increased from 12 in the year 2002 to 1418 studies till the year 2016 March and 254 studies for the fiscal year 2015-2016. We provide a broad range of studies: overnight sleep studies, overnight split-sleep study, watch-pat diagnostic sleep study, and auto CPAP.

Technical staff of the Division of Sleep Medicine are fully equipped with knowledge required for recording and interpreting sleep studies, also dedicated to the diagnosis and treatment of sleep/wake disorders in adults and develop research to lead to a better understanding of normal and abnormal sleep, and give training to medical persons in the field of sleep study acquisition.

The diagnostic and therapeutic parts of sleep breathing disorders were taught to the doctors including the postgraduate DM, MD students, and senior residents of the Institute.

Number of patients done in two machines (1st April 2015 - 31st March 2016):

- Watch-pat diagnostic sleep study: 227
- Overnight polysomnography: 27

The Sleep Laboratory is equipped for the comprehensive evaluation of sleep related disorders including: snoring, sleep apnea, excessive daytime sleepiness, restless leg syndrome, and disorder sleep due to respiratory, cardiac and/or neurological disease

Services

- Diagnostic nocturnal polysomnography (Laboratory)
- Therapeutic nocturnal polysomnography
- Continuous positive airway pressure (CPAP)
- Bi-level therapy
- Supplemental oxygen
- PAP clinic

Clinical research include "Association of obstructive sleep apnoea in patients of COPD and Asthma"; "A case control study to investigate the utility of leptin and fasting blood glucose in prediction of obstructive sleep apnea".

Scientific Programme

A Workshop on Sleep Study was held on 6th July 2015 in association with NCCP and STC.

ACC-SLEEP Medicine was held on 21 May 2016 to 22 May 2016 for the delegates enrolled in the workshop. Lectures and live demonstration were given to delegates on polysomnography.

Multi-disciplinary Research Unit

The VPCI-DHR-ICMR- Multi-disciplinary research unit (MRU) was established and made functional at V.P. Chest Institute during the year 2015-16. This MRU is a part of the Government of India initiative for establishment of multi-disciplinary research units in Government medical colleges/research institutions during the 12th Plan period. The scheme was implemented by the Department of Health Research with the technical support of ICMR. This path-breaking programme aims to develop/strengthen the health research infrastructure in the country. Under this scheme, financial assistance of upto 5.25 crores is to be provided for setting up of modern biological lab/multi-disciplinary research unit at VPCI.

The objectives of the scheme are: (i) to encourage and strengthen the environment of research in medical colleges; (ii) to bridge the gap in the infrastructure which is inhibiting health research in the medical colleges by assisting them to establish multi-disciplinary research facilities with a view to improve the health research; (iii) to ensure the geographical spread of health research infrastructure, in order to cover un-served and under-served medical colleges and other institutions; and (iv) to improve the overall health status of the population by creating evidence-based application of diagnostic procedures/processes/methods.

The VPCI-DHR-ICMR-Multi-disciplinary research unit aims (i) to undertake research in non-communicable diseases and other need-based research employing newer tools and (ii) to promote and encourage quality medical research in the institution.

Two research proposals by Dr Vishwajeet Rohil and Dr Ritu Kulshrestha, of the Department of Biochemistry and Pathology were approved in the first year by a two-tier review by a technical screening committee and evaluation committee of the ICMR.

During the year 2015-16, a total of 17 equipments worth Rs. 57 lakhs approximately were procured and installed at the MRU in the 7th floor of the multistoried building. The civil work and renovation work of this floor were completed during this period.

Specialised Centre

National Centre of Respiratory Allergy, Asthma and Immunology

The National Centre of Respiratory Allergy, Asthma and Immunology (NCRAAI) was started in the year 2011 with an aim 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;

Study in Villages: The NCRAAI is conducting a study entitled, 'Indoor Air Pollution and asthma exacerbation in Children: A Population-based Study' in the village Dujana, Gautam Budh Nagar, Tehsil – Dadri and Block-Bisrak of Uttar Pradesh. The study is funded by Indian Council of Medical Research (ICMR), New Delhi. During the period, 499 houses were surveyed (896 children and 704 adult females), 496 pulmonary function tests (PFTs) and 818 PEFR tests were performed.

The pollen count station have two "Burkard Air Samplers" one is seven days sampler and the other is one-day sampler. Both the samplers are running continuously and air samples are collected and studied on daily bases. A total of 633 slides (356 Seven day and 277 One-day) were mounted and analyzed during the period of report. Pollen data have been presented at conferences and published in national periodicals during the year.

Three **Health Camps** on 'Indoor Air Pollution and Respiratory Diseases' were organized by NCRAAI, under an ICMR Indo - US Research Project at different locations in village – Dujana, Greater Noida, Uttar Pradesh. More than 2184 people along with children were examined by doctors and tested for spirometry, PEFR after height and weight measurement. Medicines were also distributed during the camp.

The NCRAAI is engaged with the following research activities:

- Allergic bronchopulmonary aspergillosis presenting as lobar or total lung collapse
- Indoor air pollution and asthma in children at Delhi, India
- Inflammatory response to subcutaneous allergen-specific immunotherapy in patients with bronchial asthma and allergic rhinitis
- Atmospheric pollen count in North Delhi region
- A comparative study of skin prick test *versus* serum-specific IgE measurement in indian patients with bronchial asthma and allergic rhinitis
- Hypersensitivity to Pigeon allergens in asthma
- Correlation of exhaled nitric oxide and atopic status in non-obese and obese bronchial asthma patients
- To measure the effect of environmental tobacco smoke exposure on the respiratory health of children in rural area of Delhi-NCR
- Association of socio-economic status and indoor air pollution level on respiratory health of children in rural area of Delhi-NCR
- Relationship between pollens numbers and hospital visits of patients in North Delhi region
- Lifestyle factors and asthma in India

Animal House

The Institute's Animal House is registered for breeding and experiment on animals with Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Animal Welfare Division, Government of India, for breeding and conducting experiment (vide registration no. 170/GO/ReBi/S/99/CPCSEA).

The Animal House of the Institute is being maintained under controlled environment conditions as specified in CPCSEA guidelines with maintained temperature, relative humidity, timer controlled light dark cycle and air change per hour with 100% fresh air.

All experiments involving animals are approved of the Institutional Animal Ethics Committee (IAEC) constituted as per guidelines of CPCSEA. the IAEC keeps a check to promote the humane approach for 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, with supporting technical staff who are experienced and trained in modern methods of animal care, breeding and husbandry.

Library

The VPCI Library is providing patient care information support and catering to the academic needs of the faculty members, resident doctors, researchers and students alike for research purposes. It forms a part of Institute support services and acquires thought process, collate and disseminates global information in the field of Biomedical Sciences with specialization in pulmonary diseases and allied sciences. The library started in 1955, but it has back volumes of several journals more than 100 years old. Most of the journals have complete sets of volumes originating right from their treatises of medicine which are readily available for basic and historical insights. It also has a very good comprehensive collection of serial publications like Annual Reviews, Years books, Recent advances. The Institute has one of the best library in the field of Pulmonary Disease and Allied Sciences having 10056 Books, 23157 bound Journals, 160 CD's, 517 Thesis and 13 National and International Reports. A total of 118 Journals (111 International and 07 National) are being subscribed by the library, 16 Journals (05 International and 11 National) are being received on exchange programme with the Institute's Journal and 33 Journals (09 International and 24 National) are received on complimentary basis. To cover the need for daily coverage of news related to the medical field, Library is also subscribing four English and four Hindi newspapers. This has encouraged the inculcation of reading habits of all alike.

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, reference and specific information, if required. Apart from these, 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 form 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 equipment's 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 facilities are available to members/students of University of Delhi from Monday to Friday {8:30 AM to.7:00 PM} and Saturday's 9.00 AM to 5:00 PM (Reference and Reading Purpose).

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

(Including Biochemistry and Clinical Biochemistry)

Research

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

In this study, we had shown that there is an increased oxidative stress in asthmatic patients as compared to controls. Our further studies have shown that glutathione (GSH) contents decreased in red blood cell lysate in moderate and severe asthmatic patients. This may have a correlation with the differential expression of protines in erythrocyte membranes in these asthmatic patient groups, which is being analyzed.

2. A study on *CRHR1* and *GR* gene polymorphism and their correlation with the expression of various inflammatory cytokines in asthma in North Indian population

The Sequencing of *CRHR1* gene amplicons in 16 asthmatic patients was done further. The data showed presence of SNPs in *CRHR1* gene at 37260 (rs242940) (T/C), 50089 (rs242949) (T/C), 50229 (A/C), 50300 (A/C). The sequencing of *GR* gene is in progress.

3. Role of innate immune response mechanisms in development of bleomycin induced lung fibrosis

The biochemical and functional changes underlying pulmonary fibrosis were studied in bleomycin induced rat model. The expression of TGF-β1 was studied using immunohistochemistry, at mRNA level by qRT-PCR and at protein level by ELISA in experimental and control animals on day 0, 7, 14 and 28. The protease (MMP-9) and antiprotease (TIMP-1) involved in extracellular matrix remodelling were also studied. MMP-9 protein expression increased from day 7 upto day 14 and decreased on day 28 while TIMP-1 expression progressive increased. Lung function changes were studied by whole body plethysmography.

4. To investigate the role of calreticulin transacetylase mediated histones hyperacetylation induced epigenetic modulation by polyphenolic acetates in genes implicated in lung tumorigenesis

It is a multi-institutional research study. Acetylation of histone H3 and H4 proteins has been demonstrated by us in the Human NSCLC, lung adenocarcinomaA549 cells after treatment with HDAC inhibitor i.e.Valproic acid (VA) &7,8-Diacetoxy-4-Methyl Coumarin (DAMC).First Microarray Profiling on Agilent platform using 11175 Designed Probes for 683 genes implicated in carcinogenesis of Human NSCLC cell line treated with. Valproic acid and 7,8-Diacetoxy-4-Methyl Coumarin before and after transfection of human Calreticulin gene (CalR gene) was done and gene expression levels were studied i.e. the upregulation and downregulation of various genes viz. Tumor suppressor genes, Oncogenes, Cell cycle arrest genes etc.The cell line was further subjected to demethylation to remove under-expression in hypermethylated genes and the samples are being sent for a second Microarray Profiling. In an attempt to study the potential of the Histone hyperacetylation mechanism by our treatment with VA, DAMC and CalR gene in cancer therapy further studies including validation of microarray profiling results of the selected genes by Real Time – PCR, studies on Apoptosis and Cell cycle analysis by Flow cytometry and Fluorescent Microscopy and quantification of the level of NF KB regulated cytokines (TNF-α, IL-6, IL-8) by using ELISA are under process.

5. To elucidate the role of CRTAse induced epigenetic modulation *via* acetylation by the novel mechanism in the gene expression profile of lung carcinogenesis using various polyphenols and their synthetic analogue

The research work has begun with maintaining the Human Non Small Cell Lung (A549) cell lines to see the effect of treatment of Ellagic acid peracetate. Human *NSCLC,* A549 cell line is maintained using DMEM media in a Class II Type A2 Biosafety Cabinet under strict aseptic conditions following standard protocol. The cells of the maintained cell line as and when needed are made confluent and proceeded for further experimental purposes such as transfection, microarray analysis etc.

Biostatistics

The Department of Biostatistics plays a vital role and forms a supportive department of the research activities of the Institute. This Department provides the statistical needs of all the research activities i.e. from planning stage of studies or surveys, protocol development designing study schedules/forms, sample size and power determination, collection and validation of data, collation, compilation, generating tables and graphics, analyses of data, and interpretation of the results of various research studies, in order to quantify the effect of risk factors and health interventions on individuals or population. The statistical analysis is being carried out using Statistical Package for Social Sciences (SPSS).

The Department conducts regular teaching programmes for the postgraduates (MD/DTCD) and doctoral (DM/PhD) students. The Department has also been entrusted with the responsibility of preparing various reports (monthly, quarterly, half yearly and yearly) of VPCI (pertaining to patients care, patients investigations, patient status, morbidity pattern, communicable and non-communicable diseases; students, faculty and staff, income, expenditure, infrastructure, etc.) and their timely submission to various governmental agencies such as, Ministry of Health and Family Welfare, Government of India; Directorate of Health Services, Government of Delhi; University of Delhi, UGC etc.

The Department shoulders the responsibility of online reporting of vital events such as mortality and morbidity of notificable diseases, in Viswanathan Chest Hospital, VPCI to the Minicipal Corporation of Delhi in stipulated time period.

The Department also undertake responsibility of documenting and mainting the database of various research protocols of DM/PhD/MD students. The Department has identifiable and collaborative research projects with other departments of the Institute.

Research

1. To assess the prevalence, screening and recognition of anxiety and depression in COPD 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'. However, only a few prospective studies have addressed how to diagnose and manage these disorders and determine their impact on health status among patients with COPD. No studies in India have examined the joint occurrence of anxiety and depression together in the COPD patients.

A total number of 400 patients with recognized COPD with age ranged 40 to 85 years (60.8 ± 9.7) were screened for anxiety and depression, using Generalized anxiety disorder (GAD-7) and Patient health questionnaire (PHQ-9) schedules. It was found that the severity of anxiety and depression varies by age, sex, smoking status and socio-economic status. The prevalence of anxiety and depression in COPD patients was found to be 86.2% and 92.8% respectively.

2. To translate and validate the psychometric profile of 'Hindi' version of depression, anxiety and stress scale 42-item (DASS-42) in COPD patients

The Depression Anxiety Stress Scales (DASS) has been used across the world as research instrument to measure psychological aspects such as depression, anxiety and stress. This instrument has been translated in 28 other international languages. In this study, DASS-42 was translated from English to Hindi by two professional translators and reviewed by medical professionals and research workers for appropriateness of the language and back translated to English for verification. The two English versions were then compared item-by-item and minor discrepancies were addressed and corrected in the simplified Hindi version by consensus of these translators, as per the guidelines US Census Bureau. The same were pretested before starting the process of the data collection. The subjects completed the DASS-42 as an individual structured interview with a trained health worker.

A total number of 589 patients with age ranged from 40 to 86 years (58.7±9.6) were administered Hindi version of the Depression Anxiety Stress Scales 42-items (DASS-42) questionnaire to the patients with COPD. The reliability (internal consistency) was measured through Cronbach's alpha of each subscale and was found to be high (DASS42-D subscale 0.87; DASS42-A subscale 0.80; DASS42-S subscale 0.78). The overall score, which includes all items, also had high consistency (Cronbach's alpha = 0.92). Mean and standard deviation of scores were 20.5±7.4, 17.4±8.5, and 21.2±7.1 for subscales depression, anxiety and stress respectively. Overall score which includes all the three subscales was 59.0±20.7.

Microbiology

(Including Microbiology, Medical Mycology and Respiratory Virology)

Research

1. Characterisation of virulence properties of *Pseudomonas aeruginosa* isolates from hospitalised patients

Pseudomonas aeruginosa is one of the common agents implicated in nosocomial infections. It is also commonly present as a coloniser in various body sites, making diagnosis of infection difficult. This study was undertaken to identify host or organism factors which may discriminate infection from colonisation.

Clinical and surveillance samples of hospitalised patients and samples from hospital environment were screened for the presence of *P. aeruginosa* by culture. Cultured isolates were classified as colonisers or pathogens, while the patients these were isolated from were classified as infected or colonised. The isolates were subjected antimicrobial susceptibility testing and to testing of various virulence factors - biofilm formation, *apr, lasB, ExoS*, *ExoT*, *ExoU*, *ExoY* and *toxA*. Clinical histories were obtained. The isolates were typed by RAPD.

Eighty seven isolates from 61 patients were cultured, including 11 environmental isolates. None of the virulence factors or antimicrobial susceptibility were found to be significantly associated with infection. The length of hospital stay was found to correlate strongly with the presence of infection. The presence of *ExoU* gene and infection by MDR strains correlated significantly with the duration of hospital stay. Positivity for *ExoS* and *ExoU* genes was found to be strongly correlated with multi-drug resistance. *ExoU* positivity correlated strongly with fluoroquinolone resistance. Environmental isolates were found to be significantly more likely to be *ExoU* postive. The ward and ICU sinks were found to be a niche for XDR *P. aeruginosa,* which need to be specifically targeted with hospital infection control measures.

2. Hospital infection control surveillance

Routine surveillance of the hospital is performed at regular intervals to screen for the presence of pathogens. Various samples from ICU and ward like suction ports, oxygen masks and ports, Mattresses, airbed, bed railings, hand swabs from health professionals working in these units, environment samples etc were collected on April, August & November 2015 & and February, March 2016. The reports were submitted along with the recommendations.

3. Duplex PCR assay to differentiate *Mycobacterium tuberculosis* (*Mtb*) complex from non-tuberculous mycobacteria

We developed a Duplex PCR assay, which identifies *Mycobacterium tuberculosis* (*Mtb*) complex and also differentiates it from NTM, by using mycobacteria species specific *hsp65* gene and MTBC specific gene sequence of an efflux pump gene Rv1458c.

We applied the novel Duplex PCR on 352 clinical isolates from patients suspected of pulmonary tuberculosis. All the isolates were also subjected to *hsp65* PCR restriction analysis to confirm the results of Duplex PCR assay. To further validate our results, a subset of identified MTBC (n=18) and all NTM (n=30) isolates were subjected to sequencing. The assay was also applied to the standard strains of *Mtb*, NTM, *Nocardia brasiliensis*, *N. asteroides*, *Escherichia coli, Klebsiella pneumoniae*, *P. aeruginosa*, *Enterococcus faecalis, Staphylococcus aureus*, *Haemophilus influenzae* and *S. pneumoniae*.

The Duplex PCR assay correctly identified 322 clinical isolates as MTBC and the remaining 30 were identified as NTM. The results were confirmed by PCR restriction analysis. The NTM identified were *M. intracellularae* (n=13), *M. kansasii* (n=7), *M. abscessus* (n=4), *M. avium/M.intracellularae* (n=2) and one each of *M. avium, M. mucogenicum, M. fortuitum* and *M. flavescence*.

The novel Duplex PCR assay was found to be very rapid, simple, cost-effective method to identify *Mtb* complex and also to differentiate MTBC from NTM.

4. Utilisation of cholesterol by *mce4A* (*Rv3499*) overexpressed and *mce1A* (*Rv0169*) over-expressed *M. tuberculosis* H37Rv and the effect of calcium channel blockers

Mycobacterium tuberculosis (*Mtb*) is an intracellular pathogen and causative organism of TB. Mycobacteria utilizes host lipids as carbon source in the nutrient deficient environment and attains a slow growing phase in its life cycle. Host cholesterol is the most preferred *mce4A* (*Mtb*:mce4A↑) and *mce1A* (*Mtb*:*mce1A*↑) over-expressing *Mtb* H37Rv and wild type (*Mtb* H37Rv) grown in the presence of different carbon sources. Cholesterol level in infected THP-1 cells was also measured to understand the host cholesterol utilization by mycobacteria. We also extracted total lipid to observe the free lipid accumulation. Through RT-PCR, the effect of *mce4A* over-expression mediated increased cholesterol uptake on genes (coding for enzymes) of cholesterol catabolic pathway was analyzed. We observed a direct relation between expression of cholesterol import system on cholesterol catabolic pathway. This may provide a new understanding of pathogenesis of TB and open a novel therapeutic approach for the treatment of TB.

5. Efflux mechanisms in *Mycobacterium tuberculosis*: to study the effect on drug susceptibility profile

Drug resistance in *Mtb* is mainly driven by the acquisition of chromosomal mutations in genes encoding drug targets/promoter region. Alternative mechanisms, such as decreased cell wall permeability to drugs and active efflux pumping are likely to be important for conferring resistance in the isolates in which no target gene mutations are found. Few studies have shown the relevance of active efflux in the drug resistance of clinical strains. In the present study-upragulation of putative efflux genes expressed in both susceptible as well as resistant isolates was assessed by qRT-PCR analysis.

Further investigation of the potential efflux genes was based on cloning and over-expression of the potential genes, and determination of resistance. The genes *Rv0194* and *Rv1877* were over-expressed in *M. smegmatis* and *Mtb* using *E.coli-Mycobacterium* shuttle vector pST-K and MIC of the drugs SM, INH, RIF, EMB, KAN and CIP were calculated. An increase in MIC of INH was observed in the strain *M. smegmatis* overexpressing the gene *Rv1877*. *Rv0194* was not found to lead to increased MIC for any drug, in *M. smegmatis* or *Mtb.*

To conclude, efflux pumps may contribute to drug resistance by either preparing the organism to face drug stress or by maintaining a low level of resistance, thus providing the organism a prolonged suboptimal exposure to the drug. This may further prompt *Mtb* to mutate and lead to high level drug resistance.

6. Lack of association between genotypic polymorphisms in *ubiA* and ethambutol resistance in clinical isolates of *Mycobacterium tuberculosis* from North India

Definite genetic markers are unavailable for resistance to ethambutol (EMB). A mutation at codon 306 (Met to Val/Ile) has been reported in 40% to 60% EMB resistant clinical isolates. Recently the presence of mutations in *Rv3806c* (*ubiA*) in clinical isolates resistant to EMB have been reported. The present study was performed to find a possible association between *ubiA* mutations and EMB resistance in clinical isolates of *Mtb* from North India.

220 clinical isolates of *Mtb* were tested for susceptibility to EMB, of which 24 were EMB resistant while 24 EMB susceptible isolates were taken as controls. The entire gene *ubiA* as well as mutational hotspot region of the gene *embB*, and upstream region of *embA* were screened for polymorphisms. The results of mutation analysis were also correlated with the minimum inhibitory concentration (MIC) of EMB for each isolate.

A polymorphism at codon 149 (GAA to GAC) was the most common in *ubiA* occurring in 25% (6/24) resistant strains and 25% (6/24) sensitive strains. Mutation (ATG to ATC/GTG) at codon 306 of *embB* was observed in 58.3% (14/24) resistant isolates and in none of the sensitive isolates. A mutation, C to A, at -11 (upstream region) of *embA* was found in 12.5% (3/24) resistant strains but always in conjunction with *embB*306 mutation.

This preliminary investigation showed that the polymorphisms found in *ubiA* were not significantly higher in EMB-resistant clinical isolates of *Mtb* from North India to indicate their involvement in EMB resistance in Indian isolates.

7. Characterization of genotypic indicators of Ethambutol resistance in clinical isolates of *Mycobacterium tuberculosis*

Ethambutol, an anti-TB drug inhibits the polymerization of the cell wall component- arabinogalactan. Genes encoding the arabinose transferases, namely *embCAB* correspond for only 40% to 60% of resistant cases, but studies from different parts of the world have shown the same mutations in EMB-susceptible isolates as well. This opens a window to investigate the role of other genes that might confer resistance to EMB. Also, efflux mechanisms may be functional to provide additional or singular resistance towards the drug.

In the present study, 150 clinical isolates were characterized as *Mtb* after their biochemical and molecular identification. EMB resistance and susceptibility was established by drug susceptibility testing by proportion method. 17 EMB-resistant isolates were found and their minimum inhibitory concentration (MIC) was determined by absolute concentration methods along with 10 EMB-susceptible clinical isolates. Mutational analysis for the selected isolates was done for 9 genes present in the arabinogalactan synthesis pathway, namely: *embB*, *embC*, *embA*, *aftA*, *aftB*, *aftC*, *ubiA*, *dprE1* and *dprE2*. A novel mutation was found to be significant in EMB resistant isolates, and thus, is being cloned in H37Rv, following which, the mutation-expressing H37Rv's MIC will be determined. Further drug exposure to a panel of clinical isolates with sub-inhibitory concentration of EMB has been given and the relative expression of efflux genes will be conducted using real-time PCR (RT-PCR).

8. Role of VPCI_Biotin in the biosynthesis of biotin in *Mycobacterium tuberculosis*

The quantity of bioavailable biotin present inside mammalian host cells where *Mtb* reside is so scarce that *de novo* synthesis of biotin is a sound strategy. Till date complete biotin biosynthetic pathway has not been elucidated in *Mtb*. Only the later stages of biotin biosynthesis from pimeloyl CoA are known. How pimeloyl CoA is synthesized is still a dilemma. The present study was conducted to outline the process of synthesis of pimeloyl CoA, a precursor of biotin.

Nucleotide blast was used to search the homologues of BioC (involved in pimeloyl CoA synthesis in *E. coli*) in *Mtb* named as VPCI_Biotin. Protein multiple sequence alignment of the gene VPCI_Biotin was performed using the software clustalW. VPCI_Biotin was cloned in the vector pTRCB and was confirmed by western blot. pTRCB:VPCI_Biotin was then transformed into the competent ΔBioC strain of *E. coli* to generate pTRCBVPCI_Biotin:ΔBiotin *E. col*i.

Bioinformatic analysis have suggested the possible homologue of BioC gene in *Mtb* named as VPCI_Biotin. pTRCBVPCI_Biotin:ΔBiotin *E. col*i as well as ΔBiotin *E. col*i were plated onto minimal medium plates. Growth was seen only in pTRCBVPCI_Biotin:ΔBiotin *E. col*i and ΔBiotin *E. col*i supplemented with biotin. Gene complementation studies in *E. coli* knockouts with VPCI_Biotin further confirmed the role of this enzyme in biotin biosynthesis in *Mtb*.

Gene complementation studies have hinted towards the role of VPCI_Biotin in biotin biosynthesis in *Mtb*. Knockout of the VPCI_Biotin in *Mtb* and growth curve pattern in minimal media as well as protein assays would further confirm our hypothesis.

9. Phenotypic and genotypic indicators of pre Multidrug- Resistant (MDR) tuberculosis: prediction of the development of MDR tuberculosis

Multidrug-resistant tuberculosis in recent times is posing a threat to control of TB. Hence, there is a need to monitor the trends in drug resistance in *Mtb* in order to timely implement appropriate interventions to curb the menace of MDR-TB. For this propose, this study has been designed to determine the precise prevalence rate of pre-MDR/MDR strains and pattern of drug resistance in new smear-positive and previously treated cases. We further propose to investigate the propensity of pre-MDR to develop in to MDR strains of *Mtb.*

For this propose, sputum specimens were obtained from 450 patients suspected of pulmonary TB. The specimens were subjected to sputum microscopy and culture for *Mtb*. We have obtained 325 smear positive and 211 culture positive isolates of *Mtb* till date. The isolates have been characterized by biochemical tests and molecular methods. We performed drug susceptibility testing (DST) against isoniazid, rifampicin, EMB and streptomycin using standard proportion method. Of the 211 isolates tested, 29 (13.7%) were identified as progenitors of MDR and 18 (8.5%) were MDR. The isolates were tested for MIC determination for the drugs streptomycin, isoniazid, rifampicin, EMB, kanamycin and ciprofloxacin by Alamar Blue Assay and mutation analysis in the *katG, inhA, rpoB, embB*306, *embB*407, *embB*497, *rpsL, rrs, eis* and *tlyA* loci that lead to drug resistance in *Mtb* isolates using Sanger sequencing. The results are awaited.

10. Ethambutol resistant: is it a more reliable indicator of MDR tuberculosis?

Ethambutol (EMB) is one of the first-line drugs included in the directly observed treatment, short-course anti-TB regimen recommended by the WHO and Revised National Tuberculosis Control Programme. Drug resistance to EMB has been increasing. The present study was conducted to find out the EMB resistance pattern of indigenous isolates of *Mtb* from TB patients in Delhi.

A total of 345 *Mtb* clinical isolates were collected. The isolates were further studied to determine their drug susceptibility patterns by proportion method. EMB resistant strains were also tested by Alamar blue assay to find out their MIC. A subset of the isolates were subjected to PCR and sequencing to study mutations at *embB306* codon. Of the 345 clinical isolates,17 (4.9%) were isoniazid mono-resistant, and 4 (1.1%) were resistant to only streptomycin. None of the isolates were resistant to EMB while 31 (8.9%) isolates were MDR. Interestingly all the EMB resistant isolates were MDR. Two of the 10 EMB resistant isolates tested for mutations at *emb306* had a Met306Val polymorphism. None of the 13 EMB susceptible isolates tested had this mutation.

A strong association was observed between EMB resistance and MDR-TB in the clinical isolates of *Mtb* in Delhi. Since RIF monoresistance has been reported in various regions, EMB resistance may also be considered as an indicator of MDR *Mtb*. Study on a large number of samples is imperative to confirm this finding.

11. 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 differential clinical manifestation

Tuberculosis (TB), one of the oldest recorded human afflictions, is still one of the biggest killers among the infectious diseases, despite the worldwide use of a live attenuated vaccine and several antibiotics. TB can be pulmonary as well as extra-pulmonary. 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. Tubercular lymphadenopathy is a diagnostic as well as therapeutic challenge because it mimics other pathologic processes and yields inconsistent physical and laboratory findings. Diagnosis is difficult often requiring biopsy. Additionally, 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 were analyzed to address this question.

Ten *Mtb* clinical isolates from pulmonary TB patients, ten from lymph node TB patients and one reference strain were included in the study. Clinical isolates and laboratory reference strain of *Mtb* were grown under various stress conditions. Mycolic acid from each culture has been extracted and TLC has been performed. Each spot will be further quantified using densitometry. We are also analyzing expression of different genes associated with lipid metabolism, *in-vitro* and *ex-vivo*. This will lead us to identify the differential pattern of gene expression and mycolic acid content of *Mtb* obtained from lymph node TB and pulmonary TB patients.

12. Triazole-resistant *Aspergillus fumigatus* harbouring G54 mutation in the environment

Aspergillus fumigatus is the aetiological agent of a wide spectrum of diseases, including allergic syndromes, such as allergic bronchopulmonary aspergillosis and severe asthma with sensitisation. Other manifestations, including chronic pulmonary aspergillosis (CPA) and invasive aspergillosis (IA), are notably associated with

high morbidity and mortality, primarily in post-TB and immunosuppressed populations, respectively. Global estimates range from 200,000 individuals affected by IA to 1.2 million living with CPA following TB. Triazole resistance in *A. fumigatus* develops in patients with chronic lung diseases receiving long-term azole therapy or by environmental selection of resistant *A. fumigatus*. We isolated for the first time triazole-resistant *A. fumigatus* (TRAF) harbouring the G54E mutation in environmental samples in India, Romania and Tanzania. This mutation in the cyp51A azole target gene of *A. fumigatus* was so far considered as *de novo* occurring in patients due to prolonged exposure to azoles. A total of 81 soil and woody debris samples from India, Romania and Tanzania were processed for detection of TRAF and determination of their susceptibility to medical triazoles and fungicides. *Cyp51A* sequencing and real-time PCR were performed for detection of mutations. Overall, 25% of samples (20/81) from India, Romania and Tanzania harboured TRAF. Of the 20 samples that harboured TRAF, a single resistance mechanism, the G54E mutation, was found in 16 samples from three countries. This mechanism was responsible for 46.4% of resistant isolates from Tanzania, 30.4% from Romania and 20% from India. The G54E isolates revealed high MICs of (>16 mg/L) itraconazole and (2 mg/L) posaconazole and were cross-resistant to agricultural fungicides. Microsatteleilte genotypic analysis showed that the majority of the Romanian and Tanzanian G54E isolates had an identical genotype. The present report described the genetic heterogeneity of TRAF strains harbouring the G54E mutation in the environment of India, Romania and Tanzania. It might be anticipated that long-term exposure of *A. fumigatus* to fungicides induced selection of G54 mutants in the environment.

13. Multidrug-resistant *Candida auris* mis-identification as *Candida haemulonii*: characterization by Matrix-Assisted Laser Desorption Ionization–Time of Flight Mass Spectrometry and DNA sequencing and its antifungal susceptibility profile variability by Vitek 2, CLSI broth microdilution, and Etest Method

Candida auris is multidrug-resistant yeast in the *Metschnikowiaceae* clade, which was first reported in 2009 from the external auditory canal of a Japanese patient. In the last 5 years, a wide spectrum of clinical manifestations due to this unusual yeast, ranging from fungemia to deep-seated infections with high mortality rates, have been reported. Further, multidrug-resistant clonal strains of *C. auris* are widespread in hospitals, suggesting nosocomial transmission. We investigated *C. auris* prevalence among 102 clinical isolates previously identified as *C. haemulonii* or *C. famata* by the Vitek 2 system. Internal transcribed spacer region (ITS) sequencing confirmed 88.2% of the isolates as *C. auris*, and matrix-assisted laser desorption ionization–time of flight mass spectrometry (MALDI-TOF MS) easily separated all related species, *viz*., *C. auris* (*n* = 90), *C. haemulonii* (*n* = 6), *C. haemulonii* var. *vulnera* (*n* =1), and *C. duobushaemulonii* (*n* = 5). The *in vitro* antifungal susceptibility was determined using CLSI broth microdilution (CLSI-BMD), the Vitek 2 antifungal susceptibility test, and the Etest method. *Candida auris* isolates revealed uniformly elevated fluconazole MICs (MIC_{50}, 64 µg/mL), and an alarming percentage of isolates (37%) exhibited elevated caspofungin MICs by CLSI-BMD. Notably, 34% of *C. auris* isolates had coexisting elevated MICs (>2 µg/mL) for both fluconazole and voriconazole, and 10% of the isolates had elevated coexisting MICs (>2 µg/mL) to two additional azoles, i.e., posaconazole and isavuconazole. In contrast to reduced amphotericin B MICs by CLSIBMD (MIC50, 1 µg/mL) for *C. auris*, elevated MICs were noted by Vitek 2 (MIC50, 8 µg/mL), which were statistically significant. *C. auris* remains an unnoticed pathogen in routine microbiology laboratories, as 90% of the isolates characterized by commercial identification systems are misidentified as *C. haemulonii*. MALDI-TOF MS proved to be a more robust diagnostic technique for rapid identification of *C. auris*. Considering that misleading elevated MICs of amphotericin-B by the Vitek ASTYS07 card might lead to the selection of inappropriate therapy, a cautionary approach is recommended for laboratories relying on commercial systems for identification and antifungal susceptibility testing of rare yeasts.

14. Draft genome sequence of a fluconazole-resistant *Candida auris* strain from a candidemia patient in India

The lack of whole genome data of *C. auris* prompted us to undertake the first draft genome sequencing of *C. auris* VPCI 479/P/13 obtained from a blood culture from a patient with fungemia in Delhi, India. The genome of *C. auris* VPCI 479/P/13 was sequenced using the Illumina MiSeq platform with a MiSeq version 3 protocol (paired end, 300 x 2 bp). The draft genome of *C. auris* VPCI 479/P/13 was 12.3 Mb, with a G+C content of 44.8%, distributed on 533 scaffolds (≥1,000 bp) with an N_{50} length of 37,205 bp. The complete genome

sequence of *C. auris* VPCI 479/P/13 contained 6,675 coding sequences, one 5.8S rRNA, 184 tRNAs, and 3,262 repetitive elements. The draft genome sequence generated would facilitate further genomic studies on the biology and virulence of *C. auris*.

15. Profile of antibody responses and duration of protection following influenza vaccination for adults >65 years old

Vaccination has been regarded as the primary and most effective method for prevention of influenza virus infection in the elderly. The individuals aged 65 years or above are at greater risk of acquiring serious infections and the related complications. However, there are reports indicating lower influenza vaccine effectiveness in elderly individuals as compared to the young adults. The age-related deterioration of immune system in the elderly (immuno-senescence) leads to lower antibody responses. This makes them more vulnerable towards influenza virus infection even after vaccination. Therefore, assessment of vaccine efficacy becomes necessary to manage the viral infections in the elderly individuals. In the present study, 150 individuals, aged 60 years or older, were enrolled with informed consent from the Pulmonary Out-Patient Department (OPD) of AIIMS and Vallabhbhai Patel Chest Institute, VPCI, Delhi, India for intra-muscular injection of inactivated trivalent split influenza vaccine, VAXIGRIP (Sanofi Pasteur SA, Lyon, France). The enrolled individuals had no history of influenza vaccination for atleast a year before from the date of vaccination. The existing antibody titers against the respective antigens of the vaccine strains A/California/7/2009 (H1N1) pdm09, A/Texas/50/2012 (H3N2), B/Massachusetts/2/2012) were assessed in the pre-vaccination serum samples by hemagglutination inhibition (HAI) assay and microneutralization assay. The post-vaccination serum samples of 129 individuals were collected after 21 days, 3 months, 6 months and 9 months of vaccination and analyzed by HAI and microneutralization assay. The second booster of the vaccine was administered in 82 patients after one year.

16. Identification and assessment of HA epitope of human influenza A viruses

The present study is based on the use of virus-derived epitopes regarding these as a useful tool to accurately evaluate immune response and to differentiate the responses that are specific or due to cross-reactivity. Several studies have reported the existence of HA subtype-specific as well as inter subtype conserved epitopes. ELISA assays based on epitopes that are highly conserved and specific for one certain HA subtype will be useful for rapid and simple subtyping of influenza A viruses (IAVs). In this study, we aim to identify the immunodominant-B cell epitopes of the influenza A virus by a peptide scanning approach using the sera of positive Influenza virus patients. This type of study has not been performed in North Indian population and will help in the identification of immunodominant B-cell epitope of the Influenza A virus pandemic HA. In this study; we will use overlapping peptide library and human convalescent antisera. Further, we will also evaluate if the epitopes identified in this study could stimulate the neutralizing antibodies and will show a good correlation with results obtained using the hemagglutination inhibition test.

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

Influenza viruses are respiratory pathogens of major concern globally, contributing to high rates of morbidity and mortality annually. The viruses continuously evolve through antigenic changes bypassing the host's acquired immunity against them. Due to frequent antigenic and genetic changes, vaccines need to be formulated yearly and old vaccines are not effective against newly emerging viruses. Moreover, these vaccines have to be administered annually in order to prevent influenza. Hence, there is a growing need for developing new and effective chemotherapeutic agents to treat influenza. Natural products, derived from medicinal plants have shown to be of great value in preventing and or/ameliorating viral diseases in pre-clinical and clinical trials. The study aims at evaluating the antiviral efficacy of medicinal plant extracts, having expected antiviral activity for the development of an alternative and effective therapy against influenza A viruses. Appropriate parts of certain plants, known to have medicinal properties, have been procured from the local vendors, and the extracts prepared in 100% commercial grade ethanol at room temperature. The extracts were filtered using 0.22µM syringe filter and aliquoted at -20 °C for future use. The percentage yield was calculated accordingly. MTT assay was performed at different time points in A549 cells at different concentration and IC_{50} value was calculated. Further evaluation of the anti-influenza activity of the extracts under *in vitro* conditions is under process.

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

Influenza A virus causes the most prevalent infection of the respiratory tract in humans. Influenza is an infectious disease that infects birds and mammals. It is considered a relatively benign disease slightly worse than cold. The most characteristic features are weakness, fatigue, muscle ache, headache, fever etc. Every year, almost 10% to 20% of the world population suffers from influenza virus, resulting in up to 0.5-1 million deaths. Many recent reports indicates that the level of xanthine oxidase (XO) in plasma is elevated in ARDS and that XO mediates lung injury by neutrophil-elastase and hyperoxia. These suggestive data prompted to hypothesize that XO causes O_2 generation, which could produce highly toxic –OH in the pathogenesis of influenza virus infection. The potential siRNA has been designed against xanthine oxidase gene which is up regulated during influenza virus infection. Currently the HeLa cell line is being established for down-regulation studies and maintained in exosomes free serum media. The siRNA was designed against xanthine oxidase and the cloning of PB1 gene of influenza virus has been done. For delivery of siRNA and miRNA, exosome isolation procedure is under standardization.

19. Role of microRNA on influenza pathogenesis

We have found some micro-RNA, differentially expression during influenza infection. Few of them are known to regulate innate immune response. We are studying the association of these micro-RNAs with influenza pathogenesis. Expression of immunoregulatory micro-RNAs has been compared between influenza infected and non infected cells by real-time PCR. Experiments on micro-RNA transfection in lung epithelial cell lines and association of these micro-RNAs with interferon expression are still ongoing.

20. Synergistic effect of immune modulatory antimicrobial peptides in regulation of influenza A virus infection.

The peptides are endogenous and non-toxic molecules having wide applications. Peptides act as a key component of host immune modulatory mechanism and have various microbicidal activities. Due to frequent antigenic drift and shift, vaccines do not provide long-term immunity against Influenza, using small peptides as inhibitory molecules might be beneficial to combat its replication. The antiviral strategies to combat influenza virus by endogenous antimicrobial peptides is one of the area needs to be elucidated. To investigate the signalling pathways modulated by anti-microbial peptides to counter the viral infection. The aim of our study is to elucidate the mechanism of actions of antimicrobial peptides against Influenza A virus and also checking the expression of host immune defensive genes and pathways involved in this mechanism. The proposed work broadly involves checking the inhibition of viral replication and which might be used as future therapeutics.

21. To study the heterosubtypic immunity provided by pandemic influenza A H1N1 (2009) virus infected cells

Dendritic cells are the professional antigen presenting cells. Mice dendritic cells primed with influenza virus were used to study the maturation of dendritic cells. Various maturation markers of dendritic cells were studies at transcriptional and proteomic level. *In vivo* experiments were performed to assess the protection provided by primed dendritic cells against H1N1 (pdm 2009) virus. Protection was observed against pdm 2009 strain.

Pathology

Research

1. Study of immature granulocyte count and total granulocyte count in patients admitted to intensive care unit with respiratory distress

Sepsis is the leading cause of death in intensive care units (ICUs) in spite of recent advances in antibiotic therapy and general critical care practices. Early diagnosis of infection and sepsis before it progresses to organ dysfunction or circulatory failure has crucial impact on the clinical course and outcome of critically ill patients. When the immature granulocytes (IG) level increase, these are usually associated with an increase in the neutrophil portion of the complete blood count. This may prove to be a useful clue of inflammatory diseases, bacterial infection, trauma, steroid therapy, and cancer. However, in the elderly population or very young infants an increase in IG may be seen without an increase in neutrophils and needs to be investigated more thoroughly.

We evaluated the IG fraction and DIC related parameters for their utility as sepsis biomarkers in 142 adult patients admitted to VPCI ICU in January 2016 with respiratory distress. Hematocrit, hemoglobin, RBC, RDW, IG count, lymphocytes count, and neutrophils count, platelet count, prothrombin time (PT), activated partial thromboplastin time (aPTT), D-dimer, and fibrinogen levels were assayed.

Sepsis patients demonstrated significant increase in IG fraction indicative of neutrophil immaturity or activation. The IG % added to WBC and total granulocyte count in the early exclusion of infection and could be obtained routinely without extra blood sampling or costs. The present study also demonstrates a relationship between IG and DIC-related parameters. These findings suggest that IG% may be linked to a hypercoagulable state which is associated with sepsis and needs to be evaluated further.

2. Caveolin-1 expression and lung parenchymal remodeling in cigarette smoke and bleomycin induced combined pulmonary fibrosis and emphysema model: effect of phosphodiesterase -5 inhibitor

Cigarette smoke induces a complex group of lung disorders including chronic obstructive pulmonary disease, interstitial lung diseases, lung cancer, combined pulmonary fibrosis and emphysema (CPFE), etc. The mechanisms leading to their development include a complex web of inflammatory and/or fibrogenic mediators, cells and molecular pathways which remain to be elucidated.

Male Wistar rats (n=120) were studied as Group I, control, Group II, cigarette smoke alone (exposed to cigarette smoke (CS) daily), Group III (CS+Sildenafil), Group IV, combined group (CS+bleomycin), Group V (CS+bleomycin+Sildenafil). The histopathological changes were morphometrically quantified and the caveolin-1 expressed in various cell types were studied, before and after administration of phosphodiesterase-5 inhibitor (Sildenafil).

Cigarette smoke exposure resulted in progressive interstitial and peribronchiolar inflammation, constrictive bronchiolitis, destruction of alveolar walls, enlargement of alveolar spaces and progressive emphysema formation from 8th week onwards up to 12th week. An unregulated expression of Caveolin-1 was seen in the cigarette smoke exposed lung parenchyma.

Sildenafil therapy resulted in a progressive attenuation of macrophological changes as well as emphysematous areas. The present data shows that caveolin-1 is differentially expressed in the pathogenesis of cigarette smoke induced lung fibrosis and may prove to be a promising therapeutic target.

3. Study of the post transcriptional mechanism underlying pulmonary fibrosis

Pulmonary fibrosis is characterized by excessive accumulation of extracellular matrix (ECM) and remodeling of the lung architecture. The progression of fibrosis occurs as result of (i) immune mediated acute and chronic inflammation driven by cytokines, cells and cell signaling pathways, (ii) oxidative stress related tissue injury caused by elevated reactive oxygen species, (iii) a procoagulant milieu in the lung involving the

coagulation proteinases and their tissue receptors. Eventually these varied cytokines, growth factors and enzymes act on different cell types and eventually converge on the fibroblasts. This results in the activation and/or recruitment of fibroblast and leads to their differentiation into myofibroblasts. The post transcriptional regulation of these regulatory key cellular and non-cellular players, by microRNAs (miRNAs) is being studied. The miRNAs are small (~22bp), single stranded and non-coding RNAs that act as post-transcriptional regulators of gene expression and control various cellular processes such as differentiation, proliferation and cell-cell interaction. These are noncoding RNAs inhibit the production of target proteins or induce degradation of mRNAs by binding target mRNAs at complementary sites in 3′ (3′UTR) untranslated regions or coding sequences and thereby suppressing target gene expression.

A dysregulation of miRNA expression has been identified in diseased tissues. We are studying the post transcriptional regulation of pulmonary fibrosis and lung remodeling by Let-7f miRNA etc. The down regulation of Let-7f miRNA and miRNA 20 from day 0 to day 7 (inflammatory phase) and further upto day 28 was associated with upregulation of the transforming growth factor expression, activation of pulmonary fibroblasts and their differentiation into myofibroblasts. The dysregulated miRNAs represent a novel pool of therapeutic targets and biomarkers and need to be further evaluated.

4. Molecular pathology of lung cancer

Worldwide approximately 70% of patients with lung cancer present with advanced stage. Molecular testing of EGFR mutations and ALK rearrangements has been recommended in these cases. The detection of epidermal growth factor receptor (EGFR) mutations is necessary for starting therapy with EGFR tyrosine kinase inhibitors.

Total 92 cases of lung cancer presenting to VPCI were assessed. These included 82 males and 10 females. Age ranged from 18 to 76 years. These patients were analyzed for the presence of epidermal growth factor receptor (EGFR) mutations using allele specific real time PCR assay in 63 cases and immunohistochemistry using monoclonal antibodies to EGFR & ALK in 10 cases each. The DNA was isolated from the following samples: BA-2, ET-1 Blood-48, Sputum-07, FNAC-14, TBLB-10. Total 27/48 cases showed EGFR mutations; T790M (8/27, 29.63%), S768i (4/27, 14.81%), Ins 20 (9/27, 33.3%) G719X (13/27, 48.15%) Del19 (9/27, 33.3%), L858R (9/27, 22.2%), L861Q (4/27, 14.8%). Presently, Sanger sequencing for EGFR mutations is being standardized in the laboratory and has been performed on 17/92 cases. Lung cancer is the major cause of death from neoplastic disease in the world. The use of molecular pathology for early lung cancer detection and personalized therapy may lead to improved prognosis of these patients.

Pharmacology

Research

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

The study evaluated the effects of Chelidonic acid (CA), a secondary metabolite present in many medicinal plants, for its potential in the treatment of bronchial asthma and related allergic conditions in rats. Accordingly, the effects of CA were evaluated on experimental systemic anaphylaxis, immunomodulation, airway inflammation, airway hyper responsiveness and bronchoconstriction and airway remodeling – all of which are critical in the pathophysiology of allergic disorders like bronchial asthma. In experimental models of systemic anaphylaxis, CA (1, 3 and 10 mg/kg, ip) inhibited degranulation of rat peritoneal mast cells in ovalbumin immunized and challenged rats *ex vivo* in comparison to controls. There was also a marked reduction in the mortality after CA treatment *in vivo.* These responses were dose related and comparable to that seen with the comparator drug, prednisolone. In models of *in vitro* anaphylaxis, CA (1, 3 and 10 mg/ml) dose dependently inhibited the quantity of histamine released from mast cells treated with compound 48/80, and these results were also comparable to the effects seen after prednisolone. Both the above experiments suggested an anti-anaphylactic role for the compound. CA (1, 3 and 10 mg/kg) lowered eosinophil and neutrophil counts in blood in ovalbumin immunized rats and also lowered serum IgE levels when compared to the control group. All these results were comparable to those seen after prednisolone. This suggested the involvement of Th2 mediated mechanisms for CA effects. In tests for adaptive immunity, CA (1, 3 and 10 mg/kg) suppressed ant-SRBC antibody titers and also attenuated the splenic plaque forming cell count in SRBC immunized rats as compared to respective controls. Further, CA also suppressed the cell mediated immune response as assessed by the DTH assay (footpad thickness test), albeit to a lesser consistent manner and extent, in SRBC immunized and challenged (footpad) rats. These effects were mostly comparable with that of prednisolone. These data confirmed the immunomodulatory role of this compound. In experiments for airway inflammation, CA (1, 3 and 10 mg/kg) suppressed the levels of pro-inflammatory mediators like hs-CRP and cytokines like TNF-α, IL-6 and IL-1β in both blood and BAL fluid when compared to their respective control values. This secondary plant metabolite also suppressed the levels of anti-inflammatory cytokines like IL-13 and IL-5 in both body fluids in a consistent manner. However, the relative reductions in the pro-inflammatory cytokine levels were much greater as compared to the anti-inflammatory cytokines. These changes were also seen in the prednisolone treated groups and the data of the test drug and comparator groups were very comparable. This suggested the inhibitory effects of CA on airway inflammation. Further, in ovalbumin immunized rats, CA (1,3, and 10 mg/kg) treatment reduced eosinophil counts and lowered IgE and IL-4 levels, all mediators/effectors of a Th2 dependent response, in BAL fluid, when compared to controls. These changes were similar in nature to those seen earlier in blood and also comparable with the comparator drug, prednisolone, used in the study. In experimental models of airway hyper responsiveness and airflow resistance, CA (1, 3 and 10 mg/kg), reversed the reductions in airway resistance and obstruction to airflow seen in the control group in ovalbumin immunized and methacholine challenged rats, as measured by the *P-enh* values by whole body plethysmography, in conscious rats *in vivo*. The reversals by CA of the increased *P-enh* values seen in control rats was indicative of reductions in airway hyper responsiveness, airway resistance and enhancements in airflow through airways by the test drug and were consistent across all methacholine concentrations. These changes after CA were comparable to the comparator drug, prednisolone effects. This effect could be attributed to the bronchorelaxant effect of the test compound. In experimental models of airway remodeling, biochemical and histological studies showed that CA attenuated TGF-β levels and subepithelial fibrosis and also lowered the goblet cell counts and hydroxyproline levels, in BAL fluid and lung tissue, as compared to the control animals, in ovalbumin immunized and chronically challenged rats. These results were suggestive of an anti-remodeling effect of the test compound, which was comparable to that of prednisolone. Taken together, it can be concluded from our experimental study that the secondary plant metabolite, chelidonic acid, has anti-anaphylactic and immunomodulatory effects, suppresses airway inflammation, reduces airway hyperresponsiveness and bronchoconstriction, and attenuates airway remodeling – all of which to collectively contribute to its beneficial effect in allergic disorders like bronchial asthma.

2. Experimental studies on the role of nitric oxide (NO) and NO-signalling pathways in cognitive changes during emotional and environmental stress

The effects of acute hypoxia (HI and HII) and chronic intermittent hypoxia alone in combination with restraint stress (RS) was evaluated on neurobehavioral, cognitive, biochemical and molecular parameters in rats. Further, the modulatory role of nitric oxide (NO) and its possible signalling pathways were examined. Acute hypoxia at simulated high altitude of 8000ft (HI) and 12000 ft (HII) induced suppressions in neurobehavioral parameters as assessed in the elevated plus maze (EPM) and open field tests (OFT). Such neurobehavioral suppression was markedly aggravated when HI or HII was combined with restraint stress (RS). HII induced suppression of behavioral activity in EPM and OFT was attenuated by all NO mimetic, L-arginine and isosorbide dinitrate (ISDN), and aggravated after NOS inhibitor (L-NAME or 7-NI) treatments. Similar attenuating effects on neurobehavioral parameters were seen after NO mimetics in the HII+RS group of rats. Acute hypoxia (HI and HII) resulted in elevations in plasma corticosterone levels as compared to controls. HI or HII in combination with restraint stress (RS) also induced elevations in plasma corticosterone levels. Pretreatment with L-arginine and ISDN, attenuated corticosterone elevations HI or HII either alone or that seen in combination with RS, whereas, L-NAME aggravated the same. Brain metabolite (NOx) activity was reduced after exposure to acute HI or HII, which was also reversed after NO mimetic, L-arginine pretreatment and aggravated after NOS inhibitor pretreatment. On the other hand, ADMA levels increased after exposure to either HI, HII or HII+RS. Such elevated ADMA levels were attenuated by NO mimetics and unchanged after NOS inhibitors. Oxidative stress markers like reduced glutathione (GSH) were lowered after exposure to acute hypoxia (HI or HII) either alone or in combination with restraint stress (RS) and the maximal effects were seen after HII+RS when compared to controls or HII group alone. On the other hand, 8-Isoprostane and 8OH dG levels in brain showed a remarkable increase after HI, HI or HII+RS exposure. Pretreatment with NO mimetic attenuated both pro oxidative markers whereas, NOS inhibitors aggravated their levels. Acute hypoxia (HI or HII) either alone or in combination with restraint stress (RS) did not induce any significant changes in cognitive parameters as assessed in the Morris Water Maze (MWM) test or transfer latency in the EPM. Acute hypoxia exposure also did not influence any of the neuroendocrinal and biochemical markers when evaluated after completion of the cognitive testing schedule. The various drug treatments were also not able to influence the HI, HII or HII+RS induced changes in cognitive and biochemical markers studied.The effects of chronic intermittent hypoxia on stress induced neurobehavioral response were assessed on neurobehavioral, endocrinal, biochemical and molecular responses. Neurobehavioral response were generally suppressed, endocrinal response was decreased compared to acute group. Biochemical responses were exaggerated as compared to control, HII and HII+RS groups. Elevated plus maze (EPM) and Open field (OF) test were done to assess the behavioral responses after stress and various drug treatments. HII induced suppression of behavioral activity in EPM was attenuated by all NO mimetics. Similar trends were seen in OF test. Plasma corticosterone was elevated after HII, HII+RS, and NO inhibitors pretreatment. Brain metabolite (NOx) activity was reduced after chronic hypoxic stress exposure that was reversed after L-arginine pretreatment and aggravated after NO inhibitors pretreatment. On the other hand, ADMA levels increased in all chronic hypoxia and combined HI/HII +RS groups. This was also attenuated by NO mimetic and aggravated by NO inhibitors. In brain homogenates, GSH were reduced and 8OH dG and 8-Isoprostane levels showed a remarkable increase after various chronic stress exposures. Pretreatment with NO mimetics attenuated and NO inhibitors aggravated the levels of oxidative stress markers when compared with respective controls. Gene expression studies shows decrease in nNOS gene expression post stress, whereas, eNOS and iNOS gene expressions were unaffected. In chronic intermittent hypoxia (chronic HI or HII) cognitive response were generally suppressed in the MWM studies with a decrease in escape latency time as well as time spent in target quadrant in chronic hypoxia groups. Combination of chronic hypoxia (HI or HII) with restraint stress (RS) induced similar cognitive deficits as seen after hypoxia alone but to a greater extent. The effects of chronic hypoxia alone or in combination with RS were attenuated by NO mimetics and aggravated by NOS inhibitors. Biochemical responses were exaggerated in the HII and HII+RS groups as compared to control. Plasma corticosterone was elevated after HII, HII+RS, and also after NO inhibitor pretreatment. Brain NO metabolite (NOx) activity was reduced after chronic hypoxic stress exposure (HI or HII) that was reversed after L-arginine pretreatment and aggravated after NO inhibitors pretreatment. On the other hand, ADMA levels increased in all chronic hypoxic groups (HI, HII or

HII+RS). This was also attenuated by NO mimetic and aggravated by NO inhibitors. Reduced glutathione, 8-Isoprostane and 8OH dG levels in brain homogenates showed a remarkable increase in oxidative stress markers after either chronic hypoxia (HI or HII) or HII+RS. Pretreatment with NO mimetics attenuated and NO inhibitors aggravated these levels. Gene expression studies shows decrease in nNOS gene expression post stress, whereas, eNOS and iNOS gene expressions were unaffected. The overall nature of the results indicate that Nitric Oxide (NO) plays a crucial role in the neurobehavioral changes (anxiety) and cognitive dysfunction function during acute and chronic hypoxia. These effects are compounded in the presence of restraint stress. NO mimetics attenuated these effects whereas, NOS inhibitors aggravated them. These NO mediated effects are probably due to their interactions with reactive oxygen species (ROS) in the brain. The study has translational value for devising strategies for treating high altitude induced neurobehavioral disorders.

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

The study evaluated the cardiotoxic potential of theophylline and investigated the mechanism of action in experimental animals in order to device strategies for its safer use. Rats were injected with aminophylline (the soluble ethylene diamine salt of theophylline) once daily for 7 days and then were anesthetetized, dissected and connected to the software based Biopac machine for measuring cardiac parameters. Blood and hear tissue was collected for various biochemical assays. Aminophylline (50, 100, 150 and 200 mg/kg) induced dose dependent tachycardia, with maximal effects at 150 mg/kg. There was also dose related marginal increases in mean BP after the highest dose of the drug tested. The methylxanthine also induced T-wave inversions at the highest dose whereas, no significant changes were seen in the other ECG parameters like PR and RR intervals and QTc. The phosphodiesterase inhibitor, IBMX (100 mg/kg) and the adenosine agonist 2-chloroadenosine (2-CADO, 10 mg/kg) only marginally influenced the various cardiac hemodynamic and ECG parameters as compared to controls. Pretreatment with the anti-oxidant, α-tocopherol (20 and 40 mg/kg) dose dependently attenuated the aminophylline induced tachycardia. Tocopherol pretreatment also abolished the appearance of T-waves from the ECG. Similar attenuations in aminophylline (150 mg.kg) induced changes in cardiac parameters were also seen after L-arginine (100 and 500 mg/kg) pretreatment. L-NAME 25 mg/kg) was ineffective in influencing the above parameters. Assay for oxidative stress markers showed that aminophylline induced dose related changes in MDA, GSH and SOD in heart tissue homogenates. Whereas, MDA levels were raised , GSH and SOD levels were differentially inhibited. There was also increase in 8-OHdG levels in the serum. Pre-treatment with α-tocopherol (20 and 40 mg/kg) reversed the changes induced by aminophylline. In the oxidative stress parameters. Similar attenuations in aminophylline induced oxidative stress parameters were also seen after L-arginine pretreatment. No effects on these parameters were however seen after L-NAME treatment. Measurement of cardiac biomarkers in blood showed that aminophylline (100 and 150 mg/kg) increased CPK-mb, TnI and ADMA levels as compared to controls. However, the rat blood BNP levels were not much affected with the drug. On the other hand, increases in HDAC-1 enzyme activity was also seen after aminophylline treatment in the doses in which it induced tachycardia. Pre-treatment with α-tocopherol and L-arginine, differentially attenuated the aminophylline induced changes in cardiac biomarkers in the blood. In the drug interaction studies, combined treatment with salmeterol (25 µg/kg) and aminophylline (150 mg/kg) showed the differential degrees of potentiation of cardiac parameters and biochemical markers, as compared to the data of the aminophylline (150 mg/kg) treated as well as control group. Salmeterol increased the heart rate (tachycardia) and mean blood pressure compared to aminophylline 150 mg/kg. Similarly, effects on oxidative stress markers viz. lipid peroxidation (MDA) level increased, whereas, GSH and SOD were further decreased compared to the control group. There were increases in the cardiac biomarkers, CPK-mb, TnI and ADMA levels with the combined treatment as compared to the aminophylline as well as control group. Both α-tocopherol and L-arginine attenuated the combined treatment induced potentiations in cardiac and biochemical markers, with L-arginine being more consistent in this regard. Exposure of rats to restraint stress (RS) prior to aminophylline administration showed that RS induced potentiations in the aminophylline (150 mg/kg) induced tachycardia, with no appreciable changes in mean BP. In the ECG, the incidence of T wave inversions were also increased but there was no significant change in the QTc interval when compared to relevant control data. Biochemical assay showed that RS potentiated the effects of aminophylline (150 mg/kg) on oxidative stress markers viz. MDA and 8-OHdG, and these changes were differentially reversed by

α-tocopherol and L-arginine pretreatments. The effects of RS on aminophylline induced changes in levels of cardiac biomarkers also showed differential effects. The aminophylline induced TnI and ADMA levels were enhanced as compared to control levels and these changes were attenuated after tocopherol and L-arginine pretreatments. The results of the present study indicate that aminophylline induced cardiotoxicity is probably unrelated to either phosphodiesterase inhibition or adenosine antagonism. Further, pretreatment with antioxidants and NO mimetics attenuated the aminophylline induced tachycardia, other ECG changes and related biochemical changes in a differential manner. Oxidative stress and cardiac biomarker levels, which were deranged after aminiophylline treatment, were near normalized after tocopherol and L-arginine treatments. Further, in the interaction studies, (a) combined treatment with beta agonists and (b) prior exposure to restraint stress, also potentiated aminophylline induced cardiotoxicity, which were also attenuated by antioxidant and L-arginine therapy. It is thus inferred that aminophylline induced cardiotoxicity is due to oxidative stress and its interactions with nitrosative stress, and this could help in devising strategies to comba methylkxanthine cardiotoxicity.

4. Experimental studies on the association between Alzheimer's disease and diabetes mellitus: a novel approach to possible therapeutic strategies

Alzheimer's disease (AD) is characterized by progressive loss of memory, declining cognitive function and, ultimately, leads to decreasing physical functions and death. Elevated levels of Aβ are believed to contribute to the cognitive impairments associated with AD. Inspite of several neurochemical hypotheses proposed there is still no consistent and sustainable forms of therapy are available and the drugs currently used are far from satisfactory. Recent studies have indicated that cognitive decline and Type 2 Diabetes Melitus (T2DM) are co-morbidities and there is a strong possibility that there may be a strong association between such neurobehavioral deficits of AD and poor glycemic control seen in T2DM. Insulin resistance plays a role in the onset and development of AD and, AD has been considered as an "insulin resistant brain state (IRBS). Currently, the basis for the association between AD and T2DM is poorly defined. Nitric oxide (NO) is a neuromodulator with a complex array of pharmacological functions. In view of its role on influencing several neurobehavioral paradigms and its reported association with both HDAC-2 and BDNF, it is possible that NO may play a key role in redefining the treatment modalities of AD associated with T2DM by modifiying some of the biomarkers for such co-morbidity (CTGF, γ-secretase, HDAC-2, BDNF). Hence, the present study investigate the role of NO in AD associated with T2DM in experimental models. Cognition impairment will be induced by intraventricular injection of streptozotocin (STZ) to normal and T2DM rats (induced by STZ and high fat diet). Neurobehavioral, biochemical, molecular and histopathological parameters will be assessed in both groups. The effects of NO modulators on above parameters, NOS gene expression (hippocampus and prefrontal cortex), and brain NO metabolites (NOx) will be observed in both groups.

AD induced in rats by icv STZ and animals were divided into 5 groups consisting 8 in each and assigned as follows. Animals in Group I (received only artificial CSF via ICV) received normal saline, Group II (ICV-STZ injected) received normal saline and animals in Group III (ICV-STZ injected, received GSNO (50 μg/kg/ip/day), Group IV (ICV-STZ injected, received L-Name (10mg/kg/ip/day) and Group V (ICV-STZ injected, received L-Arginine (100mg/kg/ip/day) while group I and II received normal saline (0.1 ml/ip/day) during the course of the entire study of 90 days. Next day after the last behavioral test, all animals were decapitated under anesthesia (urethane) and the brains were rapidly removed and rinsed with ice-cold phosphate buffered saline (PBS) solution, pH 7.4 to remove any red blood cells and clots. Then, the hippocampus, amygdala and cortex were dissected and further tissues was homogenized in 10% (w/v) cold PBS (0.1 M, with a pH of 7.4), to which a protease inhibitor cocktail was added. Homogenates were centrifuged for 20 min at 10000 x g at 4 °C. The supernatants were collected and stored at -80 °C and the estimation of Aβ40, Aβ42, APP and BDNF were performed by ELISA using commercial kits. Treatment with various NO modulators (L-Name, L-Arginine and GSNO) showed that in 1st month there were no significant differences in all treated groups during acquisition trail of MWM test. While in 2nd month Day 4(ICV-STZ + GSNO) treated animals significantly decreased escape latency time when compared with Day 1(ICV-STZ + Saline) treated group. Also in 3rd month, similar result was observed for Day 4(ICV-STZ + GSNO) treated animals when compared with Day 1 & Day 4(ICV-STZ + Saline) treated animals. Treatment with various NO modulators (L-Name, L-Arginine and GSNO) showed that in 1st month of *probe trail test* of MWM test (Day 5), (ICV-STZ + GSNO) treated animals showed

significant increase in time spent in target quadrant as compared with (ICV-STZ + Saline) group. Similar results were observed in 2nd month while in 3rd month (ICV-STZ + GSNO) and (ICV-STZ + L-Arginine) treated animals there were significant increases ($P < 0.05$) in time spent in target quadrant as compared with (ICV-STZ + Saline) group.

In passive avoidance test, in 1st month there were no significant changes found in latency period while in 2nd and 3rd month (ICV-STZ + GSNO) treated animals showed significant increases in latency period when compared with (ICV-STZ + Saline) group. After 3 months treatment of various NO modulators (L-Name, L-Arginine and GSNO), in biochemical studies evaluation of Aβ40, Aβ42, APP and BDNF were performed in all animals. For Aβ40, in cortex, (ICV-STZ + GSNO) treated animals showed significant decreases in Aβ40 level when compared to (ICV-STZ + Saline) treated group. In amygdala, it was observed that in (ICV-STZ + GSNO) and (ICV-STZ + L-Arginine) treated groups decreases Aβ40 level when compared to (ICV-STZ + Saline) treated group. While in hippocampus, in (ICV-STZ + GSNO) and (ICV-STZ + L-Arginine) treated rats significant decreased in Aβ40 levels were seen. For Aβ42, in cortex, it was observed that (ICV-STZ + GSNO) significantly decreased Aβ42 level and (ICV-STZ + L-Arginine) also decreased Aβ42 level as compared to (ICV-STZ + Saline) treated group and Same pattern of results were observed in amygdala and hippocampus. For APP, there were no significant changes observed in cortex of all groups of animals while in amygdala and hippocampus (ICV-STZ + GSNO) treated animals significant decreases APP levels were seen when compared to (ICV-STZ + Saline) treated group. For BDNF, there were no significant changes found in cortex of all groups of animals, while in amygdala and hippocampus (ICV-STZ + GSNO) treated animals showed significant increases in BDNF levels when compared to (ICV-STZ + Saline) treated group.

NO is a unique gasotransmitter and neuromodulator substance and its involvement in AD related processes was not clearly defined. In this study, we showed that GSNO (direct NO donor), plays a promising role in all aspects of cognitive performances as measured by behavioral parameters. The effectiveness of GSNO and to a lesser extent L-arginine was seen in both in fear based memory performance as well as in spatial memory. Also, in biochemical studies, icv-STZ significantly decreased the level of Aβ40, Aβ42 in hippocampus. Hence, GSNO could be a excellent candidate for AD therapy. However, further studies are required to corroborate and confirm this hypothesis.

5. Pharmacological studies on possible role of neurosteroids during stress-induced immunomodulation in experimental animals

Stress is any internal or external stimulus capable of altering homeostasis and the ability to cope with such situation is a crucial determinant of health and disease. Stress serves as one of the main triggers for a variety of pathophysiological conditions. The central nerves system plays a crucial role in the regulation of stress responses and complex neuro-chemical pathways have been proposed. The immune system is particularly susceptible to a variety of stressors. Most stress related disorders result from chronic stress exposure, it is logical to search for safe and effective remedies against such situations. Most commonly used anti-stress agents have some or other untoward effect on prolonged use. Neurosteroids are a new class of compounds which have been shown to be neuromodulatory and neuroprotective in conditions, like anxiety and epilepsy. These are endogenously synthesized in the brain (both neuronally and extra-neuronally) as well as the periphery. The mode of action of neurosteroid effects are not clearly defined. Immunomodulation is an important consequence of chronic stress and effects of neurosteroids during stress-induced changes in immune functions are not known. Thus, the present study has been designed to evaluate the effects of neurosteroids on chronic stress induced changes in immune function in experimental animals. Specifically, the effects of chronic restraint stress (RS) are being studied on immunological, neuroendocrinal and oxidative stress markers in rats, viz. humoral immunity (antibody response to KLH); cell mediated immunity (delayed type hypersensitivity [DTH] response); cytokine levels: (IFN-γ and IL-4); neuroendocrinal marker**:** plasma corticosterone levels; oxidative stress markers: MDA Levels, reduced glutathione (GSH), and nitric oxide metabolites (NOx). Further, the effects of the neurosteroid, dehydroepiandrosterone sulfate will be assessed on the above markers in non-stressed and stressed rats. Experiments are in progress and data is likely to be finalized soon.

6. To evaluate the effect of *Terminalia catappa* fruit and seed extract in streptozotocin induced diabetic retinopathy in rats

Introdcution: The prevalence of diabetes in India is increasing at an alarming rate and has become one of the most prevalent chronic diseases. The progression of diabetes leads to various microvascular and macrovascular complications. Diabetic retinopathy is one of the most prevalent microvascular complication caused by diabetes that leads to damage to small blood vessels of the eye eventually leading to blindness. The increase in blood glucose level causes an accentuation in oxidative stress which plays a well-marked role in the pathogenesis of diabetic complications. *Terminalia catappa*, contains polyphenols in abundance which has good antioxidant and radical scavenging activity. Thus, we hypothesized that it may have beneficial effect in the treatment of diabetes induced retinopathy.

Aims and Objectives: (i) To investigate the effect of *Terminalia catappa* fruit extract in streptozotocin induced diabetic retinopathy in rats. (ii) To investigate the effect of *Terminalia catappa* seed extract in streptozotocin induced diabetic retinopathy in rats. (iii) To investigate the role of glycaemic, inflammatory, oxidative stress and angiogenic mechanisms in the genesis of diabetic retinopathy and to examine the effect of *Terminalia catappa* fruit and seed extract on these pathways. (iv)To investigate the effect of *Terminalia catappa* fruit and seed extract in streptozotocin induced diabetic retinopathy in rats by examining histopathological changes in retinal tissue.

Method: Diabetes was induced in overnight-fasted wistar rats by single intraperitoneal (i.p.); injection of streptozotocin (STZ). Rats were treated daily p.o. with hydro-alcoholic extract of the fruit of *Terminalia catappa* for 12 weeks starting from the second day of injection of STZ. After completion of 12 weeks, rats were sacrificed by overdose of anaesthesia and blood was collected by cardiac puncture.

Test drug – Hydro alcoholic extract of fruit and seeds of *T. catappa*

Three doses of each test drug was used in diabetic rats.

Parameters studied every week till 12th week

Blood Glucose

Body Weight

Urine Volume

Anterior Chamber Evaluation

Fundus Evaluation

Analysis of results is being done.

Biochemical and histological studies will be done.

7. Effect of Indian almond and sweet almond in diabetes induced nephropathy and cataract in rats

Diabetes mellitus is a chronic disease and the prevalence of diabetic patients is increasing at an alarming rate in India. The lifelong adherence to medicines for the treatment of chronic disease like diabetes is a matter of concern. The uncontrolled progression of diabetes leads to various complications like neuropathy, nephropathy, retinopathy and cardiomyopathy; all of which poses a serious threat to mankind. Thus, there is need to explore the novel therapeutic or adjuvant therapy for the treatment of diabetes that our population will accept as lifelong therapy.

Almonds have been used and promoted for centuries in India for good health. *Prunus amygdalus* (sweet almond), has been shown to decrease blood sugar in normal rats. *Terminalia catappa* (Indian almond) has shown to decrease blood sugar in diabetic rats. There is little data indicating effect of sweet almond and Indian

almond in diabetes, not much work is reported regarding their mechanism of action and effect on diabetes induced complications. Therefore, the present work is planned to study the effect of two types of almonds in diabetes and their effect on diabetes induced cataract (retinopathy) and nephropathy.

Objectives of the proposal: To study the effect of *Terminalia catappa* and *Prunus amygdalus* on:

(i) Blood sugar level in diabetic rats

(ii) Various parameters for renal pathology, including Cystatin-C marker, and histopathological studies for diabetes induced nephropathy in rats

(iii) Diabetes induced cataract in rats

(iv) Antioxidant status, oxidative stress, to find the role of free radicals in diabetes and diabetes induced renal and cataract complications.

Method: Diabetes was induced in overnight-fasted wistar rats by single intraperitoneal (i.p.) injection of streptozotocin (STZ) (45mg/kg) in 0.1 M citrate buffer, pH 4.5. Blood glucose level by tail venepuncture was measured prior to induction of diabetes and 48 hour post STZ/vehicle injection. The weight of the rats and their urine output was measured every week.

Extract Administration: Rats were treated daily p.o. with hydro-alcoholic extract of the fruit of *Prunus amygdalus* 125 mg/kg p.o., for 12 weeks starting from the second day of injection of STZ. Hydroalcoholic extract of *Prunus amygdalus* fruit was dissolved in water and was administered by oral gavage. After completion of 12 weeks, rats were sacrificed by overdose of anaesthesia.

Results:

a) Blood Glucose: Blood glucose level has been shown to be significantly decreased in rats treated with *Prunus amygdalus,* from 8th week onwards.

b) Body Weight: Body weight has been shown to be significantly increased from 2nd week onwards in rats treated with *Prunus amygdalus*.

c) Urine Output: The rats treated with *Prunus amygdalus* showed decrease in urine output in comparison to diabetic control group.

d) Cataract Development: The lens of diabetic rats treated with *Prunus amygdalus* showed marked improvement in lens opacity compared to diabetic control group.

Blood, urine and kidneys have been stored for various biochemical and histological studies.

8. 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

Effects of two kinds of chronic stress were evaluated on immunological responses and the role of NO and signalling pathways involved were explored. Exposure to chronic predictable stress (CPS) for 14 days showed suppression in adaptive immune response (humoral immunity), as evident by decreased KLH-specific-IgG levels. Similarly, chronic unpredictable stress (CUS) also showed a decreased in KLH-specific-IgG levels. The results suggest that both CPS and CUS induced immunosuppression but the magnitude of suppression was more in the CUS relative to CPS. Both CPS and CUS for 14 days showed a decrease in cell mediated immunity, as evident by decreased footpad swelling response to KLH-antigen. Similar to that observed in humoral immune response, the magnitude of suppression was much more in the CUS relative to CPS, which suggests the differential degree of modulation of the delayed type hypersensitivity reaction depending on the predictability of the stress.

Exposure to both stress protocols, i.e. CPS and CUS increased IL-1β, IL-6 and decreased IFN-γ and IL-4 levels in the blood when challenged with KLH-antigen as compared to that in control immunized rats, which suggests a disregulated T_H1/T_H2 balance. Chronic stress exposure induced changes in behavioural activity

which was accompanied with elevated NOx levels (in the periphery/blood as well as center/brain). Further, increase in NOx levels in the CUS was more as compared to CPS, which is suggestive of involvement of NO in such adaptive immune responses after chronic stress. Neurobehavioural suppression in EPM test in response to chronic stress was effectively reversed by AMG, which suggests that NO arising from iNOS may be responsible for the enhanced anxiogenesis.

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

The effects of morphine were evaluated on neurobehavioral endocrinal, oxidative stress, cellula. The effects of morphine was assessed in neurobehavioral (elevated plus maze and open field tests), endocrinal (plasma corticosterone), oxidative stress (brain MDA and GSH levels), cellular (Hsp70 and Hsp90) and immunological (humoral and cell mediated responses) parameters. Further, opioid-NO interactions were studied by co-administration of morphine with NO modulators (NO mimetic and NOS inhibitor) in both normal and restraint stressed rats.

Acute restraint stress (RS x1), which was used as the experimental stressor, suppressed neurobehavioral and immunological responses. Whereas, endocrinal and cellular responses were exaggerated as compared to 'no stress' controls. Elevated plus maze (EPM) and Open field (OF) test were used to assess behavioral responses. RS induced suppression of behavioral activity in the EPM was attenuated by morphine while naltrexone showed opposite effects, and similar trend was seen in the OF test. Morphine, per se, induced enhanced open arm entries/time spent in the EPM test and increased ambulation and rearing and decreased latency of entry in the OF test – suggestive of anxiolytic effect. Plasma corticosterone levels were elevated after RS and morphine dose dependently attenuated this endocrinal stress response, whereas naltrexone aggravated this RS effect.

In the interaction studies, pretreatment with the NO precursor, L-arginine potentiated morphine induced reversal of neurobehavioral suppression in EPM and OF tests when both drugs were co-administered at sub-effective doses. On the other hand, L-NAME, the NO synthase inhibitor, blocked opioid agonist induced effects. Neurobehavioral suppression after acute RS was associated with reductions in brain NO metabolite (NOx) activity. Pretreatment with morphine reversed the suppressed NOx level towards that of controls. L-arginine increased the level of brain NOx and when co-administered at sub-therapeutic doses, it potentiated the effect of morphine. On the other hand, L-NAME showed opposite effect with morphine on brain NOx activity. RS induced anxiogenic responses were associated with suppression of anti-oxidant defense marker, GSH and elevation of MDA levels (an index of lipid peroxidation) in brain homogenates. Morphine administration reversed the RS induced changes in both oxidative stress markers. Sub-therapeutic dose of L-arginine with morphine showed synergistic effects. In SRBC immunized rats, chronic stress (RSx15) suppressed antibody titers as compared to controls suggestive of compromised humoral immune functions. Pretreatment with morphine (1mg/kg) attenuated such immunosuppression while morphine at the higher dose of 5mg/kg, had opposite effect. Chronic RS also suppressed cell mediated immunity (CMI) as cytokines levels IFN-γ(Th1) and IL-4 (Th2) were reduced and pretreatments with morphine (1mg/kg) reversed the response.

Taken together, this study showed that morphine differentially modulated various neurobehavioral (EPM and OF tests) and endocrinal (plasma corticosterone) responses during acute and chronic stress. Further, interactions involving NO, ROS and Hsp exert complex regulatory influences on these responses

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

The effects of UNIM-352, a polyherbal Unani formulation, were evaluated in experimental models of airway inflammation and remodelling, with an aim to elucidate the cellular and molecular mechanisms to validate its use in bronchial asthma. In the process, the effects of the polyherbal agent were assessed on various markers of (a) airway inflammation and immunity (b) airway remodelling, (c) bronchial hyperresponsiveness to spasmogens and (d) oxidative stress parameters in ovalbumin sensitized and challenged rats.

Wistar rats were immunized on day 1 with ovalbumin and $Al(OH)_3$ and challenged with aerosolized ovalbumin from day 15 to 21. Ovalbumin immunized and challenged rats were treated with vehicle, UNIM-

352 (200 and 400 mg/kg) or prednisolone (10 mg/kg). After 24 h of last challenge, blood, broncholveolar lavage (BAL) fluid and lungs were collected and assayed for markers of oxidative stress. Oxidative stress results from the imbalance between pro-oxidant factors and anti-oxidant defense mechanisms of the body and accounts for morbidity and mortality in chronic refractory asthma. 8-isoprostanes are stable markers of lipid peroxidation in the airways. UNIM-352 (200 and 400 mg/kg) reduced the levels of 8-isoprostanes in both blood and BAL fluid as compared to vehicle treated control group of rats, which suggested its protective effect against reactive oxygen species. The 8-OHdG formation is the main DNA modification induced by reactive oxygen species and may be responsible for DNA base mutations and oxidative DNA damage observed in lung inflammation. UNIM-352 also attenuated the levels of 8-OHdG in both blood and BAL fluid as compared to controls, which suggests the protective effect of UNIM-352 against reactive oxygen species and oxidative DNA damage. These results were also comparable with the standard antioxidant, α-tocopherol.

11. 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

The effect of *Withania Somnifera* root extract and Withaferin A were compared on restraint stress induced neuroendocrine parameters: Plasma Corticosterone levels, Immune responses: (i) humoral immune response, (ii) cell mediated immune response (DTH Assay), (iii) IgE levels in the blood *Withania somnifera* (WS) is extensively used as Rasayana in Ayurveda for various immune related indications. Exploring plant-derived anti-inflammatory and immuno-modulatory agents is a high priority area in natural products research. Pretreatment with *Withania somnifera* (100 and 400mg/kg) L-arginine (500mg/kg) resulted in attenuations in the RS-induced suppression of antibody response. L-NAME (50 mg/kg) administered prior to RS, resulted in (51%) suppression of the anti-SRBC antibody responses as compared to that seen with RS alone. In the interaction studies, combined treatment with sub threshold doses of *Withania somnifera* (100 mg/kg) and L-arginine (500 mg/kg) resulted in no significant change in the hemagglutination scores as compared to RS. Pretreatment with Withaferin A (1 and 4 mg/kg) resulted in dose dependent reversal (58.2 and 60%) of the RS-induced suppression of antibody response. In the interaction studies, combined treatment with sub-threshold dose of Withaferin A (1 mg/kg) and L-arginine (500 mg/kg) resulted in no siginificant change in the hemagglutination scores (80%) as compared to RS.

As in the case of the humoral immune response, exposure to RS(x5) led to significant decrease in DTH response as compared to immunized 'no RS' group. Pretreatment with *Withania somnifera* (100 and 400mg/kg) and L-arginine (500mg/kg) induced attenuations in the RS-induced suppression of DTH response (58, 69 and 81.81% respectively). When L-NAME (50 mg/kg) was administered prior to RS, the DTH responses were further suppressed (45.3%) as compared to that seen with RS alone. In the interaction studies, combined treatment with sub threshold doses of *Withania somnifera* (100 mg/kg) and L-arginine (500 mg/kg) significantly potentiated the DTH scores (88%). Pre-treatment with Withaferin A (1 and 4 mg/kg) induced attenuations in the RS-induced suppression of DTH response (60 and 80.1 respectively). In the interaction studies, combined treatment with sub threshold doses of Withaferin A (1 mg/kg) and L-arginine (500 mg/kg) significantly potentiated the DTH scores (98%). IgE levels is an immunomodulatory marker in IgE-mediated anaphylaxis studies and in the present study, exposure to RS(x5) increased the Ig E levels (154.6%) as compared to controls. Pretreatment with WS (100, 400mg/kg) dose dependently reversed this increase (146.0 and 108.7% respectively). L-arginine (500mg/kg) decreased (106%) Ig E levels in these immunized rats, whereas, prior L-NAME (50 mg/kg) administration resulted in increased Ig E levels (174.6%) by RS. In the interaction studies, combined treatment with sub-effective doses of L-arginine (500mg/kg) and WS (100mg/kg) further decreased Ig E content (98.8%) in such interactions. Pretreatment with Withaferin A (1 and 4mg/kg) dose dependently reversed this increase (137.8 and 106.8% respectively). In the interaction studies, combined treatment with sub-effective doses of L-arginine (500mg/kg) and Withaferin A (1mg/kg) further decreased Ig E levels (95.2%) in such interactions.

Plasma corticosterone levels is a stress specific marker and in the present study, exposure to RS led to increase in plasma corticosterone levels as compared to controls in SRBC immunized rats. Pretreatment with *Withania somnifera* (100mg/kg and 400mg/kg), showed different degrees of inhibition of this response. L-Arginine (500mg/kg) reduced plasma corticosterone levels (55%) in immunized and stressed rats, whereas,

L-NAME (50 mg/kg) aggravated this response (260%) as compared to control. In the interaction studies, combined treatment with L-arginine (500 mg/kg) prior to *Withania somnifera* induced potentiating effects (25%) on plasma corticosterone. Pretreatment with Withaferin A(1mg/kg and 4mg/kg), showed different degrees of inhibition of this response (50 and 32% respectively). In the interaction studies, combined treatment with L-arginine (500 mg/kg) prior to Withaferin A induced significant decreased levels (14.2%) on plasma corticosterone.

12. Studies on the anti-inflammatory and immunomodulatory effects of *Albizia lebbeck and Solanum xanthocarpum* in experimental models of bronchial asthma

In recent decade, complementary and alternative medicine approach using medicinal plants for prevention and treatment of diseases have been gaining importance. Herbal drugs are rapidly emerging as safer alternatives/adjuncts in several chronic diseases and this has been shown in some inflammatory disorders. The study has been designed to evaluate the effects of *Albizia lebbeck* and *Solanum xanthocarpum* in experimental models of airway inflammation, bronchial hyperreactivity and airway remodelling and possible cellular and molecular mechanisms involved therein. Rats were actively sensitized with an intraperitoneal-injection of a suspension containing 40 mg of ovalbumin (OVA) and 2mg of aluminium hydroxide**.** Fifteen days after sensitization, rats were challenged by exposure to a 1% OVA in saline aerosol once daily for 20 min per day for 8 consecutive days. Blood and bronchoalveolar lavage (BAL) were collected and measurement of various biochemical and immunological markers were performed to validate the model. BAL fluid was obtained by intra-tracheal instillation, and the lungs were lavaged three times with 0.8mL of sterile saline. The BAL fluid from each sample was centrifuged and supernatants were stored at −80 ºC for subsequent analysis of cytokine levels. Analysis of serum MDA, GSH and NOx data revealed that there was significant difference across all groups. The ovalbumin sensitized and challenged rats have higher MDA and NOx and lowered GSH level in comparison to normal rats. The administration of reference drug, prednisolone significantly attenuated these level in comparison to that in positive control (OVA sensitized and challenged) rats. Administration of *Albizzia lebbeck* at different doses (100, 200 and 400 mg/kg) significantly reduced the level of MDA and enhanced GSH in these groups in comparison to positive control rats, and the maximum reduction was seen at the dose of 200 mg/kg rats.

13. A clinical study to evaluate the effects of yoga on pulmonary functions, cellular and molecular markers and quality of life in patients of bronchial asthma

The use of traditional systems like yoga is being encouraged by the Department of AYUSH, Govt. of India, because of its efficacy, low cost, and safety. Further, their validation by using modern scientific methodology is also being promoted. Since current asthma therapy is steroid dependent and refractory cases are reported, it is important to investigate possible alternative modes of therapy to complement existing treatments. Yoga has been shown to maintain the homeostasis and increase the resilience against several inflammatory and infectious diseases. This will be a prospective, open label, randomized, parallel design study, in patients of bronchial asthma, selected from the outpatients department of the Vishwanathan Chest Hospital, Vallabhbhai Patel Chest Institute, Delhi. The study is being carried out jointly by the Department of Pharmacology and Vishwanathan Chest Hospital, Vallabbhbhai Patel Chest Institute. This has been initiated after obtaining the approval of the Institutional Ethical Committee and will be conducted according to the ICH-GCP guidelines.

Patients with mild to moderate asthma as diagnosed by the physician on the basis of clinical history/ symptoms and pulmonary functions test (PFT) findings, visiting OPD of Vishwanathan Chest Hospital, Vallabhbhai Patel Chest Institute (VPCI), Delhi are enrolled for the study and written informed consent as per performa is obtained prior to the commencement of study.. At least 100 fresh patients of mild to moderate bronchial asthma will be enrolled for the study after taking into consideration the laid down exclusion and inclusion criteria. Assessment of symptoms, pulmonary functions, cellular and molecular markers and quality of life parameters are done in these patients on day 1 (baseline levels). The patients are informed about the aims and methods of the study, expected duration of their participation, the benefits that are expected from the research, and potential risks associated with the study. The asthmatic patients are randomized into two groups. In Group I patients are given conventional anti-asthma treatment and in Group II patients receive additionally Yoga intervention for 50 minutes daily. Pulmonary functions, Oxidative stress markers, Fractional exhaled nitric oxide (FeNO), and Quality of Life will be assessed in all patients at baseline and at end of every month, for 3 months of treatment.

Physiology

Research

1. Continuation of the work on modulation of hypoglossal motoneuron activity by NMDA receptors in rats exposed to chronic intermittent hypoxia (CIH)

To investigate the effects of CIH alone and CIH with N-acetylcysteine (NAC) supplementation on the expressions of hypoxia inducible factor-1α (HIF-1α), nuclear factor-κB (NF- κB), and phosphorylated transcriptional factor cAMP responsive element binding (p-CREB) protein in the hypoglossal nuclei of rats.

Male Wistar rats were divided into four groups: Control, CIH, Control+NAC, and CIH+NAC. CIH and CIH+NAC groups underwent a total of 48 cycles of 2 min of hypoxia (reducing the inspired oxygen fraction from 21% to 9 ± 1%) followed by 8 min of fresh air, 8 h daily, for 35 days. NAC was administered orally (3 mmol/kg b.w.) daily from 7 days prior to start of experiment in Control+NAC and CIH+NAC groups and continued during the exposure period of 35 days. Subsequently, the region of the brain containing the hypoglossal (XII) nuclei were dissected out and used for protein expression studies using western blotting and immunohistochemistry.

Exposure to CIH significantly increased the expression of HIF-1α and NF- κB in the XII nucleus. There was apparently no change in the phosphorylation of CREB. Supplementation with NAC during CIH attenuated the expression of both HIF-1α and NF- κB significantly, when compared to CIH group. No significant changes were observed for p-CREB expression in CIH+NAC group in comparison to CIH group.

CIH increases expression of transcriptional factors which are regulators and activators of hypoxia-induced neuroinflammatory cascades, which may result in the decreased hypoglossal activity observed previously. Supplementation with the antioxidant NAC may ameliorate the CIH-induced oxidative stress and prevent the activation of neuroinflammatory stress pathways associated with CIH.

2. Continuation of the studies on the effect of chronic intermittent hypoxia (CIH) on contractile properties of the upper airway muscles in rats

Previously, it was observed that with CIH, there was oxidative stress, upper airway muscle dysfunction and increased fatigability of the geniohyoid muscles. The present study examined whether these changes could be reversed by oral intake of the anti-oxidant N-acetylcysteine (NAC).

Adult male Wistar rats were divided into four groups: Control, CIH, Control+NAC, and CIH+NAC. CIH and CIH+NAC were exposed to CIH for 8 h per day with an automated CIH system for 35 days. Both Control+NAC and CIH+NAC received NAC orally (3 mmol/kg b.w.) for 42 days starting from 7 days prior to the exposure to CIH or room air in the control group. After the exposure, the geniohyoid muscles along with the hypoglossal nerve were removed for contractile studies. The fiber types in the geniohyoid muscle were assessed by myofibrillar ATPase histochemical assay.

CIH alone caused a significant increase in geniohyoid muscle fatigue and a significant decrease in its recovery from fatigue along with significantly reduced type 1 (slow, fatigue-resistant) fibers and increased type 2B (fast, fatigable) fibers. With CIH and NAC, the fatigue in the geniohyoid muscle was reduced significantly, the recovery from fatigue improved and there was the conversion from Type 2B to Type 1 fibers. Anti-oxidant intake could reduce the collapsibility of the upper airway muscles during CIH.

3. Continuation of the studies on higher nervous control of pulmonary renal reflex

To explore the spinal pathway for this reflex. Experiments were performed on anesthetized and artificially ventilated New Zealand white rabbits. After creating an isolated venous pouch in the right external jugular vein in the neck for causing pulmonary lymphatic obstruction (PLO), the urinary bladder was cannulated for collection of urine. The rabbit was placed in the prone position and its vertebral column was exposed. Drugs were administered intrathecally into the lumbar segments (L2-L4) through a cannula connected to a Hamilton syringe. The drugs that were administered were: the glutamate receptor antagonist kynurenic acid (25 mmol/ 200 nl) and vasopressin receptor1 antagonist SR 49059 (10 nmol/200 nl).

Before kynurenic acid administration into the spinal cord, PLO increased urine flow significantly without any significant change in mean arterial blood pressure, heart rate and urinary sodium and potassium concentrations. After kynurenic acid administration into the lumbar segments (L2-L4) of the spinal cord, there were no significant changes in the basal urine flow, mean arterial blood pressure and heart rate. In this background, when PLO was performed in the same rabbit, it did not produce a significant increase in urine flow.

Before SR 49059 administration into the above spinal segments, there was a significant increase in urine flow during PLO which occurred without any significant change in mean arterial blood pressure, heart rate and urinary sodium and potassium concentrations. After, SR 49059 administration, there were significant increases in basal urine flow and urinary sodium concentration and there was a significant decrease in mean arterial blood pressure in the control period. The rest of the parameters did not change significantly. When PLO was performed in this background, it still caused a significant increase in urine flow which was significantly lower when compared to that elicited before SR 49059 administration.

There is a discrete glutamatergic pathway both in the paraventricular nucleus (previous results) and the spinal cord in the reflex diuresis associated with PLO. It is also modulated by the spinal vasopressin.

4. To investigate the role of Juxta-pulmonary capillary (J) receptors in reduction of exertional breathlessness with supplemental O2 routinely received by class of ILD patients who desaturate on exertion

Interstitial lung diseases (ILD) are a diverse group of lung diseases that are characterized by chronic inflammation and progressive fibrosis of the pulmonary interstitium. Clinically, it is characterized by early fatigue, non-productive cough, exercise limitation and exertional dyspnea & desaturation. ATS (American Thoracic Society) recommends use of supplemental oxygen to patients who have documented exertional desaturation. Supplemental oxygen has been shown to increase functional capacity and reduction in dyspnea and leg fatigue.

The mechanisms of reduction in exertional breathlessness after supplemental oxygen depend upon multiple factors and are poorly understood. One of the proposed mechanisms is alteration in the central perception of dyspnea which could be due to alteration in threshold of 'J' receptor sensitivity. Since earlier studies have not investigated this aspect, present study is planned to examine whether improvement in oxygen saturation in ILD patients influence 'J' receptor output.

5. Comparison of low and high volume of high intensity interval training on heart rate variability in sedentary collegiate females

Sedentary lifestyle and poor cardio-respiratory fitness in females are associated with metabolic syndrome and could also be precursor to cardiovascular diseases and increased mortality. Heart Rate Variability is a non-invasive, practical and reproducible measure of autonomic nervous system function. High intensity interval training (HIIT) has been shown to have a significantly greater impact on autonomic nervous system and it is more effective for enhancing cardiac vagal control than a low intensity exercise program. However, dose-response of HIIT on this important marker of cardiac autonomic regulation (HRV) warrants further research. Present study aims to determine the effect of low and high volume of high intensity interval training on heart rate variability in sedentary collegiate females.

Preliminary data suggests that the high volume high intensity interval training is more effective in improving the cardiac autonomic control via the frequency domain variables of the heart rate variability than the low volume high intensity interval training. Also the high volume high intensity interval training reduced the fat mass and body fat percentage more than the low volume high intensity interval training. Low volume high intensity interval training was found to be more effective in improving the maximal oxygen consumption (VO2max) and lower leg muscle strength in sedentary collegiate females.

Pulmonary Medicine

(Including Pulmonary Medicine, Cardio-respiratory Physiology and Respiratory Allergy and Applied Immunology)

The Department is involved in the patient care (Outdoor and Indoor) at Viswanathan Chest Hospital (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. The occurrence of bronchial anthracofibrosis (BAF) in respiratory symptomatics with history of exposure to biomass fuel smoke

The term anthracofibrosis has more recently been coined to describe a distinct entity of inflammatory bronchial stenosis with overlying anthracotic mucosa. Bronchial anthracofibrosis (BAF) was primarily seen in elderly women without exposure to coal dust or tobacco smoke. This was associated with active tuberculosis, which was confirmed subsequently by bacteriological or histopathological examination in more than 60 % of the patients. Though it was initially thought to occur due to active or old tuberculosis, recent evidence suggests chronic biomass fuel exposure to be the most important etiological factor. Biomass fuel is used extensively for cooking and heating in rural households in India. However, this disease entity is yet to be highlighted and there is only a single case report from India. In view of this, an attempt will be made to ascertain the occurrence of bronchial anthracofibrosis (BAF) in respiratory symptomatics with history of exposure to biomass fuel smoke.

Consecutive patients with respiratory symptoms, never smokers, with history of biomass fuel smoke exposure were enrolled. They underwent spirometry, CT- thorax and fiberoptic bronchoscopy. Biopsy and bronchial aspirate were taken for appropriate histopathological examination. On the basis of findings on bronchoscopy patients were divided as follows: Group 1: "Bronchial anthracofibrosis", Group 2: "Bronchial anthracosis without fibrosis" and Group 3: those with no abnormalities detected on bronchoscopy.

The 60 enrolled patients with a mean age of 58.3 ± 9.96 years underwent FOB and based on the findings, 24/60 (40%) patients were categorised as BAF (Group A), 17/60 (28.3%) as bronchial anthracosis (Group B) and 19/60 (31.7%) had normal tracheobronchial appearance. Spirometry was performed in 52 out of 60 patients (In BAF group 17/24 patients). The percentage of predicted values of FVC, FEV_1, FEV_1/FVC, TLC and DLCO in 17 patients of Group A (BAF) were 56.2 ± 38.5%, 47.5 ± 34.7%, 49.4 ± 33.5%, 78.8 ± 13.4% and 69.9 ± 25.7% respectively. The post bronchodilator low value of FEV_1/FVC in BAF group was in favour of obstructive pattern and the low value of mean FEV_1 (47.5%) showed that most patients of BAF could be classified into the severe stage. The mean distance covered in the Group A was 235.4 meters while in Group B and C it was 331.8 metres and 270 meters respectively. The patients of BAF covered less distance in 6 minutes compared to the patients in the other two groups with statistically significant difference (p=.002). Consolidation was the most common finding on chest radiograph seen in 8/24 (33.3%) in this group, reticulonodular pattern and Ill-defined opacity abutting the right cardiac border occurred in 7/24 (29.2%) patients and linear shadows were seen in 16/24. HRCT thorax revealed that in patients with BAF, segmental collapse and consolidation were found in 13/24 (54.2%) followed by fibrotic lesions in 11/24 (45.8%), bronchial narrowing in 7/24(29.3 %), multifocal bronchial stenosis and peribronchial cuffing in 5/24 (20.8%) patients. The right middle lobe bronchus was most commonly involved in 15/24 patients (62.5%) of bronchial anthracofibrosis followed by right upper lobe bronchus 10/24 (41.7%) and left upper lobe bronchus in 7/24 (29.2%) subjects. In the patients of anthracosis, the right middle lobe bronchus and the left upper lobe bronchus were equally involved in 8/17(47.1%) patients followed by right upper lobe bronchus 7/17(41.2%) subjects and left lower lobe bronchus in 4/17(23.5%) patients.

BAF was associated with obstructive pulmonary defect, lower six-minute walk distance with segmental collapse and consolidation as most common HRCT finding.

2. Clinico-radiological and functional assessment of respiratory symptomatics with either exposure to biomass fuel smoke or tobacco smoking

Biomass fuel smoke exposure and smoking are two major causes of obstructive airway disease. A study was undertaken for Clinico-radiological and functional assessment in respiratory symptomatics with either exposure to biomass fuel smoke or tobacco smoking.

A total of 85 consecutive respiratory symptomatics with either exposure to biomass fuel smoke (Group 1: 41 never smokers) or tobacco smoking (Group 2: 44) with a clinical diagnosis of COPD were enrolled. Both groups, age matched with no obvious chest radiographic abnormalities, underwent PFT, six-minute walk test and HRCT thorax.

The mean age in Groups 1 and 2 were 58.1±9.5 v/s 59.6±7.9 years respectively. In Group 1, all 41 patients were females while in Group 2, there were 39 males and 5 females. Cough was the most common 39/41(95.1%) symptom in Group 1 while dyspnoea was predominant symptom 40/44(90.9%) in Group 2. Post bronchodilator FEV_1 (64±18.8% v/s 54.3±18.9%; P=0.019) and FEV_1/FVC (67.0±20.6 v/s 46.8±11.3; P=0.0001) were significantly lower in Group 2. Six-minute walk distance was significantly less in Group 1 (282.9±89.6 v/s 337.9±75.1; P=0.0028) as compared to Group 2. Diffuse fibrotic bands 24/41(58.5%) and bronchial wall thickening 16/41(39%) were commonest imaging finding in Group 1 while emphysematous changes were predominantly 36/44(81.8%) seen in Group 2.

Patients in Group 1 had more of a restrictive pattern on PFT and exercise tolerance was significantly lower. Patients in Group 2 had more emphysematous changes with poorer lung functions but a better functional status.

3. Occurrence and impact of bronchiectasis in patients with chronic obstructive pulmonary diseases (COPD)

Chronic obstructive pulmonary diseases and bronchiectasis are two different diseases that occur separately, but overlap. The exact prevalence of bronchiectasis in COPD patients is not known. To study occurrence and impact of bronchiectasis in patients with COPD, this study was planned. This study was conducted on patients attending out-patient department of the Institute. 50 patients with diagnosis of COPD (as per GOLD criteria) were enrolled. These patients were subjected to history taking, spirometry, questionnaires (mMRC dyspnea score, CAT score) and HRCT thorax.

Out of 50 patients, 31 (62%) were males and 19 (38%) were females. Among these 25 (50%) were smokers and 25 (50%) had exposure to biomass fuel smoke. Patients in GOLD class 1 (mild), 2 (moderate), 3 (severe), 4 (very severe) were 8 (16%), 13 (26%), 19 (38%), 10 (20%) respectively. Patients in GOLD category A, B, C and D were 4 (8%), 12 (24%), 3 (6%) and 31 (62%) respectively. Bronchiectasis on HRCT was found in 20 (40%) patients. Patients with bronchiectasis significantly had more number of exacerbations (2.4 ± 0.17 *versus* 1.3 ± 0.17, P <0.0001) and severe functional impairment (greater mMRC [2.65 ± 0.22 *versus* 1.83 ± 0.14, P = 0.0017] and CAT score [19.95 ± 1.74 *versus* 14.10 ± 1.05, P=0.0036]) as compared to patients without bronchiectasis. Bronchiectasis was more common in smokers and as compared to patients exposed to biomass fuel smoke (11 [44%] *versus* 9 [36%]) but the difference was not significant statistically (p=0.56).

Bronchiectasis on imaging in COPD patients is common. Presence of bronchiectasis is associated with increased symptom severity and more exacerbations.

4. Serum vitamin D levels in patients with allergic rhinitis, chronic rhinosinusitis and nasal polyposis and its association with quality of life

Allergic rhinitis (AR), sinusitis and nasal polyps (NP) are conditions known to coexist frequently. AR and sinusitis are known to cause impairment in the quality of life and activity limitation. Studies have shown that low levels of vitamin D have been associated with an increased prevalence of AR. The serum levels of vitamin D in patients with AR and chronic sinusitis and its effect on quality of life has hitherto not been studied in India.

A total of two hundred and thirty-two patients with a clinical diagnosis of allergic rhinitis, attending the outpatient clinic at Vallabhbhai Patel Chest Institute, University of Delhi, Delhi were enrolled in the study. In

addition, 53 healthy human volunteers functioned as controls. Out of 232, 29 patients were excluded from the study as per the inclusion and exclusion criteria. All patients underwent CT-PNS to evaluate for the presence of sinusitis and NP. Patients were categorized into four groups: AR, AR with sinusitis, AR with sinusitis and nasal polyps and healthy human volunteers functioning as control. Patients with AR were also categorised into "Sneezers and Runners" and "Blockers" as per their predominant symptoms. The CT changes were evaluated according to the Lund-Mackay system. In addition, serum vitamin D levels were assessed using ELISA technique on automated ELISA reader. All patients were asked to respond to interviewer administered questionnaires: Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ), Visual analogue scale, Sino Nasal Outcome Test-22 (SNOT-22), Allergic Rhinitis General Questionnaire. Comparisons were drawn among the different groups using appropriate statistical analysis.

The mean serum vitamin D levels in patients of allergic rhinitis (n=203) were 15.18$\pm$10.64 while that in healthy volunteers was 26.49$\pm$20.95 with a significant difference between the two (P<0.0001). Serum vitamin D levels in patients in group 1 were 18.77 $\pm$ 11.71 ng/ml. Vitamin D levels in patients in group 2 was 14.83 $\pm$ 10.41 ng/ml while in group 3 it was 10.56 $\pm$ 6.13 ng/ml. In group 4 among the healthy adult volunteers, serum vitamin D levels were 26.49 $\pm$ 20.95 ng/ml. There was a significant difference in vitamin D levels among the four groups (P<0.001). The serum vitamin D levels in "sneezers and runners" and "blockers" revealed a mean value of 17.23$\pm$12.01ng/ml among "sneezers and runners" and 12.148$\pm$7.29 ng/ml among "blockers with a significant difference. The mean LMS score in group 2 was 6.197 $\pm$ 3.66 while in group 3 was 6.23 $\pm$ 4.29 and the control group had a mean score of 0.20 $\pm$ 0.49 with a significant difference (P<0.0001). There was a significant difference in the mean scores of global VAS, SNOT-22 and RQLQ among three groups. In addition, an inverse correlation was established between vitamin D levels and the QoL scores which was significant.

The study reported that vitamin D levels were significantly lower in patients with AR as compared to controls. In addition, low vitamin D levels were associated with a poor QoL.

5. Occurrence of bronchiectasis in patients with COPD: smokers *versus* never smokers and the association of upper airway symptoms with quality of life in these patients

COPD and bronchiectasis are two different diseases that occur separately but can coexist. The exact prevalence of bronchiectasis in COPD patients is not known. Literature on occurrence of bronchiectasis in never smoker COPD patients is lacking.

One hundred consecutive patients with diagnosis of COPD will be enrolled and will be divided into two groups: Group I (n=50) consisting of patients diagnosed as COPD who are/were smokers and Group II (n=50) consisting of patients diagnosed as COPD who are never-smokers. These patients will undergo HRCT chest & NCCT paranasal sinuses along with routine investigations. They will be asked to respond to various questionnaires to assess severity of symptoms and QoL. The enrolled subjects shall be evaluated on the above-mentioned parameters and clinical parameters. The study will generate data on occurrence of bronchiectasis in smokers with COPD and never smokers with COPD. This study will also provide information regarding influence of upper airway symptoms on quality of life (QoL) in these two groups of patients.

6. Prediction equations for spirometry for children from north India

Most available prediction equations for spirometry for Indian children are now outdated and have limited utility due to technological advances in equipment and revisions in methodology. Further, all these equations were linear and may not be appropriate models as growth of lung function in children is non-linear. To develop prediction equations for spirometry for children from north India using current international guidelines for standardization of spirometry, a cross-sectional study was carried out in normal children of north Indian parentage between ages 6 to 17 years. After screening for normal health, spirometry was carried out with recommended quality assurance according to current guidelines in 365 boys and 305 girls. Both Linear and non-linear prediction equations were developed using multiple regression analysis. Final models were selected on the basis of the highest coefficient of multiple determination (R^2) and statistical validity. The equations for the main parameters were as follows: Boys, Ln FVC = -1.687+0.016*height +0.022*age; Ln FEV_1 = -1.748+0.015*height+0.031*age. Girls, Ln FVC = -9.989 +(2.018*Ln(height)) + (0.324*Ln(age)); Ln FEV_1 = -10.055

+(1.990*Ln(height))+(0.358*Ln(age)). Nonlinear regression yielded substantially greater R^2 values compared to linear models except for FEF_{50} for girls. Height and age were found to be the significant explanatory variables for all parameters on multiple regression with weight making no significant contribution.

7. Factors determining outcomes in acute exacerbations of chronic obstructive pulmonary disease

Consecutive patients admitted in ward or the intensive care unit (ICU) with the primary diagnosis of an acute exacerbation of COPD over a period of one year to cover all seasons were included. Details of symptom development, smoking and other exposures, co-morbidities, complications, and other relevant information were collected. Assessment of severity of exacerbation were carried out to decide the need for ICU admission and ventilatory support. We found mortality to be 8%. Factors found to be significant in our study with respect to mortality being: acidosis, hypercapnia, percentage predicted of FEV_1 (post bronchodilator), higher potassium, higher blood sugar, presence of respiratory isolate and need for antibiotic change.

8. Impact of Indian equations on spirometry interpretation

Use of Caucasian equations for interpretation of spirometry data is a common practice in Indian laboratories. Use of inappropriate equations results in errors in interpretation. We carried out a study to examine the concordance between Caucasian and Indian equations developed by us for interpretation of spirometry test results. Data of 1945 consecutive spirometry tests carried over six months was analysed. Values below the lower limits of normal were considered abnormal. The proportions of patients with different patterns of spirometry by the two equations were compared and agreement between these was evaluated. FVC, FEV_1 and FEV_1/FVC ratio were reduced in 1034 (53%), 1290 (66.2%) and 831 (42.6%) patients, respectively, by the Caucasian equations, and in 557 (28.6%), 698 (35.8%) and 698 (35.8%) patients, respectively, by the Indian equations. With Caucasian equations, the distribution of patients was: normal, 587 (30.2%); obstructive, 378 (19.4%); restrictive, 527 (27.1%) and mixed, 453 (23.3%), whereas it was 947 (48.7%), 441 (22.7%), 300 (15.4%) and 257 (13.2%), respectively, with Indian equations ($p<0.0001$). Only 1297 (66.7%) patients were classified in the same category by the two equations. The Kappa statistic was 0.55 indicating only a moderate agreement. Use of Caucasian equations to interpret spirometry data in Indian patients results in substantial misclassification. We recommend that the new Indian equations should be used to interpret spirometry data for Indian patients.

9. Prediction equations for diffusing capacity (transfer factor) of lung for north Indians

Prediction equations for diffusing capacity of lung for carbon monoxide (DLCO), alveolar volume (VA) and DLCO/VA using the current standardization guidelines are not available for Indian population. The present study was carried out to develop equations for these parameters for north Indian adults and examine the ethnic diversity in predictions. DLCO was measured by single-breath technique and VA by single-breath helium dilution using standardized methodology in 357 (258 males, 99 females) normal non-smoker adult north Indians and DLCO/VA was computed. The subjects were randomized into training and test datasets for the development of prediction equations by multiple linear regressions and for validation, respectively. For males, the following equations were developed: DLCO, -7.813+0.318*ht-0.624*age+0.00552*age^2; VA, -8.152+0.087*ht-0.019*wt; DLCO/VA, 7.315-0.037*age. For females, the equations were: DLCO, -44.15+0.449*ht-0.099*age; VA, -6.893+0.068*ht. A statistically acceptable prediction equation was not obtained for DLCO/VA in females. Therefore, it was computed from predicted DLCO and predicted VA. All equations were internally valid. Predictions of DLCO by Indian equations were lower than most Caucasian predictions in both males and females, and greater than the Chinese predictions for males. This study has developed validated prediction equations for DLCO, VA and DLCO/VA in north Indians. Substantial ethnic diversity exists in predictions for DLCO and VA with Caucasian equations generally yielding higher values than the Indian or Chinese equations. However, DLCO/VA predicted by Indian equations is slightly higher than that by other equations.

10. Indoor air pollution and asthma in children at Delhi, India

Several studies in developed countries have shown association between indoor air pollution and asthma in children. The present research was undertaken to study this association at Delhi, India This study took place at Delhi, capital of India. Eight locations based on the source of pollution such as industrial, residential

and villages were included. Recording of the demographic profile and clinical examination of each child was conducted at their residence. Indoor SO2, NO2 and SPM (suspended particulate matter) levels were measured by using handy air sampler (low volume sampler).

A total of 3104 children were examined of which 60.3% were males and 39.7% were females. 32.4% children were exposed to environmental tobacco smoke. 31.5% children's families were using biomass fuels for cooking. History of respiratory symptoms included cough (43.9%), phlegm production (21.9%), shortness of breath (19.3%) and wheezing (14.0%). 7.9% children were diagnosed as having asthma, which was highest in industrial areas (11.8%), followed by residential (7.5%) and village areas (3.9%). The mean indoor SO2, NO2 and SPM levels were 4.28±4.61 mg/m^3, 26.70 ± 17.72 mg/m^3 and 722.0 ± 457.6 mg/m^3 respectively. Indoor SPM was the highest in industrial area followed by residential area and urban village area. Indoor SPM level was significantly ($p < 0.001$) higher in the asthmatic children's houses.

This study suggests that industry plays an important role in increasing the concentration of indoor SPM and occurrence of asthma in children in developing countries like India.

11. Inflammatory response to subcutaneous allergen-specific immunotherapy in patients with bronchial asthma and allergic rhinitis

Bronchial asthma (BA) and allergic rhinitis (AR) are chronic inflammatory disorders of the airways. The allergic response is driven by the production of different immunological effector cells cytokines like interleukin-5 (IL-5) and IL-6 among others. Subcutaneous allergen-specific immunotherapy (SCIT) modifies basic immunological mechanisms, reducing IL-5 production. The effect of SCIT on levels of IL-6 is undetermined.

The aim is to study the changes in immunological parameters that follow SCIT in patients suffering from BA and/or AR.

Twenty-nine patients (18-48 years, mean 25.5 years) diagnosed with BA and/or AR were evaluated for allergic sensitivity using skin prick test (SPT). The patients were started on standardized treatment for BA and AR as per global initiative for asthma and AR and its impact on asthma guidelines, respectively. SCIT was initiated as per the standard Indian guidelines. IL-5 and IL-6 levels were obtained at 0, 3 and 6 months during the course of SCIT and the response was evaluated using Friedman test.

Twenty-nine patients; 16 males and 13 females were evaluated and initiated on SCIT. The decreasing order of antigen sensitivity on SPT was mosquito (65.5%), housefly (58.6%), female cockroach (58.6%), male cockroach (48.2%), moth (34.4%) and house dust mite (17.2%). The IL-5 and IL-6 levels, for 0, 3 and 6 months were compared, and it was noted that with an increase in duration of treatment, the levels of inflammatory markers significantly decreases ($P = 0.003$). On comparison, the inflammatory response between males and females, duration of symptoms and number of positive antigens was not statistically significant.

Immunologic changes associated with immunotherapy are complex and allergic patients suffering from asthma, and/or rhinitis showed a significant reduction in levels of inflammatory markers.

12. Atmospheric pollen count in North Delhi region

Airborne pollen data varies from place to place due to floristic diversities in a geographical region. In Delhi, a variety of trees, weeds, and grasses produce a variety of pollens, and climatic conditions are also known to affects the pollen concentration. This study was designed to describe the prevalence of pollen in North Delhi region during the year 2013-2014.

Atmospheric pollen was collected on daily bases by using Volumetric Burkard (UK) 24 h air sampler with the speed of 10 L/min airflow. Pollen was counted with light microscopy (Olympus, Japan) and the average monthly pollen count was studied from May, 2013 to April 2014.

A total of 42,232 pollens were collected for 1-year (2013-2014). The maximum and minimum pollen was counted for year 2013 in the month of September (4805 pollens) and December, (1973 pollens), respectively. The average pollen concentration started increasing in the year 2013 from the months of May to June (239.33,

279.38 pollen/m^3 /month) and started falling in 2013 in months of July to August (227.47, 148.60 pollens/m^3 /month). The pollen concentration again started increasing in year 2013 in the months of September, October and November (282.65, 275.73, and 245.44 pollens/m^3 /months) and started declining in December 2013 till the months of next year 2014 January, February, (131.53, 133.82, 139.56 pollens/m^3 /months). An increase in pollen concentration was noted in 2014 in the months of March and April (274.31, 263.75 pollens/m^3 /month). The humidity correlated significantly with the average pollen count in the year 2013 in June (P = 0.025, r = "0.556), July (P = 0.00, r = "0.848), August (P = 0.033, r = "0.552), September (P = 0.007, r = "0.627) and October (P = 0.001, r = "0.755). The average temperature correlated significantly with the average pollen count in 2013 October (P = 0.042, r = "0.530).

The current study provides a preliminary data of pollen count in North Delhi region. The results will provide information to the allergy practitioners in order to advice avoidance of exposure to allergens

13. A comparative study of skin prick test *versus* serum-specific IgE measurement in Indian patients with bronchial asthma and allergic rhinitis

Skin prick testing (SPT) is the 'gold standard' in the assessment of allergic sensitivity to inhalant allergens. Serum-specific immunoglobulin E (SSIgE) measurement is a complementary test. SPT is performed with antigen extracts from India while SSIgE utilises extracts derived from European antigens. Performance of allergic assessment by SSIgE against cockroach, housefly and mosquito aeroallergens which are frequently implicated in driving respiratory allergies in India considering SPT as the 'gold standard' were assessed in the present study. Twenty patients (mean age 28.5 years; range 15-50 years) diagnosed to have bronchial asthma and/or rhinitis underwent SPT. The SSIgE levels were obtained at the same visit. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of SSIgE testing were calculated using SPT as the 'gold standard'. The correlation between SPT grading and SSIgE levels was also evaluated. The sensitivity of SSIgE testing to each of the 3 aero-allergens was >85%. The PPV of cockroach and mosquito SSIgE was >85%; housefly SSIgE had PPV of 68.7%. The two tests were in agreement in 85% (cockroach), 90% (mosquito) and 55% (housefly). There was a significant correlation between the grades of SPT reactions and SSIgE levels. The SSIgE has higher sensitivity and PPV, but lacks specificity. Higher sensitivity with low specificity leads to increased false positive diagnosis of allergic disease. Unlike allergenic pollens, however, insect antigen extracts from different regions seem to give comparable results, and can thus, reliably be used in the evaluation of allergy.

14. Hypersensitivity to pigeon allergens in asthma

In asthma, hypersensitivity to antigens from pigeon's feathers and droppings are an important factor responsible for asthma exacerbations in the inner cities. Unmindful of this, at some places, people in India tend to keep pigeons as an ancient and respected custom or for religious purposes. This study was planned to study the occurrence of skin prick test (SPT) reactivity to pigeon allergens in asthma. A total of 111 asthma patients diagnosed as per GINA 2015 (age group 11-58 years) were recruited for the study after an informed consent. Alongwith other routine investigations, all of them underwent SPT against common aeroallergens and with pigeon allergens (feathers and droppings). Patients with SPT positive to pigeon allergens also underwent serum estimation of specific IgE against pigeon dropping and pigeon feather antigens. Out of the total 111 cases (50 males and 61 females), history of exposure to pigeons was present in 62 patients (55.85 %) with daily exposure of about 15 min to 10 hours and they were exposed to 10-20 pigeons daily. None of the patients had history of exacerbation of symptoms on exposure to pigeons or their feathers or droppings. Out of the 111 cases, 77 had positive SPT to at least one antigen and in 9 (11.7%) of these patients SPT was positive to pigeon antigens. In the pigeon SPT positive group, there were 6 males (19.3%) and 3 (9.7%) females with SPT positive against pigeon droppings and 2 females with positivity against pigeon feathers. Also, in these pigeon allergen positive group, 7 were SPT positive to ≥3 common aeroallergens and 2 were positive to 2 aeroallergens. Out of 9 SPT positive to pigeon droppings, 2 had raised specific IgE to pigeon droppings (mean = 0.99 kU/L). None of the patients had raised specific IgE to pigeon feathers. This study confirms the occurrence of hypersensitivity to pigeon allergens, found in pigeons droppings and feathers, amongst patients of asthma. Further, large scale studies are required to elucidate the prevalence and effect of pigeon allergen hypersensitivity in asthma.

15. Correlation of exhaled nitric oxide and atopic status in non-obese and obese bronchial asthma patients

Non-invasive marker, exhaled nitric oxide (FENO) measurement is an area of ongoing research in the study of airway inflammation. Several studies have demonstrated a relationship between obesity and asthma. However, the relationship is not well understood. The FENO levels known to influence the atopic status. This study was conducted to study the relationship between the non-invasive methods of NO measurements in non-obese and obese bronchial asthma patients and their association with atopic profile. 100 bronchial asthma patients of aged between 11 and 58 years were enrolled for the study and were divided into two groups – comprises 50 obese (BMI>30 kg/m^2) and 50 non-obese (BMI<25 kg/m^2) patients using BMI classification. All the subjects were assessed for pulmonary function parameters, exhaled breath analysis of NO and SPT against a battery of 58 common aero-allergens and subjects with atleast 1 positive SPT were labeled as atopic.

Out of 100 asthma patients 74 were atopic of which 39 were non-obese and 35 were obese. The mean BMI for the non-obese and obese group was 23.1 kg/m^2 and 33.4 kg/m^2 respectively. The functional residual capacity (FRC% predicted) of non-obese and obese were (113.4 ± 3.4 *versus* 85.5 ± 2.9; p = 0.00) and expiratory reserve volume (ERV% predicted) were 100.8 ± 32.5 *versus* 72.2 ± 3.7; p = 0.00. The mean FENO levels of non-obese and obese group were 28.2 ppb and 44.5 ppb (parts per billion), respectively; the difference being statistically significant (p=0.00). Atopic obese have significantly higher FENO in comparison to non-obese (28.3 ± 4.3 *versus* 47.9 ± 5.8 p = 0.007). The overall atopic profile of asthma patients did not found any statistically difference (p=0.494) in FENO levels. Obese asthmatics have higher FENO level, which are further increased in atopic obese patients. Thus, while interpreting FENO level in obese patients atopic status must be evaluated.

16. To measure the effect of environmental tobacco smoke exposure on the respiratory health of children in rural area of Delhi-NCR

Environmental tobacco smoke (ETS) also referred to as passive smoking or Second hand smoking (SHS) is correlated with various respiratory ailments, particularly in children. Children are more vulnerable to SHS as they adversely affect the immune system and development of the lung. The present study was planned to assess the effect of ETS exposure on the respiratory health of children in rural area of Delhi-NCR.

It is a cross sectional study to assess the effect of ETS exposure on the respiratory health of children (<18 years) in Khanpurjupti village of Ghaziabad in Delhi-NCR region. One hundred households were selected and were divided into two groups based on exposure to ETS. One group consisted of 50 households with children having exposure to ETS (with at least one smoker per household) and another group of 50 households without ETS exposure (No smoker residing in household). The demographic profile and respiratory symptoms of all children were recorded. Six hour reading of particulate matters (PM10, PM2.5& PM1) and 12 hour reading of volatile organic compounds (VOC) were measured by using standard instruments.

Of total 354 children studied, 59 (16.67%) had history of breathlessness and cough with sputum. Children in households with ETS exposure had significantly higher number of respiratory symptoms [40 of 181(22.1%) vs 19 of 173 (10.98%), p-0]. The level of VOC was found to be three fold higher in households with ETS exposure and was statistically significant (2.74ppm vs 0.75ppm; p-0.028). Significantly higher levels of PM10(393.72ìg/m3 vs 237.22µg/m3, p-0.002), PM2.5 (192.38µg/m3 vs 113.27µg/m3; p-0.006) and PM1 (142.02µg/m3 vs 87.67µg/m3; p-0.013) were observed in households with ETS exposure. Exposure to biomass fuel [43(86%) vs. 41 (82%)] was more in group with ETS exposure and poor ventilation [12 (24%) vs. 17 (34%)] was seen more in households without ETS exposure.

Higher reporting of respiratory symptoms was seen in children of households with ETS exposure. The respiratory symptoms in group without ETS exposure can be attributed to influence of biomass fuel exposure and poor ventilation. Measures of pollutants (PM and VOCs) were significantly raised in group with ETS exposure.

17. Association of socio-economic status and indoor air pollution level on respiratory health of children in rural area of Delhi-NCR

Nearly 3 billion people in low and middle income countries rely on solid fuels. Solid fuels together with

active and passive smoking contribute to indoor air pollution which is assessed by particulate matter 2.5 (PM2.5) and volatile organic compounds (VOCs). Children are more susceptible to indoor air pollutants as they spend most of their time indoors. The present study was planned to assess the association of socio-economic status and indoor air pollution on respiratory health of children in rural area of Delhi-NCR.

It is a cross sectional study to assess the association of socio-economic status and indoor air pollution on the respiratory health of children (<18 years) in Khanpurjupti village of Ghaziabad in Delhi-NCR region. One hundred and sixty eight houses comprising of 538 children were included in this study. The households were grouped based on their socio-economic status into low class (Family income <Rs 5000/month) and middle class (Family income Rs 5000 to 10000/month). The demographic profile and respiratory symptoms of cough, sputum and breathlessness of all children were recorded. The 24 hour particulate matter (PM2.5) and 12-hour VOC levels were measured in all houses using standardized instrument.

Amongst low socio-economic class, 19.85% of (52/262) children had respiratory symptoms in comparison to 10.87% (30/276) of children of middle socio-economic class. The 24 hour PM2.5 level was 10.63mg/m^3 in low socio-economic class and in middle socio-economic class was 5.85mg/m^3 and was significant (*p-0.02*). The 12 hour VOCs levels were also higher in lower socio-economic class houses [1.17ppm vs. 1.07ppm (*p-0.23*)]. Amongst low socio-economic class, use of exhaust in kitchen was lower [1(1.19 vs. 4 (4.35%)] and use of kerosene oil was higher [22 (26.2%) vs. 13 (15.5%)].

Indoor air pollution as measured by PM 2.5 and 12 hour VOC were raised in households with low socio-economic status with PM 2.5 being statistically significant. This might be due to decreased use of exhaust in kitchen and increased use of kerosene oil. The increased reporting of respiratory symptoms in low socio-economic group may be attributed to higher levels on indoor air pollutants.

18. Relationship between pollens numbers and hospital visits of patients in North Delhi region

Pollens which directly or indirectly come in contact with human bodies are the major source of allergic reactions. To find out how is pollen numbers associated with hospital visits in emergency department and new admission of patients (morbidity).

Atmospheric pollen was collected by using volumetric Burkard (UK) Air Sampler was placed at the roof of the VPCI multistoried building, running continuously and air samples were collected and studied on daily bases. The principle of instrument is based on air drawn through trap is 10 litre per minute and pollens are trapped on moving adhere film of slides or drum. Trapped pollens film was stained with fucshin stain for making permanent slides. Observed data was statistically analyzed with Pearson correlation using SPSS version 16.0.

A total of 396 days Burkard Air Sampler runs out of the annual catch of 119298 pollens were recorded during July 2014-July 2015. The maximum pollen concentration was observed in the month of March 2015 (18818/m^3) with mean pollen concentration 607/m^3. The minimum pollen concentration was observed in the month of August 2014 (4731/m^3) with mean pollen concentration 152.6/m^3. During study period highest mean temperature in the month of June 2014 was 34.1ºC and lowest mean temperature Jan 2015 was 11.8 ºC. The relative highest mean humidity in the month of January 2015 was 81.8% and lowest mean humidity in the month of May 2015 was 44.9% observed. During period of July 2014 to July 2015 total numbers of new and old Out Patients Department patients (OPD) in the hospital visits were recorded 12881 and 60742 respectively. Total numbers of emergency and ward patients during the period of July 2014 to July 2015 were recorded 22886 and 2211 respectively. Emergency and Out Patients Department (old) patients visits were significantly correlated with pollen count and their values are p=0.016, r=0.65, and p= 0.044, r=0.565 respectively. Temperature and Humidity were correlated with pollen numbers and their values are p=0.527, r=-0.193 and p=0.560, r=-0.178 respectively. Study suggests increased pollen concentration in ambient environment causes respiratory illness among respiratory sensitive peoples and also exacerbates respiratory patients.

19. Life-style factors and asthma in India: a case-control study

There has been a recent trend of increasing prevalence of asthma in developing countries; prevalence in Indian population is reported to be 2%. The link between life-style factors and asthma has been mostly derived

from western literature. The present study intended to study relationship, if any, between life-style factors and asthma in a representative Indian population. The study is a case-control study performed for a period of one year, between 2014 and 2015. 125 asthma and correspondingly age- and sex-matched healthy controls were recruited for the purpose of study. A self-reported questionnaire has been prepared based on routine life-style habits of Indian population.

The hours of TV watching and hours of sleep were significantly higher in asthma patients, and also duration of sports activity showed inverse relation with asthma. Smoking, tobacco, chewing as well as alcohol consumption were higher in asthma patients in comparison to controls, though neither was statistically significant. The mental stress as assessed on scale of 1''10, was significantly higher in asthma patients ($p < 0.001$). Asthma patients had significantly lower travel duration/week ($p < 0.05$). The present study concluded that increased TV watching, increased mental stress, reduced hours of physical activity and travel may be correlated with asthma in India. With growing evidence of increasing association of asthma and sedentary life-style, it is imperative to reduce acquaintance to as well as incidence of these factors through public health policies, which may impact prevalence of asthma in Indian population.

20. Evaluation of Vitamin D in bronchial asthma and its effect on asthma severity and control

Allergic rhinitis is a common health problem caused by an immune-mediated inflammatory reaction after allergen exposure. It is not a life-threatening condition but severe allergic rhinitis has been associated with significant impairments in quality of life, sleep, and work performance. The identification of Vitamin D Receptors in lymphocytes suggested a role for the vitamin in the regulation of immune function. Vitamin D has direct affects on dendritic cells, helper and regulatory T cells and activated B cells. There is increasing evidence linking vitamin D to various immune-related conditions including allergy. This study evaluates the effect of Vitamin D supplementation in allergic rhinitis.

To evaluate the levels of Vitamin D in allergic rhinitis and its correlation with the severity of disease and the effect Vitamin D supplementation (Cholecalciferol - 1000 IU) on the course of the disease.

Fifty subjects of allergic rhinitis were recruited. They were randomised into two groups - Test and Control. Vitamin D levels and Total Nasal Symptom Score (TNSS) were assessed both groups. The test group received oral vitamin D (chole-calciferol; 1000 IU) for thirty days while the Control group received placebo - along with standard medications - for the same period. Vitamin D levels and TNSS were repeated at the end of the study period.

Patients of allergic rhinitis showed deficiency in vitamin D indicated by mean vitamin D level of 17.32+8.26 ng/ml in Test group and 18.19+4.66 ng/ml in Control group. The TNSS score was 9.92+1.37 in Test group and 10.17+2.90 in Control group. After the study period, mean vitamin D level was 29.71+2.28 ng/ml in test group and 18.67+4.75 ng/ml in Control group. The Post treatment TNSS scores were 2.81+3.04 in test group and 5.42+7.78 in Control group. This difference between groups was statistically significant. There was significant correlation between the severity of disease as represented by the different TNSS groups and Vitamin D levels.

Vitamin D levels were found to be low in subjects with allergic rhinitis. The levels of Vitamin D correlated with the severity of disease. There was significant improvement in the levels of serum vitamin D and highly significant reduction in the total nasal symptom score after supplementation. Thus, Vitamin D supplementation alters the course of allergic rhinitis towards clinical improvement.

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 Pulmonary Medicine. The students currently enrolled in these courses are shown below.

DTCD

Session 2014 - 2016
Dr Gulnar Begum
Dr Sarfaraz Jamal
Dr Kavita Kumari
Dr Kiran Nilugal
Dr Gurmeet Singh

MD Degrees (Awarded)

(Session: 2012-2015)

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

MD Theses (Submitted)

(Session: 2013-2016)

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)
1.	Dr Viswesvaran B (Pulmonary Medicine)	A study of clinico-pathological profile of patients with lung cancer (2014-16)	Prof. Rajendra Prasad and Dr Ritu Kulshrestha
2.	Dr Gaurav Bhati (Pulmonary Medicine)	A prospective study to assess the role of N-acetylcysteine and comparison with pulmonary rehabilitation on quality of life in patients on chronic obstructive pulmonary disease	Prof. S.N. Gaur and Dr Vishal Bansal
3.	Dr Richa Mittal (Pulmonary Medicine)	Evaluation of discriminative properties of GOLD 2011 classification of chronic obstructive pulmonary disease	Prof. Rajendra Prasad, Prof. S.K. Chhabra and Dr Vishal Bansal
4.	Dr Muhammed Noufal Poongadan (Pulmonary Medicine)	Dietary pattern and lifestyle in bronchial asthma and their influence on bronchial asthma control	Prof. Raj Kumar
5.	Dr Archana Bhandekar (Microbiology)	Contribution of efflux pumps to rifampicin resistance in clinical isolates of *M. tuberculosis*	Dr Mandira Varma-Basil, Dr B.K. Menon and Dr Mujeeb-ur-Rahman
6.	Dr Stuti Gupta (Microbiology)	Role of respiratory viruses in exacerbations of chronic obstructive pulmonary disease	Dr Madhu Khanna, Dr Malini Shariff, Prof. S.K. Chhabra, Prof. S.N. Gaur and Prof. Raj Kumar
7.	Dr Sachinkumar Pancham Gajbhiye (Pharmacology)	A clinical study to monitor adverse drug reaction profiles in patients of bronchial asthma and COPD	Dr Kavita Gulati and Prof. A. Ray
8.	Dr Raman Ghai (Physiology)	Effect of chronic intermittent hypoxia on contractile properties of the upper airway muscles in rats	Prof. K. Ravi and Prof. A. Ray

MD Theses (Pursued)
(Session: 2014-2017)

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)
1.	Dr Sekhar Kunal Jha (Pulmonary Medicine)	Serum vitamin D levels in patients with allergic rhinitis, chronic rhinosinusitis and nasal polyposis, and its association with quality of life	Prof. Ashok Shah
2.	Dr Manu Madan (Pulmonary Medicine)	Factors determining outcomes in acute exacerbations of chronic obstructive pulmonary disease	Prof. S.K. Chhabra and Prof. Ashok Shah
3.	Dr Nipun Malhotra (Pulmonary Medicine)	Food and aeroallergens sensitization and airway inflammation in asthma	Prof. Raj Kumar and Prof. S.N. Gaur
4.	Dr Harsh Vardhan (Pulmonary Medicine)	Evaluation of markers of disease activity in patients of pulmonary sarcoidosis	Dr B.K. Menon
5.	Dr Aditi (Microbiology)	Characterization of virulence properties of *Pseudomonas aeruginosa* isolates from hospitalized patients	Dr Malini Shariff Prof. S.K. Chhabra and Dr M. Rahman
6.	Dr Rashi Khanna (Microbiology)	Co-infection of *M. tuberculosis* and *Cryptococcus neoformans* species complex in HIV positive and negative patients	Dr Malini Shariff Dr Mandira Varma-Basil and Dr Anuradha Chowdhary
7.	Dr Goutam Arora (Pharmacology)	Pharmacological studies on possible role of neurosteroids during stress-induced immunomodulation in experimental animals	Prof. A. Ray and Dr Kavita Gulati

MD-Ist Year
(Session: 2015-2018)

Name	Discipline
Dr Ambuj Kumar	Pulmonary Medicine
Dr Anshu Priya	Pulmonary Medicine
Dr Arya Gopi	Pulmonary Medicine
Dr Vidushi Rathi	Pulmonary Medicine
Dr Gulvir Singh	Pulmonary Medicine
Dr Bhagwan Singh Patidar	Biochemistry
Dr Gargi Upadhyaya	Microbiology
Dr Gautham K.	Pharmacology
Dr Abhyanchal Kishore Jha	Physiology

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

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)
1.	Dr Pawan Gupta (Pulmonary Medicine)	Characterisation of nocturnal hypoxemia in chronic obstructive pulmonary disease	Prof. S.K. Chhabra
2.	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. Rajendra Prasad, Prof. Raj Kumar and Prof. S.N. Gaur

DM Theses (Submitted)
(Session: 2013-2016)

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)
1.	Dr Mohd Yousoof Dar (Pulmonary Medicine)	Study of inflammatory markers in sputum positive patients of pulmonary tuberculosis and its response to anti-tubercular treatment	Dr B.K. Menon
2.	Dr Vikas Chandra Pilaniya (Pulmonary Medicine)	Occurrence of bronchial anthracofibrosis in respiratory symptomatics with history of exposure to biomass fuel smoke	Prof. Ashok Shah

DM Theses (Pursued)
(Session: 2014-2017)

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)
1.	Dr Chandrakant Tarke (Pulmonary Medicine)	Occurrence of bronchiectasis in patients with COPD: smokers *versus* never smokers and the association of upper airway symptoms with quality of life in these patients	Prof. Ashok Shah
2.	Dr Supreet Batra (Pulmonary Medicine)	An association of depression in asthma and role of pulmonary rehabilitation versus anti-depressant in patients with moderate and severe asthma	Prof. S.N. Gaur and Dr Vishal Bansal

PhD Awarded/Submitted

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)	Status
1.	Mr Jagdish Chander Joshi (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	Awarded
2.	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)	Awarded
3.	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	Awarded
4.	Mr Anupam Prakash (Microbiology)	A study of *Cryptococcus* species in immunocompromised patients	Dr Anuradha Chowdhary and Prof. H.S. Randhawa	Submitted
5.	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	Submitted
6.	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	Submitted
7.	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	Submitted
8.	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	Submitted
9.	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	Submitted

PhD Theses (Pursued)

Sl. No.	Name (Discipline)	Title of Theses	Supervisor(s)	Year of Registration
1.	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
2.	Ms Apoorva Pandey (Biochemistry)	Role of innate immune response mechanisms in development of bleomycin induced lung fibrosis	Prof. S.K. Bansal and Dr Ritu Kulshrestha	2014
3.	Mr Anil Meena (Biochemistry)	A study on CRHR1 and GR gene polymorphism and their correlation with the expression of various inflammatory cytokines in asthma in North Indian population	Prof. S.K. Bansal, Prof. S.K. Chhabra and Dr B.K. Menon	2015
4.	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
5.	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
6.	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
7	Mr Gaurav Tyagi (Microbiology)	To study the role of biotin in the biology of *Mycobacterium tuberculosis*	Dr Mandira Varma-Basil, Prof. Mridula Bose and Prof. Ashok Prasad (Dept. of Chemistry, University of Delhi)	2013
8.	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

Sl. No.	Name (Discipline)	Title of Theses	Supervisor(s)	Year of Registration
9.	Ms Shraddha Porwal (Microbiology)	Phenotypic and genotypic indicators of pre MDR tuberculosis: Prediction of the development of MDR TB	Dr Mandira Varma-Basil and Prof. Rajendra Prasad	2013
10.	Ms Astha Giri (Microbiology)	Characterization of genotypic indicators of ethambutol resistance in clinical isolates of *Mycobacterium tuberculosis*	Dr Mandira Varma-Basil	2014
11.	Mr Sanjesh Saini (Microbiology)	Role of microRNA in pathogenesis of influenza A virus infection	Dr Malini Shariff and Dr Madhu Khanna	2015
12.	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
13.	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 imunomodulation in rats	Prof. A. Ray and Dr Kavita Gulati	2012
14.	Ms Sulekha Chaudhary (Pharmacology)	Studies on the anti-inflammatory and immunomodulatory effects of *Albizia lebbeck and Solanum xantho-carpum* in experimental models of bronchial asthma	Dr Kavita Gulati and Prof. A. Ray	2013
15.	Mr Harikesh Dubey (Pharmacology)	Experimental studies on the association between Alzheimer's disease and diabetes mellitus: a novel approach to possible therapeutic strategies	Prof. A. Ray and Dr Kavita Gulati	2014
16.	Mr Tapan Behl (Pharmacology)	To evaluate the effect of *Terminalia catappa* fruit and seed extract in streptozotocin induced diabetic retinopathy in rats	Dr Anita Kotwani	2014
17.	Mr Shiv Prakash (Pharmacology)	Experimental studies to evaluate the time dependent changes in stress responses and their regulation by nitric oxide	Prof. A. Ray and Dr Kavita Gulati	2015

Sl. No.	Name (Discipline)	Title of Theses	Supervisor(s)	Year of Registration
18.	Ms Babita Kumari (Pharmacology)	A clinical study to evaluate the effects of yoga on pulmonary functions, cellular and molecular markers and quality of life in patients of bronchial asthma	Dr Kavita Gulati, Prof. A. Ray and Dr B.K. Menon	2015
19.	Mr Maaz Naqvi (Pharmacology)	Experimental pharmacological studies for optimization of constituents UNIM-352, a polyherbal preparation, for efficacious and safe treatment of bronchial asthma	Dr Kavita Gulati, Prof. A. Ray and Dr B.K. Menon	2015
20.	Mr Lakshmi Kanth Kotarkonda (Physiology)	An insight into the mechanisms of bleomycin induced pulmonary fibrosis	Prof. K. Ravi	2014
21.	Mr Anil Kumar Mavi (PhD Pulmonary Medicine) Faculty of Medical Science, University of Delhi, VPCI	Biochemical and clinico-immunologic characterization of pigeon (*Columba livia*) allergens (feathers and droppings) in asthma patients	Prof. Raj Kumar and Prof. S.N. Gaur	2014

Faculty Members Associated as Co-supervisors for MD/PhD Theses of DU and Other Institutions

Sl. No.	Name (Discipline) and Institution's Name	Title of Theses	Supervisor(s)	Status
1.	Dr Kakasaheb H. Bhosale (MD Medicine) Ram Monahar Lohia Hospital, New Delhi	Cryptococcal antigenemia in anti-retroviral therapy naïve patients with human immunodeficiency virus infection	Dr Brijesh Sharma (Dept. of Medicine, RML Hospital, PGIMER & RML Hospital, New Delhi) and Dr Anuradha Chowdhary	Submitted
2.	Mr Jamal Ali Moiz (PhD Physiotherapy) Jamia Millia Islamia University, New Delhi	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
3.	Ms Karuna Sharma (PhD Biochemistry) Faculty of Medical Sciences, University of Delhi, Delhi	Genetic polymorphism of matrix metalloproteinases-9 (MMP-9) and its correlation with the maternal serum level of biomarkers (PAPP-A, free β-hCG) and proinflammatory cytokines in pre-eclampsia 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
4.	Ms Anita Singh Amity Institute of Virology and Immunology, Amity University, Noida	Characterization of recombinant outer membrane proteins of *L. interogans* serovars	Dr M.M. Premlatha (Amity Institute of Virology and Immunology, Noida, Uttar Pradesh) and Dr Malini Shariff	Pursued
5.	Mr Kaushik Bhattacharya (MSc-PhD combined Programe in Biomedical Sciences) Dr B.R. Ambedkar Centre for Biomedical Research, University of Delhi, Delhi	Novel non synonymous mutations in a multi-drug resistant isolate of *M. tuberculosis*	Dr Vani Brahmachari (Dr B.R. Ambedkar Centre for Biomedical Research, University of Delhi, Delhi) and Dr Mandira Varma-Basil	Pursued

Sl. No.	Name (Discipline) and Institution's Name	Title of Theses	Supervisor(s)	Status
6.	Dr Nisha Yadav (MD Medical Microbiology) Lady Hardinge Medical College, New Delhi	Study of vulvovaginal candidiasis in pregnant females	Dr V.S. Randhawa (Dept.of Microbiology, LHMC, New Delhi) and Dr Anuradha Chowdhary	Pursued
7.	Ms Ramandeep Kaur (PhD Microbiology) Dept. of Microbiology, Baba Farid University of Health Sciences, Faridkot, Punjab	Molecular epidemiology of *M. tubrerculosis* isolated from cases of pulmonary tuberculosis in Punjab	Prof. Neerja Jindal (Dept. of Microbiology, Baba Farid University of Health Sciences, Faridkot, Punjab) and Dr Mandira Varma-Basil	Pursued
8.	Dr Sulabh Saini (MD Community Medicine) University College of Medical Sciences, Delhi	Effect of air pollution and weather changes on exacerbation of asthma: a cohort study	Prof. A.K. Sharma (University College of Medical Sciences, Delhi) and Prof. S.K. Chhabra	Pursued
9.	Ms Kuldeep Patial (PhD Life Sciences) Department of Life Sciences, Sambalpur University, Odisha	A case control study to investigate the utility of leptin and fasting blood glucose in prediction of obstructive sleep apnea	Dr Rajendra Kumar Behera Department of Life Sciences, Sambalpur University, Odisha and Prof. S.N. Gaur	Pursued

Awards/Honours

Prof. S.N. Gaur

- **Dr D.B. Gupta Oration Award,** 21st National Conference of Environmental Science and Pulmonary Diseases, Mumbai.
- **Dr H. Parmesh and Dr (Major) K. Nagaraju Oration Award,** at RajPedicon PedAllercon EnriCHcon, Jaipur.
- **Prof. K.S. Bhargava Oration Award,** XXIV Annual Conference of the Indian Virological Society at North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences (NEIGRIHMS) Shillong, Meghalaya.
- **Secretary**, National College of Chest Physicians (India).
- **Elected President**, Geriatric Society of India for 2017.
- **Member**, National Advisory Panel in Respiratory Medicine, National Academy of Medical Sciences, 2015.
- **Member**, various sub committees on Immunotherapy, Food Allergy, Anaphylaxis, Diagnostics, etc., of American Academy of Allergy Asthma and Immunology (AAAAI), USA from the year 2009.
- **Board Executive Member**, Influenza Foundation of India, Delhi.
- **Expert**, Drug Safety Monitoring Committee, Ministry of Health and Family Welfare, Govt. of India.
- **Member**, Expert Committee on Food Allergy, Department of Biotechnology (DBT), Ministry of Science and Technology, New Delhi.
- **Chairman,** National Expert Committee for formulation/finalizing criteria for lot release of diagnostic and therapeutic allergen extracts in India, CDSCO, Drug Controller General of India (DCGI), Ministry of Health and Family Welfare, Goverment of India, New Delhi.
- **Editor-in-Chief**, *Indian Journal of Allergy, Asthma and Immunology*, an official publication of the Indian College of Allergy, Asthma and Applied Immunology.
- **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).
- **Advisor**, Editorial Board, *Indian Journal of Geriatric Care*, Delhi.
- **Editorial Advisory Board Member**, *Open Medicine Journal*.
- **Member**, Programme Advisory Committee for Environment Research Programme (EnvRP), Ministry of Environment and Forest, Govt. of India, NewDelhi.
- **Member**, Committee of experts on Standardization of Commercial Allergens Used for Diagnosing in respect of Cockroach and Moth, National Institute of Biologicals, MOH FW, Noida.

Prof. A. Ray

- **Secretary,** Society for Nitric Oxide and Allied Radicals (SNOAR).

Prof. Ashok Shah

- Nominated as **Indian Editorial Advisor**, *European Respiratory Journal*.
- **Editor**, *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).

- **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, *Asian Pacific Allergy Journal* of the Asia Pacific Association of Allergy, Asthma and Clinical Immunology (APAAACI).
- **Member**, Editorial Board, *Current Medical Trends*.
- **Member**, National Committee on "*Bibliographic Biomedical Database from Indian Literature*", Indian Council of Medical Research - National Informatics Centre, New Delhi.

Prof. S.K. Chhabra

- **Editor**, *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).
- **Associate Editor**, *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.

Prof. Raj Kumar

- **Prof. D.N. Shivpuri Oration- 2015 Award**, 49th National Conference of Indian College of Allergy, Asthma and Applied Immunology, Chennai.
- **Member, Governing Body,** Swami Sharddhanand College, University of Delhi, Delhi.
- **Member,** Round-table Consultation on 'Tobacco Cessation Services in India: Status, challenges and way forward', The Union South-East Asia, New Delhi.
- **Member,** Editorial Board, *The Pulmo-Face*, Institute of Pulmocare and Research, Kolkata.
- **Member,** Editorial Board, *Journal of Asthma and Bronchitis* Delaware, USA.
- **Associate Editor**, *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).

Dr Malini Shariff

- **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).

Dr Madhu Khanna

- Awarded **Travel Grant** by International Society for Influenza and other Respiratory Viruses (ISIRV)-Antiviral Group (isirv-AVG) to attend Novel Antiviral Therapies for Influenza and Other Respiratory Viruses: Bench to Bedside Conference at University of Texas, Austin, USA (2nd- 4th June 2015).

Dr Mandira Varma-Basil

- **Member,** Ethics Committee, Rajan Babu Institute of Pulmonary Medicine and Tuberculosis, Delhi.
- **Secretary,** Indian Association of Mycoplasmologists.
- Awarded **First Prize** for a poster paper presentation on "Role of VPCI_Biotin in the biosynthesis of biotin in *Mycobacterium tuberculosis*" (Authors: Gaurav Tyagi, Pooja Singh, Rajesh Sinha, Naresh Sharma, Mandira Varma-Basil, Mridula Bose), Micro-D-Con 2015, India Habitat Centre, 11th-12th December 2015.

- Awarded **First Prize** for a poster paper presentation on "Does *Rv0194* aid *M. tuberculosis* in coping with rifampicin Stress?" (Authors: Anshika Narang, Kushal Garima, Astha Giri, Mridula Bose, Mandira Varma-Basil), National Symposium on Challenges in Tuberculosis Diagnosis and Treatment held at All India Institute of Medical Sciences, New Delhi on 30th March 2016.

Dr Anuradha Chowdhary

- **Elected Fellow,** Royal College of Pathologists (FRCPath), London, United Kingdom.
- **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).

Dr Kavita Gulati

- **Treasurer**, Society for Nitric Oxide and Allied Radicals (SNOAR).

Dr Vishal Bansal

- **Member**, Editorial Board, *Journal of Krishna Institute of Medical Sciences University*, an official publication of Krishna Institute of Medical Sciences University, Karad, Maharashtra.

Dr M. Rahman

- **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).

Dr Richa Mittal (MD Student – Pulmonary Medicine)

- **NAPCON-2015 Award**, National Conference on Pulmonary Diseases (NAPCON-2015) [17th Joint National Conference of NCCP (I) & ICS], Jaipur.

Dr B. Vishweswaran (MD Student – Pulmonary Medicine)

- **Torrent National Quiz 1st Prize**, National Conference on Pulmonary Diseases (NAPCON-2015) [17th Joint National Conference of NCCP (I) & ICS], Jaipur.

Dr Gaurav Bhati (MD Student – Pulmonary Medicine)

- **NCCP(I) - Prof. S.N. Gaur Young Scientist Award- 1st Prize**, National Conference on Pulmonary Diseases (NAPCON-2015) [17th Joint National Conference of NCCP (I) & ICS], Jaipur**.**

Dr Sekhar Kunal Jha (MD Student – Pulmonary Medicine)

- **NCCP(I) - Prof. S.N. Gaur Young Scientist Award- 2nd Prize**, National Conference on Pulmonary Diseases (NAPCON-2015) [17th Joint National Conference of NCCP (I) & ICS], Jaipur.

Dr Vidushi, Dr B. Vishweswaran and Dr Shekhar Kunal Jha (MD Students – Pulmonary Medicine)

- **NAPCON PG Quiz Winners**, National Conference on Pulmonary Diseases (NAPCON-2015) [17th Joint National Conference of NCCP (I) & ICS], Jaipur.

Mr Kamal Singh (Research Associate - ICMR-Indo-US Research Project)

- **First Prize** in the Poster Presentation for the scientific paper entitled, "To measure the Effect of environmental tobacco smoke exposure on the respiratory health of children in rural area of Delhi-NCR" at ICAAICON-2015, 49th National Conference of Indian College of Allergy, Asthma and Applied Immunology, Chennai.

Mr Tapan Behl (PhD Student - Pharmacology)

- **Dr Ambedkar Youth Dignity Award 2016,** 9th Youth Dignity Festival at University of Delhi, Delhi by Youth for Social Justice Society.
- **Rashtriya Gaurav Award,** India International Friendship Society, New Delhi.
- **Best Young Researcher Award-2015**, GRABS Educational Charitable Trust, Chennai.
- **Young Scientist Award,** National Science Colloquium and 1st Scholar's Science Meet (SCSSM-2015) at Mewar Institute of Management, Ghaziabad.

Sponsored Research Projects

Sl. No.	Faculty Member (Department)	Title of Project	Funding Agency, Date of Sanction/ Implementation and Duration	Budget (in Rs.) upto March 2016
1.	Dr Vishwajeet Rohil (Clinical Biochemistry)	To investigate the role of calreticulin transacetylase mediated histones hyperacetylation induced epigenetic modulation by polyphenolic acetates in genes implicated in lung tumorigenesis	D.B.T. November 6, 2013 (Two years) and extended upto 31.03.2016	29.58 Lakhs
2.	Dr Malini Shariff (Microbiology)	Microbiome of human lung in COPD patients attending VPCI, Delhi	D.B.T. March 19, 2015 (Two years)	19.98 Lakhs
3.	Dr Mandira Varma-Basil (Microbiology)	Expression profile of efflux related pumps in drug resistant *M. tuberculosis*	D.B.T. October 21, 2011 (Three years & six months, upto 20.04.2015)	34.93 Lakhs
4.	Dr Mandira Varma-Basil (Microbiology)	Development of aminocoumarins as candidate drugs for the treatment of multi-drug resistant (MDR) tuberculosis	D.B.T. October 30, 2013 (Two years and extended upto 25.03.2016)	41.21 Lakhs
5.	Dr Mandira Varma-Basil (Microbiology)	A point of care diagnostic tool for tuberculosis	D.S.T. September 3, 2014 (Three Years)	20.09 Lakhs
6.	Dr Mandira Varma-Basil (Microbiology)	Phenotypic and genotypic indicators of drug resistant tuberculosis: can they be used as early warning system for MDR and XDR tuberculosis	I.C.M.R. March 31, 2015 (Three years)	18.64 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)	32.44 Lakhs
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)	8.99 Lakhs

Sl. No.	Faculty Member (Department)	Title of Project	Funding Agency, Date of Sanction/ Implementation and Duration	Budget (in Rs.) upto March 2016
9.	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 and extended) upto 30.06.2016)	17.65 Lakhs
10.	Dr Madhu Khanna (Respiratory Virology)	To study the heterosubtypic immunity provided by pandemic influenza A H1N1 (2009) virus infected cells	C.S.I.R. December 10, 2013 (Three years)	15.75 Lakhs
11.	Dr Madhu Khanna (Respiratory Virology)	Evaluation of antiviral activity of medicinal plant extracts against influenza A virus	AYUSH/Central Council for Research in Ayurvedic Sciences (CCRAS) January 25, 2014 (Three years)	17.38 Lakhs
12.	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)	35.80 Lakhs
13.	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)	34.32 Lakhs
14.	Dr Ritu Kulshrestha (Pathology)	Study of the post transcriptional mechanisms underlying pulmonary fibrosis and their modulation by therapeutic agents	D.S.T. May 21, 2015 (Three years)	26.00 Lakhs
15.	Prof. A. Ray (Pharmacology)	Experimental studies on the association between Alzheimer's disease and diabetes mellitus: a novel approach to possible therapeutic strategies	D.S.T. October 17, 2013 (Three years)	24.80 Lakhs
16.	Dr Anita Kotwani (Pharmacology)	Effect of Indian almond and sweet almond in diabetes induced nephropathy and cataract in rats	AYUSH/Central Council for Research in Ayurvedic Sciences (CCRAS) January 25, 2014 (Two years + one year extension)	18.16 Lakhs

Sl. No.	Faculty Member (Department)	Title of Project	Funding Agency, Date of Sanction/ Implementation and Duration	Budget (in Rs.) upto March 2016
17.	Dr Anita Kotwani (Pharmacology)	To asses the price and availability of essential medicines in Delhi after the implementation of the National Pharmaceutical Pricing Policy 2012 phase II	W.H.O. December 5, 2014 (One year)	10.15 Lakhs
18.	Dr Kavita Gulati (Pharmacology)	Experimental studies on the cellular and molecular mechanisms 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 and extented upto 31.03.2016)	26.41 Lakhs
19.	Dr Kavita Gulati (Pharmacology)	Studies on the anti-inflammatory and immunomodulatory effects of *Albizzia lebbeck* and *Solanum xanthocarpum* in experimental models of bronchial asthma	D.B.T. March 10, 2014 (Three years)	20.88 Lakhs
20.	Dr Kavita Gulati (Pharmacology)	A clinical study to evaluate the effects of yoga on pulmonary functions, cellular and molecular markers and quality of life in patients of bronchial asthma	AYUSH October 01, 2015 (Three years)	19.84 Lakhs
21.	Dr Vishal Bansal (Physiology)	Development of exercise protocol to improve hypoxic tolerance	D.I.P.A.S. April 10, 2015 (Three years)	25.00 Lakhs
22.	Prof. Raj Kumar (Respiratory Allergy and Applied Immunology)	Comparision of pulmonary function test: skin testing to common aero allergens and food allergens:an inflammatory markers in obese and non-obese bronchial asthma patients	U.G.C.-B.S.R. June 23 2014 (Two years)	6.30 Lakhs
23.	Prof. Raj Kumar (Respiratory Allergy and Applied Immunology)	Indoor air pollution and asthma in children: a population based study	I.C.M.R. February 1, 2015 (Three years)	126.80 Lakhs
24.	Dr Ashima Anand (Principal Investigator)	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 (Four years and six months)	85.16 Lakhs

Sl. No.	Faculty Member (Department)	Title of Project	Funding Agency, Date of Sanction/ Implementation and Duration	Budget (in Rs.) upto March 2016
25.	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 (Sixteen years)	7.95 Lakhs

Fellowships

Sl. No.	Name of Student (Department) and Faculty Member	Title of Project	Funding Agency, Date of Sanction/ Implementation and Duration	Budget (in Rs.) upto March 2016
1.	Dr Rajendra Singh Post-doctoral Fellow (Biochemistry) *(Supervisor: Prof. S.K. Bansal)*	Erythrocytic membrane proteins expression proteomics and their significance in bronchial asthma	U.G.C.- Dr D.S. Kothari Post-doctoral Fellowship April 18, 2013 (Three years)	19.01 Lakhs
2.	Dr Vishal Jain (Postdoctoral Fellow) *(Supervisor: Prof. K. Ravi)*	Effect of hypobaric hypoxia on synaptic plasticity and strength role of Ca2+ signalling	D.S.T. May 22, 2013 (Two years)	13.44 Lakhs
3.	Dr Rashmi Anand (Research Associate) *Supervisor: Dr Kavita Gulati*	Experimental studies on the cellular and molecular mechanisms in the effects of *Withania somnifera* (Root extract) during chronic stress responses in rats: possible role of nitric oxide	I.C.M.R. December 5, 2012 (Three years)	12.64 Lakhs
4.	Mr Manoj Kumar (Senior Research Fellow) *(Supervisor: Prof. S.K. Bansal)*	Studies on erythrocyte membrane protein profile and oxidant and antioxidant status of blood in bronchial asthma	D.B.T. April 18, 2011 (Five years)	12.32 Lakhs
5.	Ms Anshika Narang (Senior Research Fellow) *(Supervisor: Dr Mandira Varma-Basil)*	The role of efflux pumps in drug resistance of *M. tuberculosis*	I.C.M.R. August 11, 2011 (Three years and extended for one year)	11.46 Lakhs
6.	Ms. Cheshta Sharma (Senior Research Fellow) *(Supervisor: Dr Anuradha Chowdhary)*	Molecular mechanism of triazole antifungal resistance in *A. fumigatus* and *A. flavus* originating from clinical and environmental sources	U.G.C. February 27, 2012 (Five years)	8.38 Lakhs
7.	Ms Roopali Rajpoot (Senior Research Fellow) *(Supervisor: Dr Madhu Khanna)*	Construction and characterisation of functional ScFv antibodies against NP and NSI proteins of pandemic influenza H1N1 (2009) virus	I.C.M.R June 7, 2012 (Three years) .	9.65 Lakhs
8.	Mr. Gaurav Tyagi (Senior Research Fellow) *(Supervisor: Dr Mandira Varma-Basil)*	To study biotin metabolism in the biology of *Mycobacterium tuberculosis*	I.C.M.R. September 14, 2012 (Five years)	10.09 Lakhs

Sl. No.	Name of Student (Department) and Faculty Member	Title of Project	Funding Agency, Date of Sanction/ Implementation and Duration	Budget (in Rs.) upto March 2016
9.	Mr. Anupam Prakash (Senior Research Fellow) *(Supervisor: Dr Anuradha Chowdhary)*	Molecular characterisation of *Cryptococcus neoformans* species complex originating from immunocompromised patients and from their environment	I.C.M.R. December 3, 2013 (Two years)	1.18 Lakhs
10.	Ms. Pooja Singh (Senior Research Fellow) *(Supervisor: Dr Mandira Varma-Basil)*	Cholesterol utilisation by MCE4A overxpressed *M. tuberculosis* H37RV and effect of verapapamil	I.C.M.R. January 1, 2014 (Three years)	5.92 Lakhs
11.	Ms. Anju Gautam (Senior Research Fellow) *(Supervisor: Dr Madhu Khanna)*	Evaluation of virus like particle (VLPs) and bacterial toxin adjuvants as vaccine candidate for influenza A virus	I.C.M.R. January 17, 2014 (Three years)	7.68 Lakhs
12.	Mr. Dibya Ranjan Pati (Senior Research Fellow) *(Supervisor: Dr Madhu Khanna)*	Nano-therapeutic application of small interfering RNA and micro RNA against human influenza virus	I.C.M.R. August 19, 2014 (Three years)	4.31 Lakhs
13.	Mr. Naresh Kumar (Senior Research Fellow) *(Supervisor: Dr Mandira Varma-Basil)*	Expression analysis of genes of liquid metabolism in clinical isolates of *Mycobacterium tuberculosis* from patients of pulmonary and lymph node tuberculosis	I.C.M.R. January 05, 2015 (Two years)	3.56 Lakhs
14.	Ms Tanushri Nandi (Senior Research Fellow) *(Supervisor: Dr Madhu Khanna)*	Synergistic effect of host defensive immune peptides in regulation of influenza A virus replication	I.C.M.R. August 12, 2015 (Three years)	2.91 Lakhs
15.	Md. Shamsuzzaman (Senior Research Fellow) *(Supervisor: Dr Kavita Gulati)*	Innovation in science prusuit for inspired research (inspire)	D.S.T.-Inspire July 20, 2011 (Five years)	16.64 Lakhs
16.	Ms. Sulekha Chaudhary (Senior Research Fellow) *(Supervisor: Dr Kavita Gulati)*	Studies on the anti-inflammatory and immunomodulatory effects of *albizia labbeck* and *solonam xanthocarpum* on the experimental model of brochial asthma	U.G.C. July 31, 2012 (Five years)	9.23 Lakhs
17.	Mr Shiv Prakash (Senior Research Fellow) *(Supervisor: Prof. A. Ray)*	Experimental studies to evaluate the time dependent changes in stress responses and their regulation by nitric oxide	I.C.M.R. July 29, 2013 (Five years)	9.63 Lakhs

Sl. No.	Name of Student (Department) and Faculty Member	Title of Project	Funding Agency, Date of Sanction/ Implementation and Duration	Budget (in Rs.) upto March 2016
18.	Ms. Meenakshi Sharma (Senior Research Fellow) *(Supervisor: Prof. A. Ray)*	Experimental studies on the role of nitric oxide (NO) and NO-mediated signalling pathways in cognitive changes during emotional and environmental stress	I.C.M.R. January 1, 2014 (Two years)	7.26 Lakhss
19.	Mr Rishabh Charan Choudhary (Senior Research Fellow) *(Supervisor: Prof. K. Ravi)*	Higher nervous control of pulmonary renal reflex	U.G.C. August 10, 2010 (Five years)	15.48 Lakhs
20.	Mr Ravindra Sharma (Senior Research Fellow) *(Supervisor: Prof. K. Ravi)*	Localization and functions of anterior hypothalamus in high altitude pulmonary oedema	I.C.M.R. December 7, 2012 (Three years)	6.21 Lakhs
21.	Mr Anil Meena (Junior Research Fellow) *(Supervisor: Prof. S.K. Bansal)*	A study on CRHR1 and GR gene polymorphism and their correlation with the expression of various inflammatory cytokines in asthma in North Indian population	I.C.M.R. January 28, 2014 (Two years)	7.24 Lakhs
22.	Mr Ashutosh Singh (Junior Research Fellow) *(Supervisor: Dr Anuradha Chowdhary)*	Molecular epidemiology and ecology of human pathogenic fungi	C.S.I.R. October 28, 2014 (Two years)	3.17 Lakhs

Project under Multi-Disciplinary Research Unit

Sl. No.	Faculty Member (Department)	Title of Project	Funding Agency, Date of Sanction/ Implementation and Duration	Budget (in Rs.) upto March 2016
1.	Dr Ritu Kulshrestha (Pathology)	Extracellular matrix remodelling and expression of matrix metall-oproteinases in pulmonary fibrosis	I.C.M.R.	7.5 Lakhs

Conferences/Symposia/Seminars/Workshops/CMEs

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
1.	Prof. S.N. Gaur	Faculty	V.P.C.I., University of Delhi, National College of Chest Physicians (India) and Society for Tobacco Control	Workshop on Sleep Study Delhi July 6, 2015
2.	Prof. S.N. Gaur	Lectures on: • SPT/ *in vitro* test/patch test (Lecture-Demonstration) • Clinical workup in allergy patients • Asthma and COPD overlap syndrome	ACPG State Chapter	Association of Chest Physicians of Gujarat (ACPG) State Annual Conference Ahmedabad August 23, 2015
3.	Prof. S.N. Gaur	Chaired a session on VAP	VMMC and Safdarjung Hospital	P.G. Pulmonary Update-2015 New Delhi October 11-12, 2015
4.	Prof. S.N. Gaur	Participated as an Expert, Round Table Conference on Vaccine advocacy in India-Indian recommendation for vaccination in older adults	South-East Asia Vaccine Advocacy Forum	South-East Asia Vaccine Advocacy Forum New Delhi October 15, 2015
5.	Prof. S.N. Gaur	Lecture on:Immunotherapy: role of immunotherapy in respiratory allergic diseases	Era's Lucknow Medical College and Hospital	Allergy Asthma and Immunotherapy Update Lucknow October 16, 2015
6.	Prof. S.N. Gaur	National Executive	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2015) [17th Joint National Conference of NCCP (I) & ICS] Jaipur November 4-7, 2015
7.	Prof. S.N. Gaur	Member, Organising Committee Lecture on: Respiratory care in advanced age Chaired Dr G.S. Sainani Oration Chaired a session on Yoga in health and disease	Geriatric Society of India	XII Annual International Conference of Geriatric Society of India Agra November 21-22, 2015

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
8.	Prof. S.N. Gaur	Chief Guest	National Allergy Centre	Training Programme on Allergy and Immunotherapy New Delhi December 17, 2015
9.	Prof. S.N. Gaur	National Executive IInd ICAAI-Foundation Day Lecture on "Allergy and immunotherapy: my experience of 35 years" Lecture on: Past, present and future of allergen immunotherapy Partcipated as Faculty to the Satellite Symposium on "Evidence based allergology-State-of-the-art"	Indian College of Allergy, Asthma and Applied Immunology and Saveetha Medical College	49th National Conference of Indian College of Allergy, Asthma and Applied Immunology (ICAAICON 2015) Chennai December 28-31, 2015
10.	Prof. S.N. Gaur	Participated in a Panel Discussion on COPD: recent advances in strategies of management (pharmacologic and non-pharmacologic)	Department of Pulmonary Medicine and Sleep Disorders, AIIMS, New Delhi and American College of Chest Physicians, USA	AIIMS PULMOCRIT-2016 New Delhi January 16-17, 2016
11.	Prof. S.N. Gaur	Chaired a session on COPD	Chest Research Foundation, Pune and Johns Hopkins School of Public Health, USA	2nd International Conference on Insights and Management of COPD (ICONIC 2016) Pune February 6-7, 2016
12.	Prof. S.N. Gaur	Chaired a session on Distinguished Lecture – I Biomedical sciences in 21st century and beyond	Indian Academy of Biomedical Sciences	5th Annual Meeting of the Indian Academy of Biomedical Sciences (IABS-2016) New Delhi February 26-28, 2016
13.	Prof. S.N. Gaur	Special Invitee, Round Table Discussion during Exhibition on Innovations in Medical Science and Biotechnology	Rashtrapati Bhavan and the National Innovation Foundation	Festival of Innovation (FOIN-2016) Rashtapati Bhawan, New Delhi March 16, 2016

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
14.	Prof. S.N. Gaur	Special Invitee for the World TB Day programme	Ministry of Health and Family Welfare, Govt. of India, and WHO Regional Office for South-East Asia	World TB Day 2016 New Delhi March 21, 2016
15.	Prof. A. Ray	Lecture on: History and evolution of nitric oxide	V.P.C.I., University of Delhi	Symposium on Nitric Oxide: from Research to Applications Delhi April 6, 2015
16.	Prof. A. Ray	Lecture on: PK – PD studies with Unani drugs	Central Council for Research in Unani Medicine (*CCRUM*), Ayush	Workshop on Research Methodology, CCRUM (Ayush), New Delhi June, 2015
17.	Prof. A. Ray	Lecture on: Adaptogenic effects of some medicinal plants: integration of traditional and modern concepts	USA	Global Herbals Summit Chicago, USA October 26-27, 2015
18.	Prof. A. Ray	Lecture on: Pharmacogilance and pharmacoeconomics	Dr Ram Monahar Lohia Hospital	Dr Ram Monahar Lohia Hospital New Delhi October, 2015
19.	Prof. A. Ray	Lecture on: Rational use of antibiotics	S.G.T. University	National Pharmacy Week Gurgaon November, 2015
20.	Prof. Ashok Shah	Chaired ″Session-2"	V.P.C.I., University of Delhi	Symposium on Nitric Oxide: from Research to Applications Delhi April 6, 2015

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
21.	Prof. Ashok Shah	Lecture on: Allergic bronchopulmonary aspergillosis: how I manage	Surya Chest Foundation	Respiratory and Critical Care Update 2015 Lucknow April 12, 2015
22.	Prof. Ashok Shah	Delivered Plenary Lecture on Severe asthma and fungal sensitization Meet the Expert session on Allergic bronchopulmonary aspergillosis	Sri Lanka College of Pulmonologists	Respire 7, The Annual Academic Sessions of Sri Lanka College of Pulmonologists Colombo, Sri Lanka October 23-24, 2015
23.	Prof. Ashok Shah	Lecture on: Upper airways in COPD Moderator " New Drug, New Deliveries" Chaired the oral award sessions on "Asthma" and "Tuberculosis"	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2015) [17th Joint National Conference of NCCP (I) & ICS] Jaipur November 4-7, 2015
24.	Prof. Ashok Shah	Lectures on: • Radiology of allergic bronchopulmonary aspergillosis • Bronchiectasis: diagnosis, management and role of long term antibiotics Chaired a session on "Tuberculosis: challenges and advances"	Bangladesh Lung Foundation at Krishibid Institution	PULMOCON 2015, 4th International Conference on Lung Health Dhaka, Bangladesh November 18-19, 2015
25.	Prof. Ashok Shah	Lectures on: • Managing COPD • Allergic bronchopulmonary aspergillosis: from diagnosis to management	Executive Committee of 3rd MEAAAIC, 2015	3rd Middle East-Asia Allergy Asthma Immunology Congress (MEAAAIC) Abu Dhabi, UAE December 11-13, 2015

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
26.	Prof. Ashok Shah	Panelist "COPD: recent advances in strategies of management (Pharmacologic and non-pharmacologic)"	Department of Pulmonary Medicine and Sleep Disorders, AIIMS, New Delhi and American College of Chest Physicians, USA	AIIMS PULMOCRIT-2016 New Delhi January 16-17, 2016
27.	Prof. Ashok Shah	Lecture on: COPD: in the clinic	Max Hospital, Shalimar Bagh	Pulmonology Symposium Delhi January 17, 2016
28.	Prof. Ashok Shah	Lecture on: Upper airways inflammation in COPD	Chest Research Foundation, Pune and Johns Hopkins School of Public Health, USA	2nd International Conference on Insights and Management of COPD (ICONIC 2016) Pune February 6-7, 2016
29.	Prof. Ashok Shah	Lecture on: *Aspergillus* associated hypersensitivity respiratory disorders	Department of Respiratory Medicine, King George Medical University (KGMU)	NATCON, 2015 Lucknow February 20, 2016
30.	Prof. Ashok Shah	Lecture on: BAF: a bronchoscopic evaluation	Thoracic Endoscopy Society, Jaipur	TESCON, 2016 Jaipur March 19-20, 2016
31.	Prof. Ashok Shah	Chaired the "Pro-Con Session VIII"	Indian Sleep Disorders Association (IDSA)	SLEEPCON, 2016 New Delhi March 25-27, 2016
32.	Prof. S.K. Chhabra	Lecture on: Management issues in COPD in the elderly	National Institute of Tuberculosis and Respiratory Diseases, Geriatric Society of India and Influenza Foundation of India	Geriatric Respiratory Update 2015 New Delhi May 3, 2015
33.	Prof. S.K. Chhabra	Lectures on: • Management of asthma in special situations • COPD: comprehensive assessment	Institute of Pulmocare and Research, Kolkata	Pulmocon 2015, Annual Conference of the Institute of Pulmocare and Research Kolkata October 10-11, 2015
34.	Prof. S.K. Chhabra	Lecture on: Recent advances in the management of COPD	VMMC and Safdarjung Hospital	P.G. Pulmonary Update-2015 New Delhi October 11-12, 2015

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
35.	Prof. S.K. Chhabra	Lecture on: Management of COPD: recent advances	Association of Physicians of India, Delhi Chapter	26th Annual Conference of Association of Physicians of India, Delhi Chapter Delhi November 14-15, 2015
36.	Prof. S.K. Chhabra	Lecture on: Acute respiratory failure	VMMC and Safdarjung Hospital	Workshop on the Ventilatory Management Protocols for Influenza New Delhi November 23-29, 2015
37.	Prof. S.K. Chhabra	Lecture on: Home noninvasive ventilation	Department of Pulmonary Medicine and Sleep Disorders, AIIMS, New Delhi and American College of Chest Physicians, USA	AIIMS PULMOCRIT- 2016 New Delhi January 16-17, 2016
38.	Prof. S.K. Chhabra	Lecture on: Management of COPD: recent advances	Chest Research Foundation, Pune and Johns Hopkins School of Public Health, USA	2nd International Conference on Insights and Management of COPD (ICONIC 2016) Pune February 6-7, 2016
39.	Prof. S.K. Chhabra	Lecture on: Air pollution and health	Maitreyi College, University of Delhi	National Symposium on Man-made Diseases: An Urban Menace New Delhi February 11-12, 2016
40.	Prof. S.K. Chhabra	Chaired a session on Air pollution and health	Indian Council of Medical Research	Indo-US Collaboration on Environmental and Occupational Health New Delhi February 24-26, 2016
41.	Prof. S.K. Chhabra	Chaired a session on sleep apnea	Indian Sleep Disorders Association (IDSA)	Annual Conference of the Indian Sleep Disorders Association (SLEEPCON, 2016) New Delhi March 25-27, 2016

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
42.	Prof. S.K. Bansal	Chaired a session on: Allergic disease recent perspective As a Judge of 'M. Sundaramma Young Scientist Award'	The Indian College of Allergy, Asthma & Applied Immunology	Saveetha Medical College & Hospital, Saveetha University Thandalam, Chennai January 28-31, 2016
43.	Prof. Raj Kumar	Faculty	World Health Organisation (WHO) India	World No Tobacco Day (WNTD)-2015 - National Consultation on Illicit Trade in Tobacco New Delhi May 29, 2015
44.	Prof. Raj Kumar	Faculty	V.P.C.I., University of Delhi, National College of Chest Physicians (India) and Society for Tobacco Control	Workshop on Sleep Study Delhi July 6, 2015
45.	Prof. Raj Kumar	Guest Faculty	Nischal Nidra	Workshop on Sleep and Snoring Solution Greater Noida July 7, 2015
46.	Prof. Raj Kumar	Lecture on: Tobacco cessation services in India: status, challenges and way forward	The Union South-East Asia Office	Roundtable Consultation, The Union South-East Asia Office New Delhi September 3, 2015
47.	Prof. Raj Kumar	Lecture on: Introduction on sleep medicine and scope	Nischal Nidra	Workshop on Sleep and Polysomnography, Greater Noida September 26, 2015
48.	Prof. Raj Kumar	Lecture on: Indoor and ambient air pollution Chaired a session on Air pollution and children health	PHFI and the Children's Health and Environment Program (CHEP), University of Queensland, Australia	Workshop on Children's Environmental Health Gurgaon November 23-24, 2015
49.	Prof. Raj Kumar	Chaired a session on Radial probe EBUS – technique	Jaipur Golden Hospital	Workshop on EBUS Masterclass Delhi December 17, 2015

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
50.	Prof. Raj Kumar	Delivered Prof. D.N. Shivpuri Oration Lecture on: Food allergies: can we do more beyond prevention Expert, Panel Discussion	Indian College of Allergy, Asthma and Applied Immunology and Saveetha Medical College	49th National Conference of Indian College of Allergy, Asthma and Applied Immunology (ICAAICON 2015) Chennai December 28-31, 2015
51.	Prof. Raj Kumar	Lecture on: Lung health: environmental effects	Ministry of Overseas Indian Affairs and Ministry of Health and Family Welfare, Govt. of India	AAPI Global Health Care Summit 2016 New Delhi January 1-3, 2016
52.	Prof. Raj Kumar	Lecture on: How do I achieve smoking cessation	Department of Pulmonary Medicine and Sleep Disorders, AIIMS, New Delhi and American College of Chest Physicians, USA	AIIMS PULMOCRIT- 2016 New Delhi January 16-17, 2016
53.	Prof. Raj Kumar	Lecture on: Smoking cessation	Chest Research Foundation, Pune and Johns Hopkins School of Public Health, USA	2nd International Conference on Insights and Management of COPD (ICONIC 2016) Pune February 6-7, 2016
54.	Prof. Raj Kumar	Chaired a session on Sleep disorders	Indian Sleep Disorders Association (IDSA)	SLEEPCON, 2016 New Delhi March 25-27, 2016
55.	Dr Malini Shariff	Presented posters on • Characterisation of virulence factors of *Pseudomonas aeruginosa* • Antimicrobial resistance in clinical isolates of *Enterobacteriaceae*	Indian Association of Medical Microbiologists and Department of Microbiology, JIPMER	39th Annual Conference of Indian Association of Medical Microbiologists Puducherry November 25-29, 2015
56.	Dr Balakrishnan Menon	Lecture on: Role of CECT and CT guided biopsy in lung cancer	Sir Ganga Ram Hospital	Update in Oncology 2015 : Focus on Lung and Mediastinal Tumours New Delhi December 12, 2015

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
57.	Dr Balakrishnan Menon	Lecture on: Health effects of air pollution	Shivaji College, University of Delhi	National Seminar on Water and Air Quality on Urban Ecosystems New Delhi March 22, 2016
58.	Dr Balakrishnan Menon	Lecture on: Role of radiology in diagnosis and management of tuberculosis	International Union Against Tuberculosis and Lung Diseases (IUATLD) and RNTCP Delhi	CME on TB Control and Care New Delhi March 30, 2016
59.	Dr Mandira Varma-Basil	Presented a paper on Drug susceptibility profile and molecular typing of predominant single nucleotide polymorphism (SNP) cluster groups in Delhi	European Society of Microbiologists	36th Congress European Society of Microbiologists Riga, Latvia June 28 – July 1, 2015
60.	Dr Mandira Varma-Basil	Lecture on: Molecular epidemiology of tuberculosis	Miranda House, University of Delhi	Workshop on Biotechnology Delhi September 17, 2015
61.	Dr Anuradha Chowdhary	Lectures on: • Phaeohyphomycosis due to *Cladophialophora bantiana* in India: an update • Phaeohyphomycosis Presented posters on • Prevalence and mechanism of azole resistance in *Aspergillus fumigatus* in a referral Chest Hospital in Delhi, India • Multidrug-resistant *Candida auris* : characterization by matrix assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF MS) and its antifungal susceptibility profile variability by VITEK-2, CLSI-BMD and E-test method • Genetic diversity of Indian clinical isolates of *Histoplasma capsulatum* var *capsulatum* using multilocus sequence typing (MLST)	International Society for Human and Animal Mycology	19th Congress of International Society for Human and Animal Mycology Melbourne, Australia May 4-8, 2015

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
62.	Dr Anuradha Chowdhary	Lecture on: Emerging filamentous basidiomycetes: allergic and invasive fungi Chaired a session on Common international mycoses: focus on Low-income countries Presented posters on • Comparison of the broth microdilution methods of the EUCAST and the CLSI for testing isavuconazole, posaconazole and amphotericin B against molecularly identified species of mucorales • Genotypic diversity of global multidrug resistant *Candida auris* isolates by MLST, AFLP and MALDI-TOF • ITS barcoding and antifungal susceptibility testing of black moulds and melanized yeasts from cases of Phaeohyphomycoses in India	American Society for Microbiology	Inter-science Conference on Antimicrobial Agents and Chemotherapy (ICAAC), ICAAC/ICC 2015 California, USA, September18-21 , 2015
63.	Dr Anuradha Chowdhary	Lecture on: Taxanomy of mucorales: any changes? Presented posters on • Absence of *FKS1* and *FKS2* mutations in Caspofungin resistant *C. glabrata* isolates from candidemia patients in Delhi, India • *Candida haemulonii* complex: the true scenario by sequencing and MALDI-TOF among clinical isolates in India	European Confederation of Medical Mycology	7th Trends in Medical Mycology (TIMM) Lisbon, Portugal October 9-12, 2015

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
64.	Dr Anuradha Chowdhary	Lecture on: Clinically significant cryptic *Aspergillus* species in a referral chest hospital Delhi, India: MALDI-TOF identification, sequencing and antifungal susceptibility profiling Presented a poster on Azole resistance in clinical *Aspergillus flavus* isolates with novel S196F, A324P, N423D and V465M substitutions in *Cyp51C* gene	Internation Society for Human and Animal Mycology (ISHAM) and European Confederation of Medical Mycology (ECMM)	7th Advances Against Aspergillosis United Kingdom March 3-5, 2016
65.	Dr Madhu Khanna	Lecture on: Isolation and evaluation of anti-viral activity of trachyspermum ammi plant extract against influenza A virus infection	International Society for Influenza and other Respiratory viruses (ISIRV)-Antiviral Group (isirv-AVG)	International Conferece on Novel Antiviral Therapies for Influenza and Other Respiratory Viruses Austin, USA June 2-4, 2015
66.	Dr Anita Kotwani	Presented a paper on Perception and knowledge of antibiotic use and resistance among high school students and teachers in New Delhi, India	International Society for Pharmacoeconomics and Outcome Research (ISPOR)	International Society for Pharmacoeconomics & Outcome Research (ISPOR) 20th Annual International Meeting Philadelphia, USA May 16-20, 2015
67.	Dr Anita Kotwani	Panelist on the panel discussion on efforts to improve quality in the private sector	Bill and Melinda Gates Foundation and Duke University	Workshop on Quality of Health Care: Measurement & Efforts to Improve Quality Neemrana Fort-Palace, Delhi-Jaipur Highway June 30-July1, 2015
68.	Dr Kavita Gulati	Lecture on: Role of nitric oxide in drug and xenobiotic toxicity	V.P.C.I., University of Delhi	Symposium on Nitric Oxide: from Research to Applications Delhi April 6, 2015
69.	Dr Kavita Gulati	Lecture on: Experimental methods in respiratory research	Bombay College of Pharmacy	Workshop on Telemetry the Science of Physiological Monitoring in Stress Free Animal Mumbai April 16, 2015

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
70.	Dr Vishwajeet Rohil	Participation in discussions and deliberations in spearheading private health sector towards TB free India	USAID (U.S. Agency for International Development) and The International Union Against Tuberculosis and Lung Disease	Spearheading Private Health Sector Action Towards a TB-Free India New Delhi September 29, 2015
71.	Dr Vishwajeet Rohil	Chaired a session on Biochemistry of hepatic disorders	Association of Clinical Bioehemists of India	*42nd* National Conference of Association of Clinical Bioehemists of India (ABICON 2015) Chandigarh November 25-28, 2015
72.	Dr Vishal Bansal	Lecture on: Mobile and today's youth	Darshan Academy,	World Health Day Delhi April 7, 2015
73.	Dr Vishal Bansal	Presented a poster on A prospective study to assess the role of N-Acetyl cysteine and pulmonary rehabilitation on quality of life in patients of chronic obstructive pulmonary disease	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2015) [17th Joint National Conference of NCCP (I) & ICS] Jaipur November 4-7, 2015
74.	Dr Vishal Bansal	Presented posters on • Effect of low and high volume of high intensity interval training on heart rate variability in sedentary collegiate females: a pilot study • Validity of the Hindi version of activity specific balance scale in Indian older adults	Physiotherapy Unit, Dr BRA, IRCH, All India Institute of Medical Sciences	IVth International Conference & Workshops of Physical Therapy, AIIMS - 2015 New Delhi November 28-29, 2015
75.	Dr Vishal Bansal	Participated in a panel discussion on COPD: recent advances in strategies of management (pharmacologic and non-pharmacologic)	Department of Pulmonary Medicine and Sleep Disorders, AIIMS, New Delhi and American College of Chest Physicians, USA	AIIMS PULMOCRIT- 2016 New Delhi January 16-17, 2016
76.	Dr Mujeeb-ur Rahman	Lectures on: • Correlation techniques • Regression techniques	Post Graduate Institute of Medical Education and Research, Dr RML Hospital	Workshop on Medical Research and Statistical Methods New Delhi March 2-3, 2016

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
77.	Dr Ritu Kulshrestha	Resource person of labs: laboratory experiments/ procedures	All India Institute of Medical Sciences	1st National Conclave on Virtual Teaching New Delhi September 11, 2015
78.	Dr Ritu Kulshrestha	Lectures on: • Interesting cases of lung cytology • Cytology of lung lesions	Indian Academy of Cytologists, (Karnataka Chapter) and Department of Pathology, JSSMC	IAC-KC CON 2016, the 4th Annual Conference of the Indian Academy of Cytologists, (Karnataka Chapter) Mysore January 29-30, 2016
79.	Dr Ritu Kulshrestha	Presented a paper on Study of immature granulocyte count and total granulocyte count using the Sysmex XN-1000 blood cell analyzer in adult patients admitted to intensive care unit with respiratory distress	Christian Medical College	HAEM@cmcvellore (Haematology/ HaemostasisAnalyser's Education Meet) Vellore February 26-27, 2016
80.	Dr Ritu Kulshrestha	Lecture on: Diagnostic approach to pathology of diffuse lung disease on transbronchial lung biopsy	Bombay Hospital and Cipla Ltd	Diffuse Lung Disease - ERS Meeting New Delhi March 4-5, 2016
81.	Dr Mandeep Singh (DM Student) *(Guide: Prof. Raj Kumar)*	Presented a poster on Effect of obesity and metabolic syndrome in patients with bronchial asthma	European Respiratory Society (ERS)	ERS International Congress 2015 Amsterdam, the Netherlands September 26-30, 2015
82.	Dr Preeti Solanki (Post-doctoral Fellow) *(Guide: Prof. K. Ravi)*	Presented a paper on Modulation of hypoglossal nerve activity (HGN) activity in rats exposed to chronic intermittent hypoxia (CIH)	The Association of Physiologists and Pharmacologists of India and Department of Physiology, AIIMS, Jodhpur	61st National Conference of Physiology and Pharmacology (APPICON 2015) Jodhpur November 25-28, 2015
83.	Dr Raman Ghai (MD Student) *(Guide: Prof. K. Ravi)*	Presented a poster on Effect of chronic intermittent hypoxia (CIH) on contractile properties of the geniohyoid (GH) muscle	The Association of Physiologists and Pharmacologists of India and Department of Physiology, AIIMS, Jodhpur	61st National Conference of Physiology and Pharmacology (APPICON 2015) Jodhpur November 25-28, 2015

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
84.	Mr Kamal Singh (Research Associate) *(Guide: Prof. Raj Kumar)*	Presented a paper on To measure the effect of environmental tobacco smoke exposure on the respiratory health of children in rural area of Delhi-NCR	Indian College of Allergy, Asthma and Applied Immunology and Saveetha Medical College	49th National Conference of Indian College of Allergy, Asthma and Applied Immunology (ICAAICON 2015) Chennai December 28-31, 2015
85.	Ms Karuna Sharma (PhD Student) *(Guide: Dr Vishwajeet Rohil)*	Presented a poster on First trimester biomarkers in prediction of pregnancy hypertension	Association of Clinical Bioehemists of India	*42nd* National Conference of Association of Clinical Bioehemists of India (ABICON 2015) Chandigarh November 25-28, 2015
86.	Ms Anshika Narang (PhD Student) *(Guide: Dr Mandira Varma-Basil)*	Presented a poster on Role of putative efflux gene *Rv0194* in *Mycobacterium tuberculosis* drug susceptible isolates	European Society of Microbiologists	36th Congress European Society of Microbiologists Riga, Latvia June 28 – July 1, 2015
87.	Ms Shraddha Porwal (PhD Student) *(Guide: Dr Mandira Varma-Basil)*	Presented a poster on Ethambutol resistant: is it a more reliable indicator of MDR tuberculosis?	Indian Association of Medical Microbiologists (IAMM) (Delhi Chapter)	7th Annual Conference of the Indian Association of Medical Microbiologists (IAMM) (Delhi Chapter) New Delhi December 11-12, 2015
88.	Gaurav Tyagi (PhD Student) *(Guide: Dr Mandira Varma-Basil)*	Presented a poster on Role of VPCI_Biotin in the biosynthesis of biotin in *Mycobacterium tuberculosis*	Indian Association of Medical Microbiologists (IAMM) (Delhi Chapter)	7th Annual Conference of the Indian Association of Medical Microbiologists (IAMM) (Delhi Chapter) New Delhi December 11-12, 2015
89.	Ms Astha Giri (PhD Student) *(Guide: Dr Mandira Varma-Basil)*	Presented a poster on Lack of association between genotypic polymorphism in Rv3806c (ubiA) and phenotypic ethambutol resistance in clinical isolates of *Mycobacterium tuberculosis* from Delhi	Indian Association of Medical Microbiologists (IAMM) (Delhi Chapter)	7th Annual Conference of the Indian Association of Medical Microbiologists (IAMM) (Delhi Chapter) New Delhi December 11-12, 2015
90.	Mr Kamal Shrivastava (PhD Student) *(Guide: Dr Mandira Varma-Basil)*	Presented a poster on Duplex PCR assay to differentiate between *Mycobacterium tuberculosis* complex and non-tuberculous mycobacteria	Indian Association of Medical Microbiologists (IAMM) (Delhi Chapter)	7th Annual Conference of the Indian Association of Medical Microbiologists (IAMM) (Delhi Chapter) New Delhi December 11-12, 2015

Sl. No.	Faculty Member	Role/Topic	Organiser(s)	Conference, Place and Date
91.	Mr Pradeep Kumar Singh (PhD Student) *(Guide: Dr* Anuradha Chowdhary*)*	Presented a paper on Molecular characterization and antifungal susceptibility profile of melanized fungi: a study of phaeohypho-mycoses in India Presented a poster on Matrix-assisted laser desorption/ ionization time-of-flight mass spectrometry: assessment for identification of clinically significant filamentous basidiomycetes	Society of Indian Human and Animal Mycologist (SIHAM)	11th National Conference of Society of Indian Human and Animal Mycologist (SIHAM) Shimla March 18-20, 2016
92.	Mr Ashutosh Singh (CSIR Fellow) *(Guide: Dr Anuradha Chowdhary)*	Presented posters on • Absence of *FKS1* and *FKS2* mutations in caspofungin resistant *C. glabrata* isolates from clinical sources in Delhi, India • *Candida haemulonii* species complex: an emerging species in India and its genetic diversity by multilocus phylogeny and amplified fragment length polymorphism	Society of Indian Human and Animal Mycologist (SIHAM)	11th National Conference of Society of Indian Human and Animal Mycologist (SIHAM) Shimla March 18-20, 2016
93.	Mr Dibya Ranjan Pati (PhD Student) *(Guide: Dr Madhu Khanna)*	Presented a paper on siRNA mediated targeting of NS1 gene transcript in experimental mice down regulate influenza A virus	International Society for Influenza and other Respiratory Viruses (ISIRV)-Antiviral Group (isirv-AVG)	Novel Antiviral Therapies for Influenza and Other Respiratory Viruses Austin, USA June 2-4, 2015
94.	Mr Tapan Behl (PhD Student) *(Guide: Dr Anita Kotwani)*	Presented a poster on Low dose of AM-251, a cannabinoid receptor-1 antagonist attenuate the chronic alcoholism induced neuropathic pain in Wistar rats	Indian Pharmacological Society and Saurashtra University, Rajkot	International Conference on Cutting-Edge Pharmacology: Contemporary Issues and Future Challenges & 48th Annual Conference of Indian Pharmacological Society Rajkot, Gujarat· December 18-20, 2015

Participation in Advanced and Specialised Training Programme by Faculty Members

Sl. No.	Participant (Department)	Course Title/ Topic	Training Duration	Host
1.	Prof. S.K. Bansal (Biochemistry)	Bio-Risk Management Capacity Building Workshop	May 5-9, 2015	National Centre for Disease Control (NCDC) Delhi, India, and CDC, Atlanta (USA)
2.	Dr Vishwajeet Rohil (Clinical Biochemistry)	Microarray Analysis	May 30 - June 2, 2015	Genotypic Technology Pvt. Ltd, Bengaluru, Karnataka
3.	Dr Mujeeb-ur-Rahman (Miostatistics)	Refresher Course in Mathematical Sciences [comprised of Mathematics, Operations Research, Computer Science and Statistics]	November 26 - December 16, 2015	Centre for Professional Development in Higher Education (UGC-HRDC), University of Delhi, Delhi
4.	Dr Malini Shariff (Microbiology)	Bio-risk Management Capacity Building Workshop	May 5-9, 2015	National Centre for Disease Control (NCDC), India and CDC, USA
5.	Dr Anuradha Chowdhary (Medical Mycology)	Medical Mycology Course	September 7-17, 2015	University of Leuven, Belgium
6.	Prof. Raj Kumar (Respiratory Allergy and Applied Immunology)	Advance Sleep Medicine Course-2015	October 2-4, 2015	Indian Sleep Disorders Association at Department of Pulmonary, Critical Care and Sleep Medicine, Safdarjang Hospital, New Delhi
7.	Prof. Raj Kumar (Respiratory Allergy and Applied Immunology)	Workshop on EBUS Masterclass	December 17, 2015	Jaipur Golden Hospital, Delhi
8.	Prof. Raj Kumar (Respiratory Allergy and Applied Immunology)	SMSs - mCessation Programme for Tobacco Cessation Programme	January 27, 2016	Ministry of Health and Family Welfare, Govt. of India, New 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 Siddhartha Kumar and Mr Raj Aryan MSc (Biotechnology) Central University of South Bihar, Patna	Techniques in biochemistry	Prof. S.K. Bansal (Biochemistry)	June 15 - July 17, 2015
2.	Ms Princy Kaur Saini and Ms Priyanka Sharma MSc (Biochemistry) Kurukshetra University, Kurukshetra, Haryana	Techniques in biochemistry	Prof. S.K. Bansal (Biochemistry)	June 15 - July 17, 2015
3.	Ms Shweta Tomar MSc (Biodiversity and Conservation) Guru Gobind Singh I.P. University, New Delhi	Techniques in biochemistry	Prof. S.K. Bansal (Biochemistry)	July 01 -31, 2015
4.	Ms Nidhi Gupta MSc (Biomedical Science) Banasthali University, Rajasthan	Clinical biochemistry and biotechnology	Dr Vishwajeet Rohil (Clinical Biochemistry)	June 1- 30, 2015
5.	Ms Ridhima Wadhwa BTech + MTech (Dual) (Biotechnology) Amity Institute of Biotechnology, Amity University, Noida, Uttar Pradesh	Clinical biochemistry and biotechnology	Dr Vishwajeet Rohil (Clinical Biochemistry)	June 4 - July 3, 2015
6.	Ms Varsha Gupta, Ms Barkha Gupta and Ms Sunita BSc (H) Biomedical Science Shaheed Rajguru College of Applied Science for Women, University of Delhi, Delhi	Clinical biochemistry and biotechnology	Dr Vishwajeet Rohil (Clinical Biochemistry)	June 8 - July 7, 2015

Sl. No.	Name, Subject and University/Institute/College	Course Title/Topic	Faculty Member (Department)	Period
7.	Ms Priyanka Yadav MSc (Applied Chemistry) Amity Institute of Applied Sciences, Amity University, Noida, Uttar Pradesh	Clinical biochemistry and biotechnology	Dr Vishwajeet Rohil (Clinical Biochemistry)	June 15 - July 15, 2015
8.	Ms Taru Aggarwal and Ms Harshika Tyagi BTech (Biotechnology) Amity Institute of Biotechnology, Amity University, Gurgaon, Haryana	Clinical biochemistry and biotechnology	Dr Vishwajeet Rohil (Clinical Biochemistry)	June 1 - July 31, 2015
9.	Ms Nikky and Ms. Vandna MSc (Medical Biotechnology) Maharshi Dayanand University, Rohtak, Haryana	Clinical biochemistry and biotechnology	Dr Vishwajeet Rohil (Clinical Biochemistry)	July 1 - July 31, 2015
10.	Ms Malvika Sharma and Ms Unnati Singh BSc (H) (Medical Biotechnology) Amity Institute of Applied Sciences, Amity University, Noida, Uttar Pradesh	Clinical biochemistry and biotechnology	Dr Vishwajeet Rohil (Clinical Biochemistry)	February 22 - April 5, 2016
11.	Ms Priya Gulati MSc in Applied Microbiology Vellore Institue of Technology, Vellore, Tamil Nadu	Development of a real-time assay for quantification of non-tuberculous mycobacteria in clinical samples	Dr Mandira Varma-Basil (Microbiology)	December 1, 2015 - May 13, 2016
12.	Mr Divyanshu Uppal and Mr Himanshu Bairagi BTech + MTech (Dual) (Biotechnology) Amity Institute of Biotechnology, Amity University, Noida, Uttar Pradesh	Training on pathology techniques	Dr Ritu Kulshrestha (Pathology)	February 8 - April 8, 2016

Sl. No.	Name, Subject and University/Institute/College	Course Title/Topic	Faculty Member (Department)	Period
13.	Mr Akshyansh Kumar, Ms Juhi Rai, Mr Kartik Bhargava and Ms Mansi Balhara (BTech Biotechnology) Amity Institute of Biotechnology, Amity University, Noida, Uttar Pradesh	Training on pathology techniques	Dr Ritu Kulshrestha (Pathology)	February 15 - April 8, 2016
14.	Ms Adhya Kumar, Ms Rashmi Adhikari, Mr Rajkumar, Ms Pooja Singh, Ms Geetika and Mr Rahul BSc (Physiotherapy) Pt. Deendayal Upadhyaya Institute for the Physically Handicapped, New Delhi	Clinical training in cardio-pulmonary rehabilitation	Dr Vishal Bansal (Physiology)	August 17, 2015 - February 10, 2016
15.	Ms Pooja Rana, Ms Charu Sain, Ms Shivani Sagar, Ms Sonam Kasana, Ms Kriti Sharma and Mr Karan B. Sc. (Physiotherapy) Pt. Deendayal Upadhyaya Institute for the Physically Handicapped, New Delhi	Internship training in cardio-pulmonary rehabilitation	Dr Vishal Bansal (Physiology)	September 7, 2015 - March 6, 2016
16.	Three batches of 5 members each of Intensive Care specialists from different states (nominated by Ministry of Health and Family Welfare, Government of India)	Intensive care management of influenza patients	Prof. S.K. Chhabra (Cardio-respiratory Physiology)	October 2015- November 2015
17.	Mrs Aruna A (Charge Nurse) Department of Pulmonary Medicine, Christian Medical College and Hospital, Vellore, Tamilnadu	One day training in smoking cessation including how to start Tobacco Cessation Clinic	Prof. Raj Kumar (Respiratory Allergy and Applied Immunology)	October 1, 2015
18.	Dr Anand Yannawar (Medical Officer) Kasturi Heights, Nanded, Maharashtra	One day training in smoking cessation including how to start Tobacco Cessation Clinic	Prof. Raj Kumar (Respiratory Allergy and Applied Immunology)	November 18, 2015

Cultural and Sports Activities

The Institute conducted the VPCI Sports and Cultural Activity - 2015 programme from 1st to 6th January 2016. The Sports events include: Musical Chair, Table Tennis, Badminton, Bench Press (Weight Lifting), Carom and Chess; and the Cultural events include: Play, Dance, Vocal Music, Instrumental Music and Poem Recitation. Most of the staff members, students and family members of VPCI participated in this programme. The Institute distributed Trophies and Certificates (First, Second and Third) to the winners. Dr Manu Madan, MD (Pulmonary Medicine), Student adjudged as the Best All Round Sportsman and Ms Baby Neerja Anup (Daughter of Ms Jayalakshmi Anup, Staff Nurse) adjudged as the Best Cultural Performer for the year 2015.

The staff members of the Institute had also participated in various events of the Annual Tournament of Delhi University Staff Club.

Annual cultural and sports day was celebrated in the Institute. Director of the Institute addressed the participants. Some of the events of the programme are presented in the photographs

Independence and Republic days were celebrated in the Institute. Prof. S.N. Gaur, Director (Acting) was addressing the audience on the occasion. Sweets were distributed to the patients admitted at Institute on the occasion.

List of Publications

Journals

1. Abdolrasoulia A, Rhodes J, Beale MA, Hagen F, Rogers TR, Chowdhary A, Meis JF, Armstrong-James D, Fisher MC. Genomic context of azole-resistance mutations in *Aspergillus fumigatus* determined using whole-genome sequencing. *Mbio* 2015;6:pii: e00536-15.
2. Abhimanyu, Bose M, Varma-Basil M, Jain A, Sethi T, Tiwari PK, Agrawal A, Banavaliker JN, Bhowmick KT. Establishment of elevated serum levels of IL-10, IL-8 and TNF-β as potential peripheral blood biomarkers in tubercular lymphadenitis: a prospective observational cohort study. *PLoS One* 2016;11:e0145576 [doi: 10.1371/journal.pone.0145576].
3. Agarwal K, Gaur SN, Chowdhary A. The role of fungal sensitization in clinical presentation in patients with chronic obstructive pulmonary disease. *Mycoses* 2015;58:531-5 [doi: 10.1111/myc.12352].
4. Badali H, Khodavaisy S, Fakhim H, de Hoog GS, Meis JF, Chowdhary A. *In vitro* susceptibility profiles of eight antifungal drugs against clinical and environmental strains of *Phaeoacremonium. Antimicrob Agents Chemother.* 2015;59:7818-22.
5. Behl T, Kotwani A. Exploring the various aspects of pathological role of vascular endothelial growth factor (VEGF) in diabetic retinopathy. *Pharmacological Research* 2015;99:137-48.
6. Behl T, Kotwani A. Possible role of endostatin in the antiangiogenic therapy of diabetic retinopathy. *Life Sciences* 2015135:131-7.
7. Chhabra SK. Clinical application of spirometry in asthma: why, when and how often? *Lung India* 2015;32:635-8.
8. Chhabra SK. Interpretation of spirometry: selection of predicted values and defining abnormality. *Indian J Chest Dis Allied Sci* 2015;57:91-105.
9. Chaudhary R, Sharma R, Gulati K, Ravi K. Role of the paraventricular nucleus in the reflex diuresis to pulmonary lymphatic obstruction in rabbits. *Canadian J Physiol Pharmacol* 2016;94:18-27.
10. Chowdhary A, Singh PK, Kathuria SK, Meis JF. Comparison of the broth microdilution methods of the European Committee on Antimicrobial Susceptibility Testing and the Clinical and Laboratory Standards Institute for Testing Isavuconazole, Posaconazole and Amphotericin B against molecularly identified species of Mucorales. *Antimicrob Agents Chemother* 2015;59:7882-7.
11. Chowdhary A, Sharma C, Kathuria S, Hagen F, Meis JF. Prevalence and mechanism of triazole resistance in *Aspergillus fumigatus* in a referral chest hospital in Delhi, India and an update of the situation in Asia. *Front Microbiol* 2015;6:1-10.
12. Chowdhary A, Hagen F, Curfs-Breuker I, Madrid H, de Hoog GS, Meis JF. In vitro activity of eight antifungal drugs against a global collection of genotyped isolates of *Exserohilum*. *Antimicrob Agents Chemother* 2015;59:1-4.
13. Garg T, Gera K, Shah A. Middle lobe syndrome: an extraordinary presentation of endobronchial tuberculosis. *Pneumonol Alergol Pol* 2015;83:387-91.
14. Gaur SN, Bhati G. Asthma and chronic obstructive pulmonary disease overlap syndrome: Decoding the enigma. *Indian J Allergy Asthma Immunol* 2015;29:1-2.
15. Gera K, Roshan R, Varma-Basil M, Shah A. Chronic pneumonia due to *Klebsiella oxytoca* mimicking pulmonary tuberculosis. *Pneumonol Alergol Pol* 2015;83:383-6.
16. Goel C, Gaur SN, Bhati G, Arora N. DC type 2 polarization depends on both the allergic status of the individual and protease activity of Per a 10. *Immunobiology* 2015;220:1113-21.

17. Goel C, Kalra N, Dwarakanath BS, Gaur SN, Arora N. Per a 10 protease activity modulates CD40 expression on dendritic cell surface by nuclear factor-kappaB pathway. *Clin Exp Immunol* 2015;180:341-51. [doi: 10.1111/cei.12569].

18. Gonçalves SS, Souza AC, Chowdhary A, Meis JF, Colombo AL. Epidemiology and molecular mechanisms of antifungal resistance in *Candida* and *Aspergillus. Mycoses* 2016; Jan 26. [doi: 10.1111/myc.12469].

19. Grover C, Goel N, Armour C, Asperen PP van, Gaur SN, Moles RJ, Saini B. Medication education program for Indian children with asthma: a feasibility study. *Nigerian J Clin Prac* 2016;19:76-84.

20. Gulati K. Translational research and herbal drug development: an experience with bronchial asthma. *Med Aromat Plants* 2015;4:63.

21. Gulati K, Ray A. ADR surveillance in asthma and COPD patients. *J Pharmacovig Drug Safety* 2015;12:27-30.

22. Gulati K, Chakraborti A, Ray A. Gender based differences in stress-induced gastric ulcer formation and its regulation by nitric oxide (NO): an experimental study. *Curr Pharm Design* 2015;21:3395-3401.

23. Gulati K, Joshi JC, Ray A. Recent advances in stress research: focus on nitric oxide. *Eur J Pharmacol* 2015;765:406-14.

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29. Joshi JC, Ray A, Gulati K . Effects of morphoine on stress induced anxiety in rats: role of nitric oxide and Hsp70. *Physiol Behav* 2015;139:393-6.

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34. Kotwani A, Kumar S, Swain PK, Suri JC, Gaur SN. Antimicrobial drug prescribing patterns for community-acquired pneumonia in hospitalized patients: A retrospective pilot study from New Delhi, India. *Indian J Pharmacol* 2015;47:375-82. [doi: 10.4103/0253-7613.161258].

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38. Kumar R, Poongadan MN, Singh M. Allergic bronchopulmonary aspergillosis presenting as lobar or total lung collapse. *Pneumonol Alergo Pol* 2015;83;144-50.

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40. Kumar R, Kumar M, Robinson K, Shah P, Bisht I, Gupta N. Atmospheric pollen count in North Delhi region. *Indian J Allergy Asthma Immunol* 2015;29:32-9.

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Books

Kumar R. *Respiratory Allergy: Diagnosis and Management.* Delhi: Neelam Graphics; 2015.

Chapters in Books

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7. Shah A. Fungal infections of lungs. In: Munjal YP, editor. *API Textbook of Medicine*; 10th edition. Mumbai: Association of Physicians of India; 2015:pp2371-7.

Institute celebrated 1st International Yoga Day on June 17, 2015. Faculty, Staff and Students of the Institute as well as personnel of the Delhi Police participated.

On World Environment Day, plantation of a tree was done by The Director, Faculty members and Staff of the Institute on June 5, 2015

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