ANNUAL REPORT
2005-06

Vallabhbhai Patel Chest Institute
University of Delhi, Delhi

CREDIT LINE

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From the Director's Desk

It is with great pleasure I am presenting the Annual Report of the V.P. Chest Institute (VPCI) for the year 2005-06. The present report reviews Institute's manifold activities in the areas of Teaching, Research and Patient-care. The year under review is a momentous one in the sense that the Clinical Research Centre has been expanded with an 8-bedded Intensive Care Unit (ICU) having ultra modern facilities. Prof. P.N. Srivastava, Chairman, Governing Body (VPCI), inaugurated the ICU on 10th January 2006.

The Institute continued to celebrate its Foundation Day. On the occasion of the 56th Foundation Day Celebrations, Prof. Naranjan S. Dhalla, Professor and Director, Institute of Cardio-vascular Sciences, St. Boniface General Hospital and Research Centre, University of Manitoba, Canada, delivered the 7th Professor Raman Viswanathan-VPCI Oration (earlier named as VPCI Oration) on 6th April 2005.

In the memory of late Professor Autar Singh Paintal (Padma Vibhushan recipient and a Physiologist of International repute), former Director of our Institute, an Oration was instituted and the first "Professor Autar Singh Paintal Memorial Oration" was delivered by Prof. M.S. Valiathan, an eminent Cardio-thoracic Surgeon and presently Honorary Advisor, Manipal Academy of Higher Education, Manipal, Karnataka, on 24th September 2005.

The Institute continued its thrust for research in Respiratory Diseases and Allied Sciences. The notable contributions during the period include; acetoxy drug: protein transacetylase from lung and liver, lipid rafts in bronchial asthma, mycobacterial-epithelial interaction in innate immune response to tuberculosis, efficacy of UNIM-352 (ZN_5) in bronchial asthma, impact of standard treatment guidelines and patient education on quality of asthma management, responsiveness of airway rapidly adapting receptors to cigarette smoke inhalation in normal and sensitized rabbits, prevalence of sleep related breathing disorders, effect of indoor air pollution on respiratory functions in children, virological and biochemical regulatory mechanism of influenza virus induced apoptosis in murine model of allergic asthma, etc.

During the year, the Institute has successfully organized as many as five important Conferences / Symposia / Workshops / CMEs with the prodigious efforts of the faculty, student and staff members: "a National Symposium on Influenza: Epidemiology and Control" on 5th April 2005, "5th CME: National Update on COPD" on 24th April 2005, "7th Annual Conference-cum-Workshop of the Indian Association of Mycoplasmologists" on 28th-29th April 2005, "32nd Workshop on Respiratory Allergy: Diagnosis and Management" on 25th May-1st June 2005, and "Workshop on Good Clinical Practice for Investigators" on 25th-26th November 2005. All these events were attended by a good number of eminent scientists as well as trainee Physicians / Researchers / Technical personnel / students in their respective areas and shared their knowledge and experiences.

The renovation of the Institute buildings, Patel Niwas (Postgraduate hostel) and addition of equipments for research / patient care were also done during this period. The construction of the Golden Jubilee Auditorium-cum-Convention Center is in its last phase and gives a new look to the Institute.

V.K. Vijayan
Director

ANNUAL REPORT (2005-06)

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MILESTONES OF VPCI

April 6,	1949	Foundation stone of the Institute was laid down by Sardar Vallabhbhai Patel.
November	1951	Ad-hoc Governing Body was appointed by the Executive Council of University of Delhi for administrative affairs of the Institute.
December	1951	Main building of the Institute was completed.
January 12,	1953	The Institute was formally opened by Rajkumari Amrit Kaur, the Union Minister of Health, Government of India.
		Prof. R. Viswanathan was appointed as the first Director. The grant for 1953-54 was Rs. 2 lakh.
January 21,	1955	A regular Governing Body was constituted by the Executive Council of the University of Delhi for the management and administration of the Institute.
April 4,	1955	The first meeting of the regular Governing Body was held.
	1955	Prof. A.S. Paintal reported the discovery of lung deflation receptors, a historical landmark in understanding the functioning of lung and its diseases.
July 1,	1957	Prof. R. Viswanathan took over as full-time Director of the Institute. Previously, he was the Deputy Director General of Health Services, Govt. of India and Honorary Director of the Institute.
September 24,	1957	Pt. Jawaharlal Nehru said in a message: "It was a brave act of the University of Delhi to start the V.P. Chest Institute".
October 24,	1957	Clinical Research Centre was inaugurated by Dr Rajendra Prasad, President of the Republic of India.
January 24,	1959	Indian Association for Chest Diseases was inaugurated by Sir A.L. Mudaliar. It was rechristened as National College of Chest Physicians (India) in January 1981.
July	1959	*The Indian Journal of Chest Diseases*, a Quarterly Journal, was started under the joint auspices of the V.P. Chest Institute and the Indian Association for Chest Diseases.
	1959	A ward of 20 beds was opened to admit patients.
	1959	By a resolution of the Governing Body, V.P. Chest Institute was nominated as a "National Institute for Teaching and Research in Chest and Allied Diseases".
January	1960	A Diploma course in Tuberculosis Diseases, which was started in March 1947, was re-designated as "Diploma in Tuberculosis and Chest Diseases" (DTCD) from XIV Course. The XV DTCD Course started from July 1960.
April 6,	1961	Celebration of Foundation Day 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, Delhi.
January 26,	1963	A contingent of V.P. Chest Institute staff participated in the Republic Day parade.
February 20-24,	1963	VII International Congress on Diseases of the Chest was held at Vigyan Bhawan under the auspices of V.P. Chest Institute, Indian Association for Chest Diseases and the University of Delhi.
August 1,	1964	Prof. A.S. Paintal joined as the Director of the Institute after the retirement of Prof. R. Viswanathan.
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.
	1984-85	Prof. A.S. Paintal was elected General President of the Indian Science Congress Association.
	1986	Prof. A.S. Paintal was appointed as Director-General of the Indian Council of Medical Research.
	1985-88	Prof. H.S. Randhawa was elected Vice-President of the International Society for Human & Animal Mycology.
	1986	Padma Vibhushan was awarded to Prof. A.S. Paintal.
	1986-88	Prof. A.S. Paintal was elected President of the Indian National Science Academy.
November 10,	1991	Prof. H.S. Randhawa joined as the Director of the Institute.
October 5,	1998	Dr V.K. Vijayan joined as the Director of the Institute.
April 6,	1999	Golden Jubilee Celebrations of the Foundation Day of the Institute.
		1st VPCI Oration by Prof. N.K. Ganguly, Director-General, Indian Council of Medical Research.
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.
April 6,	2000	2nd VPCI Oration by Prof. A.S. Paintal, Ex-Director-General, ICMR and Ex-Director, VPCI.
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.
	2000-06	Dr V.K. Vijayan was elected International Regent, American College of Chest Physicians, U.S.A.
March	2001	A Respiratory Critical Care Unit was started.
March 15,	2001	CT Scan Centre was inaugurated by Honourable Padma Shree Dr C.P. Thakur, the Union Minister of Health & Family Welfare, Govt. of India.
April 6,	2001	3rd VPCI Oration by Dr S. Lakshminarayanan, University of Washington School of Medicine, Washington, Seattle, U.S.A.
April 21,	2001	1st Refresher (CME) Course in Respiratory Diseases started.
November 21,	2001	Inauguration of Tobacco Cessation Clinic.
April 6,	2002	4th VPCI Oration by Dr S. Padmavati, President, All India Heart Foundation and Director, National Heart Institute, New Delhi.
August 14,	2002	Inauguration of the State-of-the-art Oxygen Plant by Prof. P.N. Srivastava, Chairman, Governing Body, V.P. Chest Institute.
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.
April 7,	2003	5th VPCI Oration by Prof. J.S. Bajaj, former Professor and Head, Department of Medicine, All India Institute of Medical Sciences, New Delhi & former Member, Planning Commission, Government of India.
May 28,	2003	"Bhoomi Pujan" to start the construction work of the Auditorium.
April 6,	2004	6th VPCI Oration by Prof. H.S. Randhawa, former Director, V.P. Chest Institute, University of Delhi, Delhi.

April 6,	2005	7th Prof. R. Viswanathan-VPCI Oration by 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.
September	24, 2005	First Prof. A.S. Paintal Memorial Oration by Prof. M.S. Valiathan, Honorary Advisor, Manipal Academy of Higher Education, Manipal (Karnataka).
January 10,	2006	Inauguration of 8-bedded Intensive Care Unit by Prof. P.N. Srivastava, Chairman, Governing Body (VPCI).

THE INSTITUTE

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

Objectives

The main objectives of VPCI have been to conduct research on fundamental and clinical aspects of chest diseases, to develop new diagnostic technology and disseminate it to other institutes in the country and provide specialised clinical and laboratory services to patients. The training of post graduates in Pulmonary Medicine and allied subjects is another important objective of VPCI.

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 composition of the Governing Body follows in the next page. 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, Cardiorespiratory Physiology, Respiratory Medicine, Thoracic Surgery, Clinical Research Centre housing Outdoor/Indoor patient care services, and Departments of Biochemistry, Clinical Biochemistry, Biostatistics, Medical Mycology, Microbiology, Pathology, Pharmacology, Physiology, Radiodiagnosis and Imaging, Respiratory Allergy and Applied Immunology and Respiratory Virology. These departments are headed by the Faculty Members in the concerned area. The General and Personnel Management including various maintenance activities required for the Institute are supported by administrative services of the Institute which are available through following three sections controlled by the Deputy Registrar who reports to the Director. These sections are: *1*. Administration–I, *2*. Administration–II, and *3*. Finance and Accounts. The administrative services and its sections are shown in the Administrative Structure chart on page no. 19.

GOVERNING BODY

CHAIRMAN	
The Vice-Chancellor, University of Delhi (Ex-Officio) or a person nominated by him	**Prof. P.N. Srivastava** Ex-Vice-Chancellor, J.N.U., New Delhi
MEMBERS	
Treasurer, University of Delhi (Ex-Officio)	**Mrs Janaki Kathpalia**
Two members of the Executive Council nominated by the Executive Council	**Prof. P.V. Indiresan***(till 07.03.2006)* **Prof. Debi P. Sarkar***(11.11.2005 onwards)*
Dean, Faculty of Medical Sciences, University of Delhi	**Prof. P. Kar** *(09.01.2005 onwards)*
Three members nominated by the Ministry of Health and Family Welfare, Government of India, New Delhi	**Mr Sanjiv Misra** Additional Secretary & Financial Advisor
	Smt. Bhawani Thyagarajan Joint Secretary
	Dr S.P. Agarwal Director General of Health Services *(till 2005)*
	Dr R.K. Srivastava Director General of Health Services *(2006 onwards)*
One Member, not connected with the University, appointed by the Executive Council	**Prof. J.N. Pande** *(07.03.2003 onwards)* Former Head, Deptt. of Medicine, AIIMS, New Delhi
One Professor of the Institute by rotation according to seniority for a period of one year	**Prof. M. Bose** *(till 02.11.2005)* **Prof. S.K. Chhabra** *(03.11.2005 onwards)*
One Reader or Lecturer of the Institute by rotation according to seniority for a period of one year	**Dr Vishwajeet Rohil** *(till 02.11.2005)* **Dr Vishal Bansal** *(03.11.2005 onwards)*
MEMBER-SECRETARY	
Director, Vallabhbhai Patel Chest Institute University of Delhi, Delhi (Ex-Officio)	**Dr V.K. Vijayan**

Standing Finance Committee

Mr Sanjiv Misra — *Chairman*
Additional Secretary & Financial Advisor
Ministry of Health & Family Welfare
Government of India
Nirman Bhawan
New Delhi

Dr V.K. Vijayan — *Member-Secretary*
Director
V.P. Chest Institute
University of Delhi
Delhi

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

Dr Binod Kumar Singh *(till 30.05.2005)* — *Member*
Deputy Registrar
V.P. Chest Institute
University of Delhi
Delhi

Shri S.N. Subramanian *(w.e.f. 12.08.2005)* — *Member*
Deputy Registrar
V.P. Chest Institute
University of Delhi
Delhi

Scientific Advisory Committee

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

Dr V.K. Vijayan — *Member-Secretary*
Director
V.P. Chest Institute
University of Delhi
Delhi

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

Principal — *Member*
University College of Medical Sciences
Delhi

Prof. S.N. Gaur — *Member*
Department of Respiratory Medicine
V.P. Chest Institute
University of Delhi
Delhi

Prof. S.S. Thukral — *Member*
Head, Department of Microbiology
V.P. Chest Institute
University of Delhi
Delhi

Ethics Committee

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

Dr V.K. Vijayan — *Member-Secretary*
Director
V.P. Chest Institute
University of Delhi
Delhi

Prof. Nomita Aggarwal — *Member*
Dean, Faculty of Law
University of Delhi
Delhi

Prof. Aruna Bharadwaj — *Member*
Head, Department of Social Work
University of Delhi
Delhi

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

Dr S. Dwivedi — *Member*
Head, Department of Medicine / Preventive Cardiology
University College of Medical Sciences (UCMS)
Shahdara
Delhi-110 095

Dr Ashima Anand — *Member*
Principal Scientific Officer
DST Centre for Visceral Mechanisms
V.P. Chest Institute
University of Delhi
Delhi

Animal Ethics Committee

Prof. M. Fahim — *Chairman (till 19.11.2005)*
Head, Department of Physiology
V.P. Chest Institute
University of Delhi, Delhi

Prof. M.K. Agarwal — *Chairman (20.11.2005 onwards)*
Head, Department of Respiratory Allergy and
Applied Immunology
V.P. Chest Institute
University of Delhi, Delhi

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

Prof. S.S. Thukral — *Member*
Head, Department of Microbiology
V.P. Chest Institute
University of Delhi, Delhi

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

Dr Rameshwar Singh — *Member*
Veterinary Surgeon-Incharge
Animal House
Defence Institute of Physiology and Allied Sciences
Lucknow Road, Delhi

Mrs Uma Tyagi — *Member*
Librarian
V.P. Chest Institute
University of Delhi, Delhi

Ms Geeta Seshamani — *Nominee of CPCSEA*
President
Friendicoes -SECA, Shop Nos. 271 & 273
Defence Colony Flyover Market (Jangpura Side)
New Delhi – 110 024

Prof. K. Muralidharan — *Nominee of CPCSEA*
Head, Department of Zoology
University of Delhi, Delhi

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

ORGANISATIONAL STRUCTURE

DIRECTOR

V.K. Vijayan, MBBS, DTCD, MD, MAMS, PhD, DSc, FCCP, FNCCP (I), FCAI, FICC, FAMS

Biochemistry

H.G. Raj, MSc, PhD, CChem, FRSC
Professor

S.K. Bansal, MSc, PhD
Professor

Biostatistics

Mujeeb-ur-Rahman, MSc, PhD, PGDCP
Lecturer

Cardiorespiratory Physiology

S.K. Chhabra, MBBS, MD
Professor

Clinical Biochemistry

Vishwajeet Rohil, MBBS, MD
Lecturer

Medical Mycology

(Mrs) Anuradha Chowdhary, MBBS, MD
Lecturer (till 02.05.2005)
Reader (w.e.f. 03.05.2005)

Microbiology

S.S. Thukral, MSc (Hons), PhD
Professor

(Mrs) Mridula Bose, MBBS, MD
Professor

(Mrs) Malini Shariff, MBBS, MD, PhD
Reader

(Mrs) Mandira Varma, MBBS, MD, DNB
Reader

Pathology

(Mrs) Ritu Kulshrestha, MBBS, MS (Biomedical Sciences), DNB (Pathology), MNAMS
Lecturer (w.e.f. 10. 05. 2005)

Pharmacology

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

(Mrs) Anita Kotwani, MSc, PhD
Reader (w.e.f. 29.06.2005)

(Mrs) Kavita Gulati, MSc, PhD
Lecturer (w.e.f. 02.05.2005)

Physiology

M. Fahim, MSc, PhD, Av HF (Germany), FAMS
Professor

K. Ravi, MSc, PhD
Professor

Vishal Bansal, MBBS, MD, DNB
Lecturer

Respiratory Allergy and Applied Immunology

M.K. Agarwal, MSc, PhD, FCAI
Professor

Balakrishnan Menon, MBBS, DMRD, MD
Lecturer (till 01-05-2005)
Reader (w.e.f 02-05-2005)

Respiratory Medicine

Unit - I

V.K. Vijayan, MBBS, DTCD, MD, MAMS, PhD, DSc, FCCP, FNCCP (I), FCAI, FICC, FAMS
Director

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

Unit - II

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

Raj Kumar, MBBS, MD, FNCCP (I), FCAI, MIAOH
Reader

Respiratory Virology

(Mrs) Madhu Khanna, MSc, PhD
Reader

Clinical Research Centre

Officer-in-Charge
V.K. Vijayan

Library

(Mrs) Uma Tyagi, MPhil (Physics), MLib. Sci.
Librarian

Animal House

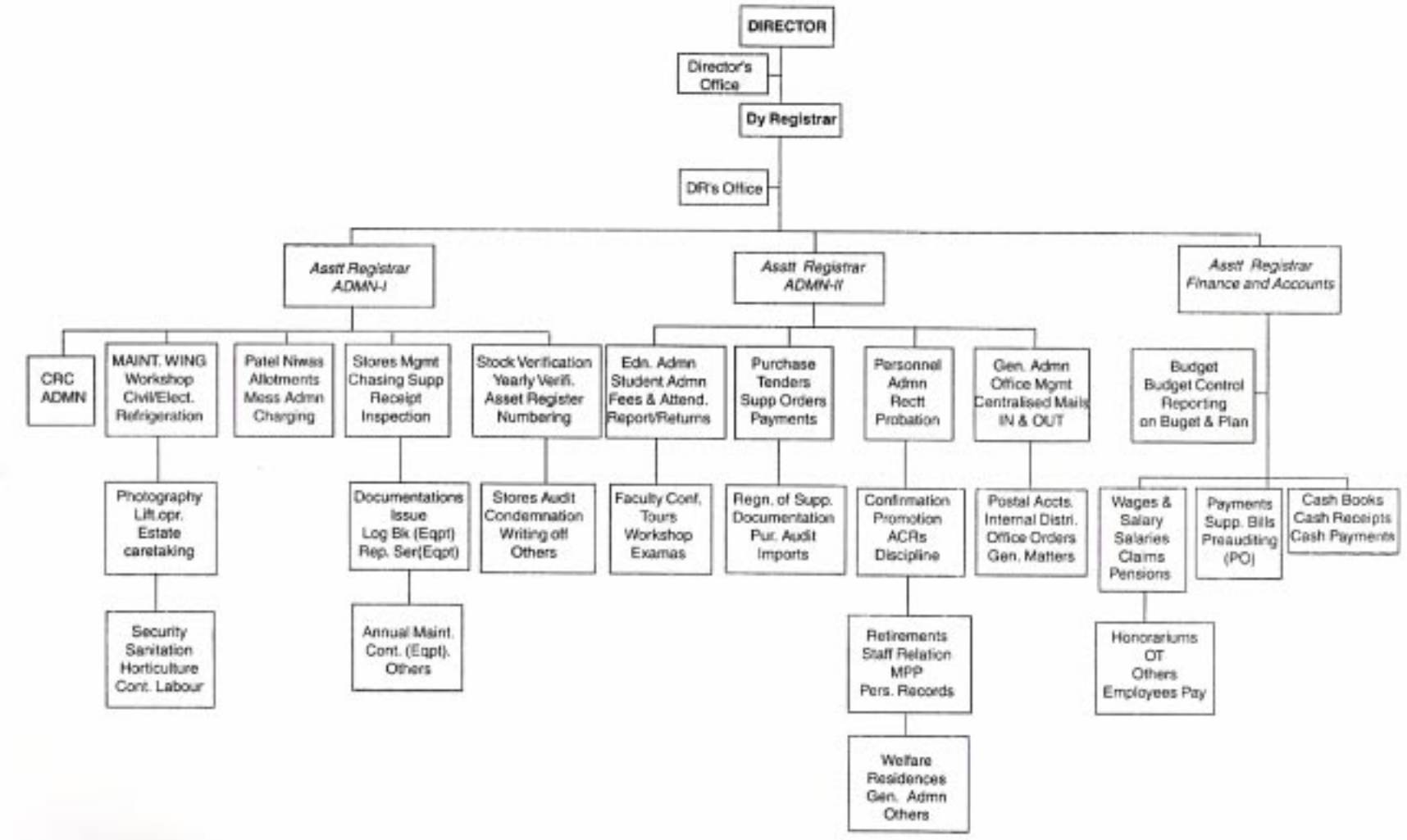
Rajinder Bajaj, BVSc & AH
Veterinarian

Administration

Binod Kumar Singh, MA (Publ. Admn), MA (Eng.), PGDPM, LLB, PhD
Deputy Registrar (till 30.05.2005)

S.N. Subramanian, MSc
Deputy Registrar (w.e.f. 12.08.2005)

ADMINISTRATIVE STRUCTURE



CENTRAL FACILITIES

Clinical Research Centre

The Clinical Research Centre (CRC) is the hospital wing of the Institute with the following Departments / Facilities:

1. Respiratory Medicine (Two units),
2. Cardiorespiratory Physiology,
3. Respiratory Allergy and Applied Immunology,
4. Radiodiagnosis and Imaging (including CT Scan Unit),
5. Out-patient / In-patient Facilities,
6. 24 Hours Respiratory Emergency,
7. Tobacco Cessation Clinic.

During the year 2005-06, the CRC continued to provide specialized investigations and treatment to patients referred to this Institute. The detailed data of patients attending CRC are as follows:

Number of new patients attended OPD	:	8737
Number of old patients attended OPD	:	42783
Total		**51520**

Total number of indoor patients

General Wards	:	2027
Emergency Wards	:	939
Total		**2966**
Number of patients treated at emergency	:	13179
Number of patients treated in ICU	:	125

Number of specialized investigations done

Pulmonary function tests	:	20541
Arterial blood gases	:	1866
Bronchoscopy	:	319
Bronchoalveolar lavage	:	92
CT scans	:	1838
Ultrasound examinations	:	539
X-rays	:	14305
Electrocardiogram	:	1688
Polysomnograms	:	54
HIV testing	:	90
HBs Ag tests	:	07
Flowcytometry	:	638
Clinical biochemistry	:	6546

Tobacco Cessation Clinic

Tobacco Cessation Clinic has been running on every Monday and Wednesday from 2:30-4:30 P.M.

New Cases	:	143
Follow-up Cases	:	53

Animal House

The 'state-of-the-art' Animal House centres on the objective to supply adequate number of good quality animals, which is essential for obtaining reliable and reproducible experimental results in research. Different species, pathogen free animals are bred in the Animal House, which is fully equipped with laboratories for animal experimentation. The rooms of the animal house are well-maintained, ventilated with filtered air and have climate and lighting control facility.

The Animal House is registered for Breeding and Experiments on Animals with Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Animal Welfare Division, Government of India.

The Institute's Animal Ethics Committee kept a vigil so as to promote the humane approach of animal experimentation and provides specifications that enhance animal care and quality in the pursuit of advancement of scientific knowledge.

It is indeed gratifying to report that our Animal House has been accredited with standards of Public Health Service (PHS) Policy on Human Care and Use of Laboratory Animal Welfare (OLAW), Department of Health and Human Services, National Institute of Health, Bethesda, U.S.A.

Library

The Institute has one of the best library in the field of Pulmonary Diseases and allied sciences having 9,601 Books, 17,211 bound Journals, 110 CD's, 426 Thesis and 80 reports from National and International Institutes. A total of 60 Journals (58 International and 02 National) are being subscribed by the library, 20 Journals (08 International and 12 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. Library is also subscribing four English and two Hindi newspapers.

Library renders its services not only to the scientists / research scholars of the Institute, but also to other Colleges and Institute's of the University of Delhi. Library is also affiliated with DELNET (Developing Library Network) to access various databases like Union Catalogue of Books / Periodicals for providing timely and current information. Much emphasis is also laid on to provide abstracts, references, CAS and SDI services. Apart from this, online searches are being carried out for providing instant access of Information Resources to the desktop of researchers through LAN (Local Area Network). The Internet surfing and access has been provided right on the desktop of each Faculty Member through LAN and ISDN connectivity with 128 KBPS line. Library also provides inter-library loan facilities and reprographic services on demand.

The web page of "Online Public Access Catalogue" can be accessed right on the desktop through LAN in the Institute using the URL " http://opac/index.jsp " for searching the database for Books, Journals & Serials available in the library and also for checking the account(s) status by entering the respective membership code.

In continuation to put a further step in the ongoing progress of library development, a new add-on feature of "Hindi Fonts" has been incorporated in the OPAC and the web access to the Catalogue of VPCI Library has been uploaded on the Delhi University Campus Wide Network since March 2004. The catalogue can be accessed using the URL " http://10.8.2.21 " by the users from within as well as outside the Institute (Over Delhi University LAN), thus enabling the users to search the holdings of VPCI Library.

The Web OPAC has now been upgraded with new look and additional features like 'download Hindi font' with other existing features like most used books, suggestion, member directory, library holdings etc, since March 2005.

The Library services are available to Members / Users of Delhi University from Monday to Friday {8.30 A.M. to 7.00 P.M.}.

PUBLICATION DIVISION

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

<http://www.vpci.org.in> and

<http://medind.nic.in>.

Moreover, the Division is also responsible for documentation and dissemination of research output through Annual Reports and other publications of the Institute.

DEPARTMENTAL ACTIVITIES

Biochemistry

Research

1. New insights into the unique biological action of polyphenolic per acetates: the role of acetoxy drug: protein transacetylase

Polyphenols such as flavones, coumarins, chromones and xanthones form an important group of oxygen containing heterocyclic compounds widely present in nature. They are an integral part of plant food material and considered to possess therapeutic potential. Nothing was known about the unique biological action of polyphenolic peracetates (PA) till we discovered an enzyme in the microsomes of mammalian cells and tissues, that catalyze the transfer of acetyl group from PA to certain functional proteins resulting in the altered physiological effects. The enzyme was termed Acetoxy Drug: Protein Transacetylase (TAase) since acetoxy derivatives of several classes of polyphenols were found to be the substrates. TAase catalyzed mechanism-based inhibition of microsomal cytochrome P-450 and profound irreversible activation of cytochrome P-450 reductase by PA were found to be the basis for several beneficial pharmacological effects. Accordingly, PA were found effective in the prevention of activation of clastogenic agents such as benzene and aflatoxin B_1 as evident from cell cycle alteration and the reduced incidence of micronuclei and apoptotic body formation. Further, spheroid cultures established from one of the glioma cell lines had two fold increase in the level of TAase as compared to the monolayers and also a higher degree of sensitivity to 7, 8-diacetoxy-4-methylcoumarin (DAMC), a model PA. Nitric oxide synthase (NOS) bearing a domain of NADPH cytochrome P-450 reductase was found to be remarkably activated by PA catalyzed by TAase present in human platelets and rat tracheal smooth muscle cells culminating in the enhanced intracellular levels of NO. Accordingly, PA in tune with their specificities to TAase were effective in eliciting the NO related physiological effects such as inhibition of ADP-induced platelet aggregation and vasorelaxation. TAase mediated acetylation of purified NOS by PA was established using anti-acetyl lysine indicating the role of acetylation in the activation of NOS. The afore-mentioned results obtained with PA were carefully compared with the corresponding parent polyphenols that failed to produce the biological effects elicited by PA. These observations have highlighted for the first time PA as a versatile acetyl group donor for the enzymatic acetylation of protein independent of acetyl CoA.

2. In silico studies on the mechanism of calreticulin mediated protein acetylation independent of acetyl CoA

Recent studies have established the identity of TAase with calreticulin (CRT), a resident protein of endoplasmic reticuluum (ER) and consequently TAase was termed calreticulin transacetylase (CRTAase). The tertiary structure of human CRT was predicted using homology modeling approach. We have attempted to explain the mechanism of CRTAase action by considering acetoxycoumarin as the model substrate. The interaction of acetoxy coumarins with CRT resulted in the conformational change leading to loss of its Ca^{2+} binding ability. Ca^{2+} proved inhibitory to CRTAase activity, as a result of the conformational change following the binding of DAMC to CRT. The substrate binding studies suggested simultaneous involvement of ε-amino group of two lysines of CRT, Lys164 acting as nucleophile reacting with C-2 carbonyl of coumarin and Lys414 acting as site of acetylation. The acetyl group bonded to ε-amino group of Lys414 is then transferred to the amino group of the receptor protein with concomitant release of CRT bound to C-2 carbonyl of coumarin. The acetylation of receptor protein perpetually accompanied by autoacetylation of CRTAase indicated the possibility that it could be a stable intermediate in the TAase catalyzed reaction. The proposed mechanism backed by the computational studies would satisfactorily explain the specificity of CRTAase to various acetoxy coumarins.

3. Studies on the synthesis of thiocoumarins and their biological activity evaluation

During the course of our investigations we had designed and synthesized a number of heterocyclic

derivatives (4-methylbenzopyran-2-ones or 4-methylcoumarins) and used for the protein modification by the way of acetylation with the novel enzyme acetoxy drug: protein transacetylase (TAase) which was discovered in our laboratory. For the modification we used mainly three proteins, cytochrome P-450 (CYP-450), NADPH cytochrome c-reductase and glutathione S-transferase and got very interesting results accordingly.

To extend the previous studies, we have synthesized eight novel 4-methyl thiocoumarins and characterized by spectral data (UV, IR, ^{1}H NMR and ^{13}C NMR) to examine QSAR the effect of acetoxy, propoxy and butoxy derivatives of 4-methylthiocoumarin on liver microsomal cytochrome P-450 (Cyt. P-450), NADPH cytochrome c reductase and cytosolic glutathione S-transferase (GST). Introduction of $SCOCH_3$ and heteroatom S in place of $OCOCH_3$ and heteroatom O respectively in the coumarin system is ineffective with respect to above-mentioned activities. But introduction of S in place of O in carbonyl group of coumarin system enhanced the activities. Again introduction of propoxy and butoxy group in place of $OCOCH_3$ enhanced the biological activities of thiocoumarins. The compounds were indeed found to cause profound TAase inhibition of GST activity, activation of NADPH cytochrome c reductase. These compounds also demonstrated the higher degree of inhibition of ethoxyresorufin O-deethylase (EROD) and pentoxyresorufin O-deethylase (PROD) again confirmed the modification of isoforms of Cyt. P-450 (1A and 1B). These compounds also satisfied the mechanism-based inhibition and activation of said enzymes like model compounds. From the obtained data it may be concluded that these thiocoumarins are better drug candidates as compared to coumarin derivatives for the above mentioned biological activities.

4. Role of metalloporphyrins in modulating the malaria-induced hemolytic anaemia in mouse model

Synthetic metal porphyrins, with the central atom of heme replaced by other elements can not be degraded to bile pigments, are known to modulate the heme oxygenase activity thereby as promising therapeutic agents of neonatal jaundice. These metalloporphyrins may posses novel biological properties to intervene the malaria associated jaundice and anemia. The present study is designed to investigate the role of metalloporphyrins in modulating malaria-induced anaemia. Initially, the course of infection of *Plasmodium berghei* NK 65 has been worked out by repeating experiment. For this we use to take 6 mice every time and parasitemia levels has been worked out and it has been observed that *Plasmodium berghei* NK 65 infected mice died within 13 days and when we treated the *Plasmodium berghei* NK 65 infected mice with metalloporphyrins (0.1mg/Kg bwt) orally tinprotoporphyrin (SnPP) and chromiumprotoporphyrin (CrPP) the life span of mice increases for few days and it was found the SnPP is more effective than the CrPP.

Mortality of SnPP treated mice was found to be higher than treated with CrPP. Blood smears of drug treated mice showed less haemolytic changes less than the malaria control. There is also significant reduction in bilirubin level.

5. Studies on mechanism of signal transduction during release of proinflammatory cytokines IL-1β and TNF-α by alveolar macrophages in asthma

We had studied effects of lipopolysaccharide (LPS), phorbol myristate acetate (PMA), sphingosine and histamine on the kinetics of expression of IL-1α and TNF-α in alveolar macrophages (AM) of asthmatic patients *in vitro* at mRNA level by gene specific RT- PCR and at protein level by ELISA. Continuing the same studies, the effects of methacholine chloride (MCC) and salbutamol were also studied similarly. The findings suggest the expression of IL-1β and TNF-α by MCC at 5 minutes in asthmatic patients. Salbutamol caused the expression of IL-1β at 30 min and that of TNF-α at 20 minutes. It is apparent that alveolar macrophages of asthmatic patients, on exposure to asthmogen (MCC), express these proinflammatory cytokines very rapidly, which is delayed when these cells are exposed to the drug (salbutamol) used for the treatment of the disease, suggesting the role of AM and proinflammatory cytokines in the airway inflammation in asthma.

6. Signalling mechanism during macrophage-stimulus interaction in rats

The experiments were conducted on the rat peritoneal macrophages (PM) and effect of various stimuli, *viz.* LPS, PMA, histamine and sphingosine, studied on release of the cytokine IL-1β, nitric oxide (NO) production, superoxide free radical generation, expression of nitric oxide synthase (iNOS), determination of

total PKC activity, changes in phosphorylation of target proteins of PKC and isoenzymes of PKC. These studies suggest that the release of the cytokine IL-1β in the culture supernatants, which was released minutes after the exposure of the macrophages to these stimuli, is comparable to the kinetics of expression of iNOS. The LPS and PMA activate rat peritoneal macrophages as evidenced by the expression of iNOS in a few minutes of exposure to it, and subsequent increase in the production of NO, though its production took about two to three hours after the expression of iNOS. Similarly, the generation of superoxide radicals, which also indicates the macrophage activation, took nearly the same time as taken for NO production. The increase or decrease may be reasonably associated to the changes in signal transduction mechanism, which revealed an increase in total activity of PKC in a few minutes after exposure to the stimuli. The increased PKC activity could be further correlated with the increase in the isoenzyme profile of PKC and phosphorylation of its target proteins. There was increased expression of PKCα by LPS and PMA, which could possibly be due to initial spike in intracellular calcium levels that activates Ca^{2+} dependent PKCα. The delayed expression of PKCε by LPS, PMA and histamine could be due to the fall in the levels of intracellular Ca^{2+} to the normal limits after the initial spike. The expression of PKCζ was induced by LPS, PMA and sphingosine. However, histamine did not induce any expression of PKCζ at any point of time of incubation used for study, suggesting that histamine induced activation of PKC is Ca^{2+} and DAG dependent. These changes in isoenzymes profile may account for the changes in the phosphorylation of different proteins in response to different drugs used in this study. Thus, we can conclude that PKC mediated pathway plays a major role in macrophages activation and cytokines release during their interaction with the stimuli used in the present study.

7. Lipid rafts in bronchial asthma: a study on membrane lipid metabolism in asthmatic patients using erythrocyte membrane as the model

Lipid rafts are the structures present in the exoplasmic leaflet of the lipid bilayer and are composed mainly of sphingolipids and cholesterol. Rafts are involved in signalling events and intracellular trafficking of proteins. Changes in the composition of the lipid rafts may be speculated to bring about changes in the signal transduction in plasma membrane, the pathophysiology and the ultimate manifestation of the disease. The study was, therefore, contemplated on plasma membranes prepared from the RBCs obtained from the peripheral blood of asthmatic patients. The data showed that the total yield of RBCs was almost similar in both asthmatics and healthy volunteers. The total protein contents in the RBCs of asthmatics were almost two-fold to that of the normal subjects. Contrary to this, the total inorganic phosphorus of the lipid contents in RBCs of asthmatics was found to be about half its content in normal subjects. The resolution of phospholipids on TLC shows five distinct bands, four of which correspond to LPC, sphingomyelin, PC and PE. These findings suggest that there is no statistical difference between the number of RBC in asthmatics and the healthy subjects. However, the interesting finding is that the total protein contents of asthmatics are significantly increased and the total phospholipid contents significantly decreased in asthmatics as compared to the healthy subjects, suggesting a reciprocal metabolic relationship in the two molecules in the plasma membrane.

8. Experimental asthma: a study on transmembrane signalling in airway smooth muscles and peripheral blood lymphocytes during the development of airway hypersensitivity in guinea pig

Various studies conducted in our lab have demonstrated the role of PKC mediated signal transduction pathway in bronchial asthma. However, the changes in the signalling mechanism at the onset of the disease are not known. On the basis of this, it is envisaged that during the development of asthma, the asthmogen(s) may bring about the changes in the process of signalling mechanism that may ultimately lead to the pathophysiology and the development of airway hyper-responsiveness and the precipitation of the symptoms of asthma. In view of it, the study had been planned to assess the changes in signal transduction pathway in lymphocytes and airway smooth muscle (ASM) in guinea pig model of asthma. The initial experiments were conducted to establish the day when the hypersensitivity sets in guinea pig in response to the allergen (ovalbumin). The skin prick test as well as measurement of airway hyperreactivity suggest day 9^{th} to be the day of the onset of hypersensitivity after the initial challenge by ovalbumin.

Cardiorespiratory Physiology

Research

1. Potentiation of allergic asthma by air pollution: the ozone-allergen interaction and its modulation by dietary antioxidants, alpha-tocopherol and ascorbic acid

The hypothesis was that being an oxidizing agent, ozone inhalation would potentiate the response to allergen inhalation in sensitized animals as asthma itself is a disease with oxidative stress. The study was carried out in a guinea-pig model in which allergen-induced asthma was developed and the animals were given a daily exposure to ambient concentrations of ozone. Animals receiving ozone showed the greatest inflammatory response in the airways accompanied by increased oxidative stress. Physiologically, these animals had greater early and late phase bronchoconstriction. Dietary supplementation with antioxidants, vitamin E and C offered a protective effect against these ozone-enhanced responses to allergens.

2. Time series study on air pollution and mortality for Delhi

A study is currently on in collaboration with The Energy Research Institute, Delhi to study the effect of air pollution on all-cause and cardiorespiratory mortality in Delhi. Daily mortality records of the Municipal Corporation of Delhi are being studied for the years 2003-2005 and these will be correlated with the ambient air quality during the same period to develop models to predict the trends in mortality with changes in air quality.

3. Assessment of the effects of high particulate pollutants on pulmonary health status in selected mega-cities of South Asia

Assessment of effects of particulate pollution on lung health in the Indian subcontinent is being carried out in selected mega cities of India, Pakistan, Bangladesh, Nepal and Sri Lanka. In India, the studies are being carried out in Delhi and Kolkata. Both chronic and acute respiratory effects are being studied. For the chronic effects, prevalence of respiratory symptoms – cough, dyspnoea, wheezing and phlegm production; prevalence of asthma and COPD are the outcome parameters while for the acute effects, frequency of acute respiratory (upper/lower) symptoms in adults and children, health care utilization and mortality are being studied. The questionnaires have been designed and the sampling through a process of systematic random selection has been completed. The role of ambient air pollution in producing these health effects will be determined.

4. Assessment of outcome measures for treatment in chronic obstructive pulmonary disease

Assessment of the outcomes of therapy in COPD patients, both in clinical and research work is mostly done with spirometric measurement. However, it fails to capture several dimensions of the disease and it has been suggested that assessment should also be based on other measures of lung function, exercise tolerance and the health-related quality of life. Little information is available on the relative values of these different measurements. We carried out a study of patterns of acute response in spirometry and static lung volume after administration of a bronchodilator and changes and the interrelationship among different outcome measures (spirometry, static lung volumes, measures of dyspnoea, exercise tolerance and HRQoL) during regular treatment in patients with COPD. Results showed that measurements of FEV_1 alone underestimated the response to treatment and inclusion of parameters such as FVC and the inspiratory capacity gave a better assessment of improvement in lung function. It is important to include other parameters including quality of life, measures of dyspnoea and exercise endurance in assessing outcomes as a substantial proportion of patients may show an improvement in these without improvements in lung function. As changes in one parameter were not readily predicted by the other, a complete assessment of response should be based on multiple parameters.

5. Impact of substitution of arm span for height on results of spirometry

Interpretation of spirometry results requires comparison of observed values with predicted values. Predicted values are usually based on age and height besides other factors. When it is not possible to measure

height due to physical reasons, arm span is often substituted. Height may be obtained from arm span by direct substitution, by estimating height using a fixed arm-span ratio and by linear regression. As these different methods have not been compared, a study was carried out in 517 subjects. Direct substitution was found to be the least suitable method as it gave almost 20% misclassification of results compared to actual height. Height predicted by linear regression or estimated from fixed ratio gave significantly fewer wrong interpretations. Thus, it was recommended that when it is not possible to measure actual height, it should be estimated or predicted from arm span rather than directly substituting arm span for height.

6. Comparison of prediction equations for lung function parameters in children and adults in India

There is a general impression that north Indians have a better lung function than western Indians who in turn have a better lung function than people hailing from south India. This impression has never been confirmed in a scientific study. A comparison of prediction equations for adults and children available for different regions in India is being carried out and the results shall be analyzed shortly to test the above impression.

Medical Mycology

Research

1. Evaluation of peptone glucose fluconazole agar as a selective medium for rapid and enhanced isolation of *Aspergillus fumigatus* from respiratory tract of bronchopulmonary aspergillosis patients colonized by *Candida albicans*

We have reported earlier that *Aspergillus fumigatus* is inhibited *in vitro* by *Candida albicans*, a commensal of the human respiratory tract. This inhibition may result in mis-diagnosis of aspergillosis in patients with respiratory tract colonization by *C. albicans*. In order to guard against this possibility our laboratory has recommended supplementing peptone glucose agar with fluconazole which is more inhibitory to *Candida albicans* than to *A. fumigatus*. To evaluate the efficacy of peptone glucose fluconazole agar (PGFA) as a selective medium for rapid and enhanced isolation of *A. fumigatus*, 21 patients clinically suspected of bronchopulmonary aspergillosis with *C. albicans* colonization in the respiratory tract were investigated. Thirty-five freshly expectorated sputum specimens and one bronchial lavage collected from 21 patients by the Clinical Research Centre of the Institute were investigated for fungal etiology. The specimens were obtained in sterilized, 30-ml screw-capped glass bottles and homogenized by mixing with sterile glass beads and shaking on a cyclo-mixer. KOH wet mounts of each specimen were examined microscopically for hyphal or yeast-like fungal elements. They were inoculated on triplicate plates of PGFA (peptone – 10g, glucose 20g, agar-20 g, chloramphenicol-40 mg / l, gentamicin-25 mg / l, fluconazole-5 µg / ml, distilled water 1000 ml, pH-6.8-7.0) and the same medium without fluconazole (PGA) as control. The plates were incubated at 28 ^{0}C and observed up to 7 days for appearance of fungal growth. Evaluation of *A. fumigatus* growth was done by enumerating its colony counts per plate and by the time taken for development of macroscopically recognizable colonies. Growth of *C. albicans* was graded as heavy= **++++** (confluent growth), good= **+++** (151-250 colonies / plate), moderate= **++** (51-150 colonies), poor= **+** (21-50 colonies), very poor= **±** (1-20 colonies) and no growth= -. The significance of difference in efficacy of PGFA and PGA medium was statistically analyzed by applying the student's t test and Fischer's exact test. Of the 35 sputum specimens and a solitary bronchoalveolar lavage cultured, *A. fumigatus* was isolated from all (100%) on PGFA as against only 28 specimens (78%) that proved to be positive on the control PGA medium ($p < 0.05$). The greater efficacy of PGFA than that of PGA was further evident from the 2-fold higher *A. fumigatus* mean colony count (8.2 ± 1.87) on the former medium than on the latter (3.4 ± 1.00), and this difference was found to be statistically significant ($p < 0.05$). Besides, *A. fumigatus* colonies were macroscopically recognizable within 2-3 days on PGFA at 28 ºC in strong contrast to 5-7 days required on PGA. It is noteworthy that but for the use of PGFA medium isolation of *A. fumigatus* would have been missed in 8 of the 36 (22%) clinical specimens investigated. Based upon these observations, PGFA is recommended for wider application as a selective medium for rapid and enhanced recovery of *A. fumigatus* from sputum of patients clinically suspected of bronchopulmonary aspergillosis with *C. albicans* colonization in their respiratory tract.

2. Prevalence of *Candida dubliniensis* in the respiratory tract of HIV negative patients

Candida dubliniensis is a newly described species capable of causing oropharyngeal, vaginal and systemic infections. It may be confused with *C. albicans* because of its close phenotypic similarity. Although *C. dubliniensis* has been reported from diverse patient populations, it occurs more frequently among patients infected with HIV. The present study was undertaken to determine the prevalence of *C. dubliniensis* isolates in oropharyngeal specimens of HIV negative patients registered at Clinical Research Centre of the Institute.

Fifty-three germ tube and chlamydospore positive yeasts obtained from a total of 134 specimens (77 sputum, 53 BAL / bronchial aspirate, 3 pus, 1 tracheal aspirate) were screened for *C. dubliniensis* using a variety of phenotypic characteristics. Briefly, all of the isolates were streaked on Staib's niger seed medium and were incubated at 28 ^{0}C for up to 7 days. After 48 hours of growth the isolated colonies were examined for morphological characteristics by naked eye and for chlamydospore production. Isolates showing rough colonies and chlamydospores on Staib's niger seed medium were tested for their carbohydrate assimilation

profile by using ID 32 C kit (bioMerieux), read by mini API analyzer (Biomerieux). A total of 7 (13%) isolates recovered sputum specimens were presumptively identified as *C. dubliniensis* on the bases of rough colonies and chlamydospore production on Staib's niger seed medium. The species specific identity was confirmed by semi-nested PCR (snPCR) amplification of internally transcribed spacer region of rDNA.

Antifungal susceptibility testing of the 7 *C. dubliniensis* isolates was done by using the Etest strips (AB Biodisk, Solana, Sweden). The test antifungals included amphotericin-B, fluconazole, 5-flucytosine and caspofungin. The testing was done on RPMI agar plates buffered with MOPS. The growth suspension of the test isolate was adjusted to 0.5 McFarland standard for inoculating the plates. The plates were incubated at 35 ^{0}C and MICs were read after 24 hours of incubation. The isolates were susceptible to all of the antifungal agents tested and the MIC ranges were as follows: amphotericin B (0.002 µg / ml-.016 µg / ml), fluconazole (0.125 µg / ml -0.5 µg / ml) 5-flucytosine (012 µg / ml- 0.125 µg / ml) and caspofungin (0.002 µg / ml- 0.125 µg / ml). Our findings extend the geographical distribution of *C. dubliniensis* to India and it is likely that it is a significant constituent of the yeast-flora of oropharynx of the patients with respiratory illnesses.

Diagnostic Services

The Department continued to provide diagnostic mycological and serologic services to the Clinical Research Center of the Institute and other hospitals in Delhi. A total of 951 clinical specimens were processed during the year. These included 508 blood specimens, 274 sputum, 124 bronchial lavage / aspirate / washings, 15 tissue / nasal biopsies, 6 skin / nail scrapings, 6 pleural fluid and 18 miscellaneous (swabs / urine / pus / FNAC / Blood culture / semen) specimens.

Microbiology

Research

1. Isolation and molecular characterization of respiratory isolates of *M. catarrhalis*

A total of 1695 clinical samples yielded 34 *M. catarrhalis* isolates; 28 as significant pathogens and 6 as colonizing strains. Tests for identification of the isolates included: Gram's staining, oxidase, catalase, nitrate reduction, sugar fermentation, DNase production and tributryin hydrolysis. Five isolates showed resistance to more than one antibiotic. A total of 82.35% (28/34) of the isolates were found to be β-lactamase producers using a cefinase disc (Difco). SDS-PAGE whole cell protein profile analysis of the isolates revealed 22 bands in each profile; 4 bands of 48-60 kDa were common to all the profiles. All the isolates were assigned to unique protein profiles, indicating that the isolates were unrelated. Eight randomly selected isolates were subjected to ribotyping using HindIII. Each profile had 3-7 bands of molecular weight ranging between 1.7 kbp to 9.4 kbp. All strains exhibited unique ribopatterns thereby confirming the results of protein profile analysis that each isolate was a unique clone.

2. Evaluation of a modified double disc synergy test for detection of ESBLs in AmpC positive isolates

In this study, which is the first of its kind, a modified double disc synergy test (MDDST) employing a combination of cefepime (FEP) and piperacillin-tazobactam (TZP) for the detection of extended spectrum β-lactamases in AmpC β-lactamases producing *Proteus mirabilis* was evaluated and compared with double disc synergy test (DDST) and NCCLS phenotypic disc confirmatory test (NCCLS-PDCT). A total of 90 clinical isolates of *Proteus mirabilis* were selected for the study. As many as 34/40 ESBL positive isolates were confirmed to be AmpC β-lactamase positive by the modified three-dimensional test (MTDT). MDDST and NCCLS-PDCT could detect ESBLs in all the 34 AmpC positive isolates while DDST could detect ESBLs in only 19 of these. The study demonstrated that MDDST is superior to DDST and as sensitive as NCCLS-PDCT test.

3. Metallo-β-lactamases (MBLs)— evaluation of phenotypic detection tests

MBL producing *Pseudomonas aeruginosa* have been increasingly recognized worldwide. Comparative evaluation of modified Hodge and EDTA-disc synergy test for detection of MBL production was undertaken. Of the 88 isolates screened, 28 which were imipenem-resistant, were subjected to modified Hodge and EDTA-disc synergy test. Modified Hodge test detected metallo-β-lactamases in only 13 (~47%). The EDTA-disc synergy test which proved to be superior, detected MBL in 20 (~72%). All the MBL producing isolates were resistant to a variety of antibiotics, *i.e.*, amikacin, ciprofloxacin, gentamicin, carbenicillin, netilmicin, cefoxitin, ceftazidime, cefotaxime, cefpodoxime, ceftriaxone, cefepime, aztreonam and imipenem. Resistance to amoxycillin-clavulanate and piperacillin-tazobactam was 100% and 95% respectively.

4. Detection of ESBLs in gram-negative bacteria

A total of 200 clinical isolates which included *Escheichia coli*, *Klebsiella pneumoniae, Klebsiella oxytoca*, *Proteus mirabilis* and *Pseudomonas aeruginosa,* collected from four different hospitals of Delhi were tested for ESBLs. Broth microdilution and NCCLS disc diffusion screening tests for ESBL production showed 80% of *E. coli*, ~77% of *K. pneumoniae*, ~73% of *K. oxytoca*, 52% of *P. mirabilis* and 92% of *P. aeruginosa* isolates as ESBL producers.

5. Comparative evaluation of confirmatory tests for detection of ESBLs

Double disc synergy test (DDST) detected ESBLs in ~38% of *E. coli*, 26% of *K. pneumoniae,* 73% of *K. oxytoca,* 62% of *P. mirabilis* and only ~2% of *P. aeruginosa* isolates. Modified double disc test (MDDT) detected ESBLs in 95% of *E. coli,* 56% of *K. pneumoniae,* 82% of *K. oxytoca,* 100% of *P. mirabilis* and ~20% of *P. aeruginosa* isolates while NCCLS phenotypic confirmatory test (PCT) could detect ESBLs in ~93% of *E. coli*, ~59% of *K. pneumoniae,* 91% of *K. oxytoca,* ~96% of *P. mirabilis* and ~30% of *P. aeruginosa* isolates. The MDDT test clearly was the most sensitive of the three techniques.

6. Identification of ESBL plasmids

Transfer of ESBL plasmids was attempted by conjugation using membrane filter mating technique. Ceftazidime resistance was transferred by conjugation from 12 ESBL positive donor strains of *E. coli* to the *E. coli K12* recipient strain. In three cases the transconjugants had the same ceftazidime MIC as the donor *E. coli* strains while the other nine transconjugants had lower MIC values as compared to the respective donor strains.

7. The effect of *M. tuberculosis* infection of *in vitro* matured macrophages on T cell viability

The induction of apoptosis of T cells is an attractive model to explain the persistence of intracellular pathogens in host cells. However, this mechanism has not been studied so far for tuberculosis**.** The proposed study has been designed to examine the hypothesis that *M. tuberculosis* induced T cell immune-suppression is macrophage dependent. Co-culture experiments were done using autologous T cells activated with PHA / CFP / WCL with *ex vivo* matured macrophages from the peripheral blood monocytes of normal volunteers as well as pulmonary tuberculosis patients, to examine the role of cell to cell contact in inducing T cell apoptosis.

To determine the role of soluble mediators (NO & TNF-α) released by *M. tuberculosis* infected macrophages, the supernatant of *M. tuberculosis* infected macrophages was added to PHA (phytoheamagglitinin) / CFP (culture filtrate protein) / WCL (whole cell lysate) activated T cells.

The study suggests that soluble mediators play an important role in inducing T cell death provided the concentration of these mediators is optimum. Not only cell to cell contact of *M. tuberculosis* infected macrophages with activated T cells can induce T cells death but mycobatericidal molecules and TNF-α released in response to *M. tuberculosis* infection can also mediate cell death. Induction of activated T cell death by any or both of the above-described mechanisms are factors contributing to persistence of the pathogen *M. tuberculosis* inside the host cell / tissues.

8. Functional analysis of the mammalian cell entry (*mce*) proteins of mycobacteria

The ability to gain entry and resist the antimicrobial intracellular environment of mammalian cells is an essential virulence property of *M. tuberculosis*. Following complete sequencing of the *M. tuberculosis* genome, four *mce* operons were deciphered and designated *mce1* to *mce4*. In an attempt to understand the significance of retention of four *mce* operons of *M. tuberculosis*, an expression analysis under different growth condition was carried out in our laboratory earlier, and *mce4* operon was observed to be expressed under stress conditions like stationary phase condition and during infection in animal models. The emphasis of the present study will be on deciphering the functional significance of *mce1A* and *mce4A* proteins in tuberculosis.

pGEX-5X-3 vector was used for cloning, which has fusion protein expression system having glutathione S-transferase (GST) just before the MCS. The gene was cloned at XhoI and SmaI site. The protein expression study was performed in *E. coli* (BL-21). For induction IPTG was used at a final concentration of 1mM for two hours.

Protein expression was checked by SDS-PAGE and to confirm western-blotting was done. As the expressed protein was in inclusion bodies, it was solublized in 1.5% sarcosyl solution. To demonstrate invasion and internalization, recombinant *E. coli* cells was added to the monolayer of HeLa cells at a multiplicity of infection (MOI) of 10:1 and incubated at 37 ºC for three hours. Following washing and treatment, the monolayer was lysed to release the intracellular *E. coli* and colony forming unit (c.f.u.) was counted. Transmission electron microscopy was also done for these samples to demonstrate internalisation.

9. Analysis of polymorphism of *mce1* and *mce4* operons in different clinical isolates and four standard strains of *Mycobacterium tuberculosis*

It is often reported by the clinicians that different clinical isolates of *Mycobacterium tuberculosis* vary in their potential to cause tuberculosis and severity of infection brought about by them also varies. *Mce* operons are known to be involved in the entry of mycobacterium inside the host's cell which is the first step in pathogenesis, we have studied the differences at the genetic level of *mce1* and *mce4* operons by single nucleotide

polymorphism (SNP) analysis.

The genes of *mce1* and *mce4* operons of four standard strains (H37Rv, H37Ra, LVS, and BCG) and 18 clinical isolates of *Mycobacterium tuberculosis* varying in their drug susceptibility profile were sequenced using overlapping primer sets. SNPs were most commonly found in clinical isolates 591/00, 652/00, 77/01 and standard strains LVS and BCG. The rate of transitions was higher in *mce4* operon as compared to *mce1* operon. The comparative analysis of the genes of *mce1* and *mce4* operons had found that *mce1A* was most polymorphic in *mce1* operon and *lprN* was most susceptible to synonymous changes in the *mce4* operon. Therefore, the SNP analysis of *mce1* and *mce4* operons has shown that *mce1* operon is susceptible to mutations as compared to *mce4* operon.

10. Analysis of rifampicin resistance mutations in the clinical isolates of *M. tuberculosis* by sequencing and dot-blot hybridization

Multidrug-resistant tuberculosis (MDR-TB) is an increasing problem worldwide. Rapid diagnostic assays for MDR-TB should address this problem by enabling early isolation and treatment of patients with this disease. We are assessing a dot-blot assay for rapid detection of MDR-TB. Rifampicin resistance is a surrogate marker for multidrug-resistant *Mycobacterium tuberculosis*, as 90% of rifampicin-resistant *M. tuberculosis* strains are also Isoniazid resistant. Rifampicin resistance is also amenable to detection by rapid genotypic assays, because approximately 95% of all rifampicin-resistant strains contain mutations localized in an 81-bp core region of the bacterial RNA polymerase gene, *rpoB*. Moreover, virtually all mutations that occur in this region result in rifampicin resistance. Five probes A, B, C, D and E have been designed to cover the 81 bp hot spot region of the *rpoB* gene of the wild type *M. tuberculosis* (H37Rv) genome. Absence of hybridization with any of the five probes in a dot-blot assay would indicate rifampicin resistance.

One hundred and seventy-nine patients of pulmonary tuberculosis were taken from the Clinical Research Centre of the Institute and R.B.T.B. Hospital, Delhi. The patients were asked to submit sputum samples for three consecutive days. Ziehl-Neelsen staining was performed for direct smear examination. Sputum samples were processed by modified Petroff's method for culture and inoculated in duplicate on the Löwenstein-Jensen medium. Isolates were confirmed to be *M. tuberculosis* by biochemical tests. These isolates were then further taken up for susceptibility testing to antituberculous agents. Of the 119 isolates subjected to susceptibility testing 48 (40%) isolates were resistant to rifampicin, 58 (48.7%) to isoniazid, 59 (49.58%) to streptomycin and 40 (33.61%) to ethambutol. Multidrug resistance to atleast isoniazid and rifampicin was detected in 36 (29.4%) isolates.

Dot-blot hybridization was carried out first with probe E since this probe is able to detect mutations occurring in the *rpoB* core region from codon 528 to 533. Mutations at this site are responsible for 66-75% of the mutations seen in rifampicin resistant strains. Of the 148 samples probed with probe E, susceptibility results are available for 88. Fifty of these were susceptible to rifampicin. Of these 50 isolates, 40 hybridized with probe E. The *rpoB* core region of 18 of the susceptible isolates was sequenced and none had a mutation at the *rpoB* core region. Thirty-eight isolates were resistant to rifampicin. Of these, 22 did not hybridize with probe E. The *rpoB* core region of nine of these isolates was sequenced and a mutation was found in the region complementary to probe E in all the nine isolates. Thus showing 100% concordance with the results of the probe assay. Sixteen resistant isolates hybridized with probe E. Of these 4 were sequenced. Two of the sequenced isolates did not have a mutation at the *rpoB* core region. The other two isolates had mutations away from the region complementary to probe E.

Hybridization with probe A was seen in all the 43 strains of *M. tuberculosis* tested. Of the 15 rifampicin resistant isolates, the PCR amplicons of the *rpoB* core region of 10 samples were sequenced. All of these, except one had a mutation outside the region covered by probe A (codon 507-511). Hybridization was seen in all the 46 strains of *M. tuberculosis* tested with probe B. Twenty of the isolates tested were resistant to rifampicin and of these 10 were sequenced. All, except one had a mutation outside the region covered by probe B (codon 512-518). Of the 13 samples tested with probe C, 5 were susceptible to rifampicin. All these 5 strains hybridized with probe C. All the eight resistant isolates also hybridized with probe C, suggesting a mutation outside the region covered by probe C. Fifty-eight strains of *M. tuberculosis* were tested with probe

D. Of the 39 rifampicin susceptible, all hybridized with the probe. Of the 19 rifampicin resistant isolates, 18 hybridized with probe D consistently. On sequencing 9/18 of the isolates, they were found to have mutations outside the region complementary to probe D (522-527). The Dot-blot assay was found to be a sensitive assay and can be adapted for rapid testing of rifampicin susceptibility in the routine laboratory.

11. Identification of *M. tuberculosis* by PCR restriction analysis

Rapid diagnosis of tuberculosis is needed to initiate prompt treatment and to arrest the spread of the disease in the community. We evaluated the use of *hsp65* PCR-restriction fragment length polymorphism analysis for direct detection and identification of *M. tuberculosis* in sputum samples of patients of tuberculosis. Of the 120 cases studied, PCR restriction analysis (PRA) could identify *M. tuberculosis* in 83 AFB smear positive samples and in 2 AFB smear negative cases. The sensitivity of PRA in identifying *M. tuberculosis* directly in sputum samples was 75% in AFB smear positive samples and 22% in AFB smear negative samples. PRA was found to be an economical and simple technique which can be incorporated in microbiology laboratories for rapid identification of *M. tuberculosis.*

12. Functional analysis of *mce4* gene of *M. tuberculosis* H37Rv using antisense approach

Genome sequencing has resulted in revolution in research area by upbringing the candidate gene identification and discovery of new drug targets in case of pathogens. Four mce operons have been localized on mycobacterial genome encompassing a total of 32 genes predicted to be coding for membrane proteins. Existence of four mce operons with same organization of genes questions whether all operons are performing same function under different growth conditions and during different phases. The *mce4* operon is expressed during stationary phase of the culture and infectious phase in animal model. Properties like intracellular survival inside macrophage and invasion of non phagosytic cells were attributed initially to the *mce1* gene can also be assigned to *mce4* gene too as both are homologues. Present work was planned to create and observe the effect of antisense RNA on expression of *mce4* gene of *M. tuberculosis* H37Rv. For this 1100 bp of *mce4* gene has been amplified by PCR. Further subcloning will be done in a plasmid shuttle vector pSD5 for mycobacteria. Recombinant plasmid will be electroporated in mycobacterial cells and transformants will be screened using drug resistance marker. As mRNA expressed from plasmid carrying part of *mce4* gene in reverse orientation is expected to base pair with endogenous *mce4* mRNA, expression of *mce4* gene will be blocked which will be analysed by western blotting. Effect of reduction in *mce4* protein on mycobacterial cells will be studied using confocal microscopy and c.f.u. of the recombinant mycobacterium recovered from THP1 macrophage cell line.

13. Phenotypic and genetic characterization of *Streptococcus pneumoniae* isolates from patients with respiratory infections in India

The study was undertaken to delineate the serotype, antimicrobial susceptibility patterns, and genotypes of 24 strains of *S. pneumoniae* isolates from patients with chronic respiratory illnesses and other illnesses in New Delhi.

A total of 24 *S. pneumoniae* strains isolated from patients attending Clinical Research Centre of the institute and other Hospitals in Delhi, India during the period January to October 2004, were taken up for the study. The samples included sputa from patients with respiratory illnesses like chronic obstructive lung diseases, bronchectasis, and acute exacerbation of bronchial asthma, blood from cases of septicemia and pneumonia and cerebro spinal fluid from cases of meningitis, and peritoneal fluid from cases of nephrotic syndrome.

The strains were serotyped and the minimum inhibitory concentration to a panel of antibiotics was determined. The DNA was isolated from these strains and pulsed field gel electrophoresis (PFGE) and multilocus sequence typing (MLST) were performed.

The age of the patients ranged from 4 years to 77 years. Patients who presented with various respiratory diseases belonged to the older age group. The patients included cases of bronchectasis with or without pneumonia, chronic obstructive lung disease and bronchial asthma with acute exacerbations.

The serotypes encountered were 15B (2), 3(2), 7F (2), 7C (1), 29 (2), 5(2) 14(1), 22F (1) and 32A (1), 6A (10). All the strains were sensitive to penicillin, amoxicillin and cefotaxime. However, two showed intermediate sensitivity to penicillin, one was resistant to erythromycin. Majority (20/24) showed resistance to trimethoprim-sulphamethoxazole combination. Resistance to tetracycline (9/13), chloramphenicol (4/24), ciprofloxacin (3/24) and levofloxacin (2/24) was also seen.

Twelve PFGE types were seen among the 24 isolates of various serotypes. Ten strains belonging to 6A had 4 PFGE profiles which were 95% similar. Two strains each of serotype 7F and 3 had very different PFGE profile among the same serotype. Nine of the 14 STs were newly documented in this study of which 3 had new alleles (aroe76, gdh112, xpt 170 and ddl190). These 4 alleles represented three new STs. These three STs comprised of one SLV of ST 1210(ddl190) and two MLV STs. Between the serotype 7F two new STs (1702 & 1759) were discovered one of which had a new allele (Aroe76). Similarly two strains of serotype 3 showed two new STs which differed in 4 loci. Of the ten isolates belonging to 6A serotype, 4 were MLSTed and all were of the same ST, 1669, which was newly discovered in this study.

14. Prevalence of *Mycoplasma pneumoniae* infection in patients of acute exacerbation of chronic obstructive pulmonary disease

Eighty percent of the cases of acute exacerbation of chronic obstructive pulmonary disease (AECOPD) have an infective etiology; atypical bacteria including *Mycoplasma pneumoniae* account for 5-10% of these. However, some studies could not find evidence of association of *M. pneumoniae* with episodes of AECOPD. The present study was, therefore, undertaken to delineate the involvement of *M. pneumoniae* in patients of AECOPD at a referral hospital in Delhi.

Sputum samples and throat swabs from a total of 66 patients of AECOPD attending Clinical Research Centre of the Institute were collected during a two-year period (January 2004 to January 2006). The samples were investigated for the presence of aerobic bacterial pathogens and *Mycoplasma pneumoniae*. Diagnosis of infection with *Mycoplasma pneumoniae* was based on culture, serology, P1 antigen detection and PCR for the P1 gene. PCR with a 16S rRNA *Mycoplasma* genus specific primer set was also carried out.

Bacterial etiology could be established in 17 of the 66 samples studied. *Pseudomonas* sp. was recovered from 8 cases, *Streptococcus pneumoniae* from 4, *Klebsiella* sp. from 2, while *Acinetobacter* sp. and *Moraxella catarrhalis* were isolated from one case each. Evidence of *Mycoplasma pneumoniae* infection in terms of P1 antigen detection; and IgG, IgM or IgA antibody positivity was seen in 16/66 (24%) of the cases. Of these, positive IgM antibodies were observed in one case. In two patients, convalescent sera collected after an interval of 4 weeks showed a four fold rise in the IgG titer. Three patients had a positive IgA titer as well as a positive IgG titer, though IgM was negative. Of the 43 samples screened for antigen detection, two were positive.

PCR assay for P1 antigen was negative in all the cases. PCR for 16S rRNA was positive in 30/41 cases. Only eight of these had serological evidence of *M. pneumoniae* infection. Two of the cases with evidence of *M. pneumoniae* infection also had co-infection with *Pseudomonas* sp. *Mycoplasma pneumoniae* emerged as a significant etiological agent of AECOPD in our study population and accounted for 21% (14/66) of the cases as the sole pathogen.

Diagnostic Services

Details of diagnostic services provided to the indoor and outdoor patients are given below:

Mycobacteriology Laboratory

(a) **Clinical specimens processed for AFB**

Nature of Specimen	***No.***
Sputum	4504
Bronchial aspirate	180
Bronchoalveolar lavage (BAL)	50
FNAC	03
Pleural Fluid	53
Endotracheal aspirate	05
Urine	04
Pus	07
Cervical cyst fluid	01
Semen	01
Total	**4808**

(b) **Clinical specimens processed with BACTEC 460 TB system**

Nature of Specimen	***No.***
Sputum	35
Pleural fluid	07
Pus	05
Bronchial aspirate	04
Bronchoalveolar lavage (BAL)	02
Endotracheal aspirate	02
Biopsy	03
FNAC	02
Total	**60**

Drug Sensitivity	
Routine	69
Research	50

Pathology

Diagnostic Services

Diagnostic services were provided to the indoor and outdoor patients in subdivisions of Hematology, Histopathology, Cytopathology, and Clinical Pathology. These subdivisional details are given below:

A. Hematology

i. All blood samples were analysed using automated five part analyzer- Melet Schloesing 9-5.

ii. Internal quality control programme was started.

iii. Absolute eosinophil count, manual platelet count and reticulocyte count were standardized and started on regular basis.

iv. Cytochemical stains – Sudan Black and PAS were added and standardized for leukemia subtyping.

Hematology tests done	Number
Total number of blood samples examined	9596
Hemoglobin estimation	9408
Total leukocyte count	9408
Differential leucocyte count	9408
ESR	6010
Absolute eosinophil count	101
Platelet count	163
Peripheral smear	54
P/S for malarial parasite	28
Bleeding time	248
Clotting time	248

B. Histopathology

i. Diagnostic histopathology was restarted from June 2005.

ii. Special enzyme histochemical stains – PAS, Reticulin, Masson Trichrome, Silver methanamine, Perl's iron, Von Kossa, were standardized and used for categorization of disease.

iii. Afcoset precision scale was added for preparation of special stains.

Surgical histopathology biopsies processed		Number
Lung biopsy		146
Pleural biopsy	– VATS	02
	– Other	03
Skin biopsy		04

C. Cytopathology

i. Diagnostic cytopathology was restarted from June 2005.

ii. Percutaneous fine needle aspiration cytology, with and without CT guidance were done.

iii. Transbronchial fine needle aspiration cytology slides examination was started from January 2006.

iv. Exfoliative cytology was carried out on Sputum and BAL samples.

v. All slides were stained with Papanicolau and Giemsa stain.

vi. Special stains- PAS, mucicarmine, AFB stains were standardized and done on regular basis for disease categorization.

Cytology samples processed	Number
Sputum	220
BAL fluid	44
FNAC	
Percutaneous	128
Transbronchial	04
Bronchial aspirate	76
Pleural fluid	58
Ascitic fluid	01

D. Clinical Pathology

Clinical pathology-urine examination	Number
Specific gravity	1300
pH	1300
Albumin	3254
Sugar	3254
Microscopic examination	3254

Hematology and Clinical Pathology laboratories were made functional on all holidays for emergency indoor and ICU patients.

Museum

All specimens in Pathology Museum were relabeled and categorized according to disease and organ involvement. There are 204 samples in this museum.

Pharmacology

Research

1. Possible protective role of Livina (a polyherbal preparation) against anti-tubercular therapy (ATT)-induced hepatotoxicity

A single blind, randomized, placebo controlled study was conducted to evaluate the efficacy of Livina (a polyherbal formulation) against anti-TB drug therapy induced hepatotoxicity. The Ethical Committee of the Institute had cleared the study protocol. After taking written informed consent, the patients were divided into two groups; one receiving Livina and the other receiving placebo. Baseline liver function tests were performed prior to the study, and subsequently at 2, 4 and 8 weeks after initiation of ATT / herbal drug therapy. A total of 40 patients were enrolled, out of which there were 11 dropouts. Twenty-eight patients had completed the initial intensive phase chemotherapy, and preliminary data indicates that Livina had greater protective effects against ATT induced liver damage as evidenced by qualitataive and quantitative measures of liver function. More patients are to be enrolled over the next few months to complete the total tally of 50 patients, and the data will be analysed and conclusions drawn.

2. A clinical study to evaluate the efficacy and safety of UNIM-352 (a polyherbal Unani formulation) in patients of bronchial asthma

A double blind, placebo controlled, randomized, parallel design, prospective study was performed to evaluate the efficacy and safety of UNIM-352, a polyherbal Unani formulation, in patients of bronchial asthma. After taking the written informed consent, patients were divided into two groups – one receiving UNIM-352 and the other receiving placebo. After baseline PFT data was recorded the patients were put on standard anti-asthma treatment with bronchodilators and steroids as inhalation therapy. PFT data was recorded in both groups at 2,4,6,8 and 12 weeks, as also the frequency of use of SOS salbutamol inhalers. Out of the 24 patients enrolled for the study, initial results indicate that the UNIM-352 group showed greater improvement in the PFT data / parameters as compared to the placebo group, and the frequency of use of SOS salbutamol was also less. A total of 100 patients are to be enrolled in this study, which is continuing.

3. A study to monitor adverse drug reactions in patients of chronic obstructive pulmonary disease (COPD)

This is the first study of this kind in which adverse drug reactions (ADR) were monitored in both outdoor and indoor patients of COPD, attending the Clinical Research Centre of the Institute. The study protocol was approved by the Ethical Committee of the Institute, and after taking into consideration the various inclusion and exclusion criteria, ADRs were systematically monitored in COPD patients receiving the various forms of drug therapy. The study was also part of the National Pharmacovigilance Programme initiated at the Institute (sponsored by the WHO-CDSCO collaboration). Initially, 60 patients of COPD were enrolled and evaluated for ADRs, as per the prescribed format provided by the CDSCO-DCGI. On evaluation of the ADR reports it was found that mostly ADRs followed a particular pattern in relation to the drug used, *viz.* beta agonists, theophylline, corticosteroids, anticholinergics, antibiotics, etc., in these COPD patients. The most distinct ADRs were seen in patients receiving inhaled steroids (oropharyngeal thrush and voice disturbances) and / or oral theophylline (GI disturbances, anxiety and palpitations). Causality analysis was done by using Naranjo's scale and there was a more than probable association between drug and ADR.

4. Studies on the possible role of nitric oxide in the regulation of neurobehavioural and immunological responses during stress

Nitric oxide (NO) is now recognized as an important bioregulatory molecule and its importance in several inflammatory and immunological disorders is well recognized. Immunocompromised situations enhance the susceptibility to disease and there is a clear correlation between neural pathways, immunity and somatic / visceral disorders. Stress is known to induce complex neural interactions and also modulate immune functions. The present study evaluated the possible role of nitric oxide in the neural modulation of immunity and some related responses in experimental animals. Stress induced suppression of different aspects

of behaviour and immune function (humoral and cell-mediated) and these effects were stressor intensity dependent. Nitric oxide modulators like precursors (L-Arginine) and synthesis inhibitors (L–NAME, 7-NI) influenced specific immunity in a complex manner and these correlated with nitrite / nitrate levels in the plasma and the brain. Additional studies showed that repeated stress exposure induced a degree of behavioural adaptation / tolerance in rats, and these effects were well correlated with corresponding fluctuations in brain nitrate / nitrite levels. Both changes in acutely and repeatedly stressed animals were associated with reduced plasma and brain NO metabolites, and precursor studies with L-Arginine confirmed these findings. NO also regulated humoral and cell-mediated immune responses during stress, and L-Arginine and L-NAME showed opposite effects on these parameters. RS induced immunomodulation after single and repeated stress exposures were also accompanied by differential elevations in plasma corticosterone levels, which were also under the modulatory influence of the NO-ergic agents used. Of particular interest was the finding that stress induced elevations in cytokine TNF-alpha and lowered the levels of IL-4. Both these changes were reversed by L-Arginine pretreatment and aggravated by the NO synthase inhibitors. Behavioral factors were also good predictors of the stress-induced immunomodulation and its regulation by NO. Interestingly, NO exerted a protective effect against stress-induced immune suppression and this could have an impact on several psychosomatic disorders including those involving the respiratory tract and allied systems. Similar protective effecst of NO were seen on the gastric mucosa during stress, and both drugs produced opposite effects on cold restraint stress induced gastric ulceration in rats. In conclusion, it appears that NO may act as an important modulator molecule during stress reactions and this could have immense apllied / clinical implications in both diagnosis and management of inflammatory / allergic disorders.

5. Studies on the possible role of pro-oxidant/anti-oxidant balance in theophylline toxicity

Theophylline is now emerging as an important adjunct to therapy in bronchial asthma because of some newly discovered pharmacological effects. The anti-inflammatory and immunomodulatory effects of the drug are now known, but a safer toxicity profile could make its use more acceptable. Its close relationship with ROS and RNS is shown in its chemical / pharmacological effects and the present study was designed to evaluate the role of free radicals in theophylline toxicity. The study was designed to measure theophylline induced convulsions and correlate the anti-oxidant / pro-oxidant status in the brain. Modulation of these effects with anti-oxidants were seen and melatonin was particularly effective in this regard. Combination of melatonin with NO synthase inhibitors had a greater effect than melatonin alone. These efffects were true for both convulsiogenic and pro-convulsant effects of theophylline. Studies in respect of theophylline, anti-oxidants and brain antioxidant status revealed that such seizures were associated with enhanced lipid peroxidation and lowered antioxidant defense in the brain. Anticonvulsant effects were also seen with the NO synthase inhibitor, L-NAME and 7-nitroindazole, and melatonin synergized with the NO synthase inhibitor effects. These neuroprotective effects are associated with attenuations in the brain oxidative damage as measured by biochemical markers of lipd peroxidation (MDA) and antioxidant defense (SOD and catalase). Further, brain NO metabolites were also lowered during the anti-convulsant effects with L-NAME or 7-NI.

6. Pharmacological studies on the role of NO in stress adaptation in rats

Adaptation to stress is a basic prerequisite for maintenance of the biological homeostasis and complex cellular and molecular mechanisms are involved in this phenomenon. Free radicals (ROS and RNS) are crucial biomodulators at the cellular / molecular level, and may be involved in neural transmission. Some of the drugs used in cardiorespiratory medicine are known to act by free radical related mechanisms and also induce the development of tolerance resulting in attenuation of their effects. Thus, the molecular basis of stress tolerance is of considerable importance for devising strategies for drug therapy in such situations. Preliminary studies showed that subacute / chronic (repeated) stress induced differential attenuations in the normal stress responses in experimental animals, as assessed on behavioural and immunological parameters, and NO-modulators influenced these markers predictably. Preliminary pharmacological and biochemical data show that NO may be involved in the cellular / molecular events resulting in stress tolerance. Using neurobehavioural, endocrinal and visceral parameters as markers of stress, it was observed that repeated stress exposure attenuated acute stress responses and these were associated with parallel changes in plasma and brain NO metabolite levels. Pretreatment with NO modulators also influenced these stress markers and also modulated the biochemical parameters studied. Additional studies with conventional anti-anxiety / anti-stress agents showed that there may be a possible interaction between NO and some of the classical

neurotransmitters during stress. Further, interaction between RNS and ROS during such stress reactions are also being explored.

7. Experimental studies on the role of free radicals in emotional and environmental stress

The effects of emotional and xenobiotic stressors on immune regulation and its modulation by free radicals were studied. Pharmacological and biochemical data showed that lipid peroxidation was associated with stress-induced immunomodulation and anti-oxidants reverse this. Behavioural studies showed a close correlation between behavioural patterns and immune responses. Using restraint stress as an emotional stressor and endosulphan as the xenobiotic stressor, it was observed that both forms of stress resulted in enhanced lipid peroxide formation and lowered NO metabolites in the blood and the brain. Antioxidants (ascorbic acid, tocopherol, melatonin and n-actyl cysteine) reversed these immunosuppressive effects and also altered biochemical markers.

8. Studies to explore gender differences in stress responses with special emphasis on NO

It is well known that gender differences influence physiological and pharmacological responses. The present study was planned to explore the pharmacological basis for gender differences in stress responses in rats. Restraint stress (RS) induced biological changes were assessed in both male and female rats, *viz.* neurobehaviour, immunological and biochemical, and their possible correlation with NO-ergic mechanisms. The study is in its initial stages and preliminary data indicate distinct differential stress responsiveness in male and female rats, and NO may have a regulatory influence for this difference.

9. Role of endogenous opioids and its interactions with NO during stress responses in rats

Endogenous opioids are important neuromodulators during stress reactions and the present experiments were designed to evaluate the possible association between opioids and NO in stress susceptibility and tolerance. Initial results of pharmacological studies are encouraging, and supportive biochemical data will further authenticate the possibility of such opioid-NO interactions during stress.

10. Experimental studies on flouroquinolone induced seizures in experimental animals

A comparative study of three commonly used FQs with respect to their neurotoxic properties was done in rats and mice. Ciprofloxacin, ofloxacin and levofloxacin showed differential convulsiogenic effects and lethality. However, their seizurogenic potential was more marked when combined with other stimuli like electroshock and theophylline. These effects were antagonized by pretreatments with antioxidants and melatonin, in dose dependent manner. The results indicate that oxidative stress could be involved in the neurosensitizing potential of FQs.

11. Medicine prices and availability

High prices and poor availability of medicines are major barriers to better health in poor countries. In India, more than 80% of health care expenditure is 'out-of-pocket'. WHO with Health Action International (HAI) has developed a practical and robust methodology for measuring medicine prices and availability in different sectors (public and private) for a range of medicines (both innovator brands and generic equivalents). Six surveys were conducted simultaneously from 2004-2005. Survey work was finished in May 2005 and for final data cleaning, data analysis and report writing a post survey workshop was organized in June 2005. These surveys have shown that the procurement price is low and reasonable in public sector but the availability of essential medicines is very poor in the public sector. Therefore, most of the population has to purchase medicines from private pharmacies. Prices of certain medicines in the private sector were very high compared to the procurement price indicating very high margins for the wholesalers and retailers. Treatment regimens for a selection of conditions were affordable for the lowest paid government worker, but a large proportion of the population earns much less.

12. Methodology to determine if the price a patient pays for a medicine differs from the price collected by a Data Collector in retail pharmacies

A field survey was done to develop a methodology to determine if the price a patient pays for a medicine differs from the price collected by a Data Collector in retail pharmacies. A simple simulated client approach was used to investigate whether the prices paid by patients for branded and generic medicines are

the same as the prices collected by Data Collectors using a survey approach; the study also explored if the pharmacies offered on request, an alternate medicine which was cheaper. Study was conducted in 10 retail pharmacies near big public and private hospitals in October 2005. The study found that the methodological approach worked well with the need for a few minor modifications and simplifications including modifying the indicators in line with the findings of this study.

13. Surveillance of antimicrobial drug use and resistance in the community

Indiscriminate and irrational use of antimicrobial agents is the main cause of increasing antimicrobial resistance in the community. Several studies have shown an association between antibiotic use and antibiotic resistance in hospital-acquired infections. Conversely, studies addressing community-acquired infections are very few. Hence, it is important to study drug use patterns in the community, understand the motivating factors for the current drug use patterns and develop appropriate sustainable interventions to improve antimicrobial use that can be adopted for the community.

A collaborative work with Sir Ganga Ram Hospital and WHO was planned and carried out. Data on consumption of all antimicrobial agents was collected by collecting the purchase data from 30 private pharmacies in five municipal wards of West Delhi and validating the results by doing "exit interview" of patients purchasing any antimicrobial agent from these pharmacies. Baseline data was recorded and analysed. Phase II project "Continued surveillance of antimicrobial resistance and use in the community and in-depth qualitative investigation for behaviour of antimicrobial drugs use for suitable interventions for rational use of antibiotics" is being finalized.

14. Impact of standard treatment guidelines and patient education on quality of asthma management

Our previous work has shown even after educational interventions of prescribers, treatment / management of asthma is irrational. The three lacunae were:

a. Non adherence of prescribers to standard treatment guidelines (STGs),

b. Poor patient knowledge and

c. Non-availability of inhalers from treating hospitals / clinics, as patients expect to get free medicines.

Hence, the present work is planed in a chest disease hospital, Vallabhbhai Patel Chest Institute (VPCI) where all prescribers are chest specialists and all resident doctors have written STGs and all prescribers are expected to follow these STGs. Unlike other government hospitals of Delhi medicines are not given free to patients in this hospital. Most of the times patients are referred to this institute for chest diseases and all patients purchase the prescribed medicines from private facilities (chemist shops).

Therefore, a study is taken up to find out the impact of standard treatment and the effects of additional intervention with a formal educational programme on quality of asthma management, based on the existing guidelines for quality of astma management.

Physiology

Research

1. Mechanism of action of estrogen on hemodynamic parameters in rabbits

The effect of estrogen (17 β-estradiol) on the cardiovascular performance before and after the blockade of left anterior descending coronary artery was studied in anesthetized, thoracotomised positive pressure ventilated rabbits. It was found that acute administration of 17 β-estradiol did not produce any significant effect under normal conditions and during myocardial ischemia produced by LAD occlusion suggesting that acute estrogen treatment doesn't provide any beneficial effect in male rabbits under present experimental conditions.

In order to understand the mechanism of action of estrogen (17 β-estradiol) on vascular smooth muscle, experiments were conducted on the isolated aorta of rabbits in the presence of various blockers of the endothelium dependent mechanisms. It was found that 17β -estradiol produced a concentration dependent contractile response, that was probably mediated through prostaglandins and this contractile response was partly mediated through ATP activated K channels (K_{ATP}).

2. Neural and cardiovascular responses during epilepsy in conscious animals

Electroencephalogram (EEG) and arterial blood pressure (BP) were monitored simultaneously in conscious rats with chronically implanted radiotelemetric device. Changes in mean arterial pressure (MAP) during epileptiform seizures induced by intraperitoneal administration of pentylenetetrazole (PTZ) were studied. Seizures are known to influence autonomic nervous system and thus will influence cardiovascular system. The radiotelemetry system used to acquire data in unrestrained conscious rats enabled us to study neurological excitation and its effect on cardiovascular system during seizures. Our results demonstrated an increase in BP and increased variation in the heart rate (HR) during seizures. Heart rate increased or decreased depending on the basal values. Pretreatment of valproic acid blocked seizures at the doses of 100mg/kg and 50mg/kg but was not statistically significant at the dose of 20mg/kg. So if we can block seizures we can achieve control over seizure-induced hypertension. Also combination of nifedipine and valproic acid not only provided better control over PTZ induced seizures but also maintained blood pressure and heart rate in normal range.

3. Effect of mucus hyper-secretion on respiratory impedance in a murine model of asthma

Inhalation of methacholine causes mucus secretion and bronchoconstriction in mice with experimental asthma and goblet cell metaplasia. Mucus secretion in such mice was blocked by inhibition of the MARCKS protein that is essential for secretion of mucus by airway goblet cells using a 24-amino-acid peptide that is identical to its N-terminus (MANS). Histological examination by fluorescent staining of intracellular mucus of airway goblet cells confirmed such mechanism. Mice pre-treated with the MANS peptide demonstrated significantly attenuated the increase in airway resistance compared to control mice, confirming the role of mucus secretion in changes in respiratory impedance. The difference between the two groups was 0.3 cm H_20 s which is about one-third of normal specific airway conductance and is biologically significant.

4. Protective role of carboxylic ionophore monensin in experimentally induced septic shock in rabbits

The carboxylic ionophores have an advantage over catecholamines in increasing external cardiac work without a corresponding increase in myocardial oxygen consumption. The occurrence of myocardial depression is a well documented phenomenon due to down regulation of beta receptor density in sepsis.

In view of the above cardiovascular effects of a strong pressor agent carboxylic ionophore (monensin) is compared with various pressor agents in experimentally induced septic shock in rabbits. The induction of septic shock in rabbits has been standardized and effect of infusion of nor-epinephrine are being compared with single bolus intravenous injection of monensin.

5. Effect of remote preconditioning on myocardial reperfusion injury

Ischemic preconditioning (IPC) is known to reduce infarct size of heart caused by ischemia / reperfusion. Protection can be achieved either by an ischemic stimulus of the heart itself or by ischemia of an organ distant to the heart. Protection by inducing ischemia of a distant organ to the heart is known as 'Remote Preconditioning' (RPC).

Several mediators have been suggested to be involved in this process. However, the precise mechanism(s) of RPC is still not clear. Mitochondrial K_{ATP} channel is the most important mediator in the cardioprotective effect of IPC. It has been reported that eNOS activates mitochondrial K_{ATP} channel *via* PKCε (Protein kinase C-ε) dependent mechanism in the cardioprotective action of IPC. It has been suggested that NO plays an important role in the mechanism of both acute 'classic' as well as acute RPC.

We have standardized the rat model of myocardial infarction. Our observations on two groups of animals; control MI and RPC with MI have demonstrated a significant reduction in the infarct size by RPC. RPC has been found effective in significantly reversing the myocardial stunning due to ischemia / reperfusion injury when compared with control group.

In different groups various blockers will be used in order to explore the possible mechanisms underlying this protective effect of RPC.

6. To study the vasoactive responses in animal models of non-cirrhotic portal hypertension (NCPH)

The effect of non-cirrhotic portal hypertension on isolated aortic tissues of rabbits was studied at one month after the induction of portal hypertension. The results have shown a hyper-responsiveness of aortic smooth muscle activity in isolated aortic segments recorded in tissue organ bath set-up. The tissues from control animals and from experimental animals (non-cirrhotic portal fibrosis) were tested with vasoconstrictors – phenylephrine and potassium chloride. There was biphasic response of acetylcholine and isoproterenol in the aortic rings from both the control and experimental animals. By inhibiting endothelium dependent mechanism individually (NO blocker, K channel blocker, prostacyclin inhibitor) we have attempted to elucidate whether vascular endothelium has any role in the responsiveness or aortic tissues from non-cirrhotic portal fibrosis animals. The study has been extended to rats in order to examine whether our observations on rabbits are species dependent.

7. Role of free radicals in vascular responsiveness on mercury exposure in experimental animals

Mercury is the second most common cause of heavy metal toxicity. Chronic exposure to mercury causes abnormal blood pressure, tachycardia, coronary endothelium damage and blocked heart muscle receptors. The effect of mercury exposure on cardiovascular function needs to be examined.

The effect of mercury exposure on vascular responsiveness on isolated aortic rings was investigated *in vitro* studies were conducted on aortic rings in order to observe the effect of mercury exposure on vascular reactivity. Isometric tension from isolated aortic rings was recorded with the help of force transducer. The aortic rings were exposed to mercury (10^{-12} to 10^{-4} M) and response curve was recorded. Furthermore, dose responses of acetylcholine, isoproterenol, sodium notroprussied and mercury before and after incubation of aortic ring with L-NAME, glamenclamide, oubain, superoxide dismutase and catalase will be studied to examine the role of endothelium dependent mechanism and also the role of free radical scavengers.

8. Behaviour of pulmonary vagal sensory receptors during high altitude simulation and exposure to cigarette smoke

Continuation of the work started in 2005 on the effect of simulation of high altitude on the activities of vagal sensory receptors of rabbits

Initiation of the studies on the effects of cigarette smoke on the activities of vagal sensory receptors of rabbits

Both these studies involve single fiber recordings of vagal afferents. We have just now made some progress in establishing this technique in the rabbit.

In the cigarette smoke study, we are looking at the responsiveness of airway rapidly adapting receptors (RARs) to acute cigarette smoke exposure in control and ‘sensitized’ rabbits. It is anticipated that the observations from the ‘sensitized’ rabbits may provide the sensory basis for the exaggerated airway responses of atopic individuals who are exposed to environmental pollutants.

Radiodiagnosis and Imaging

The Department continued to provide routine diagnostic services to the patients attending the CRC of the Institute. The Department consists of three units: *i.* CT scan unit, *ii.* Ultrasound unit and *iii.* X-ray unit.

(i) CT Scan Unit

A total of 1838 CT examinations were done during the period as per the details given below:

Examination	Number
Chest CT	1066
Head CT	22
PNS CT	599
Spine CT	01
Abdomen CT	03
CT guided FNAC	147
Total	**1838**

(ii) Ultrasound Unit

A total of 539 ultrasound examinations were done during the year as per the details given below:

Examination	Number
Chest USG	282
Abdomen USG	221
USG guided FNAC	36
Total	**539**

(iii) X-Ray Unit

A total of 14305 X-ray examinations were done during the year as per the details given below. With the introduction of PACS* facility last year, out of a total of 14305 X-ray examinations made, 9681 were done on PACS and 4624 X-ray films were made.

Examination	Number
Chest X-rays (Total)	14305
PACS*	
Chest X-ray (adult)	7983
Chest X-ray (child)	415
PNS X-ray	1283
Total PACS X-ray	**9681**
FILM X Ray	
Chest X-ray (adult)	3749
Chest X-ray (child)	63
PNS X-ray	812
Total Film X-ray	**4624**

PACS* : Picture archiving and communication systems.

Respiratory Allergy and Applied Immunology

Research

1. Biochemical and clinico-immunologic characterization of mosquito (*Culex quinquefasciatus*) allergens

A comprehensive and systematic study was undertaken to elucidate the role of *Culex quinquefasciatus* (*Cq*) in the etiology of allergic respiratory diseases. *Culex quinquefasciatus* were reared in our laboratory and whole body extract was prepared. The allergenic significance of *Cq* allergen was evaluated by performing skin prick tests (SPTs) with its WBE on 200 patients, suffering with bronchial asthma and / or allergic rhinitis, who were attending the OPD of Clinical Research Centre of the Institute. Blood samples from suitable patients were collected for further immunochemical and clinico-immunologic studies.

Allergen-specific IgE antibodies in the sera of patients were estimated through RAST. Homologous *Cq* extract induced dose related inhibition of *Cq* RAST, which established the specificity of *Cq* RAST assay. For these studies, the IgE serum pool (PPS) was prepared by pooling equal volumes of sera from 20 patients who showed highly positive skin reactions as well as very high RAST ratio to *Cq* WBE. As a negative control inhibition of *Cq* RAST was also attempted with eight unrelated heterologous allergen extracts of pollen species: *Prosopis juliforia, Ricinus communis*, fungal species: *Alternaria* sp., *Mucor* sp., horse dander, housefly (*Musca domestica*), moth (*Spodoptera litura*) male and female as liquid phase inhibitors. None of these produced significant inhibition of *Cq* RAST.

To study the exposure of patients to *Cq* derived allergens in Delhi metropolitan area, quantification of airborne *Cq* allergen levels was undertaken using an immunochemical method. Immunochemical quantification studies revealed seasonal as well as day-to-day variations in the airborne *Cq* allergen content. Protein profile of *Cq* WBE was studied by SDS-PAGE using vertical slab gel in discontinuous system. Allergenic activity of various proteins in *Cq* extract was evaluated by performing immunoblot experiments. Immunoblot experiments are underway to identify the major and minor allergenic proteins.

2. Comparative evaluation of allergenic significance of various species of mosquitoes prevalent in Delhi metropolitan area and physico-chemical and immuno-chemical characterization of their whole body extracts

We have studied the clinical and immuno-chemical properties of the three common species of mosquitoes prevalent in Delhi atmosphere (*Anopheles stephensi, Culex quinquefasciatus, Aedes aegypti)*. Heterogeneity of patient's immune response to various allergenic components in one of these three different species has been investigated.

The three species of mosquitoes were reared in our laboratory, lyophilized, pulverized and passed through a sieve to get a fine powder. The aqueous whole body extracts (WBE) were prepared.

To study the presence of any shared allergenic components among different species of mosquitoes, inhibition of *Culex quinquefasciatus* RAST was attempted with the other two species of mosquitoes (*Aedes aegypti* and *Anopheles stephensi*). Dose related inhibition was obtained by homologous as well as the two heterologous species, suggesting the presence of shared allergenic components in the three species of mosquitoes.

Protein profile of different species of mosquito WBEs was studied by SDS-PAGE using vertical slab gel in discontinuous system. Allergenic activity of various proteins in different species of mosquito WBEs is being evaluated in immunoblot experiments. Further experiments are underway to identify shared allergenic components among the three species of mosquitoes.

3. Identification, purification and characterization of major and minor allergens of some clinically important allergens of India used for the diagnosis and immunotherapy of patients suffering with allergic rhinitis and bronchial asthma and development of techniques and reagents for their quality control

In India, crude, aqueous allergen extracts are used for diagnosis and immunotherapy of patients suffering with IgE mediated type I allergic naso-bronchial disorders, which have not been characterized or standardized

as procedures and reagents are not available for their quality control.

A detailed study has been undertaken *(i)* for identification, isolation and characterization of major and minor allergens of various clinically important indigenous allergen extracts of our country and *(ii)* to develop techniques and prepare reference reagents for quality control of clinically important indigenous allergen extracts. In the present study, extracts of various clinically important inhalant allergens, *i.e.* pollen, fungi, insects, etc., will be studied.

Allergen extracts of four pollen types (*Prosopis juliflora, Ricinus communis, Holoptelia integrifolia, Morus alba)* were evaluated by performing skin prick tests (SPTs) with their extracts on 200 patients, suffering with bronchial asthma and / or allergic rhinitis, who were attending the OPD of Clinical Research Centre of the Institute. Blood samples from suitable patients were collected for further immunochemical and clinico-immunologic studies. Solid phase allergen discs were prepared and allergen specific IgE antibodies in the sera of patients eliciting different grades of cutaneous response to the particular allergen extracts (-ve to 4+) were estimated through RAST assays. In our patients *Prosopis juliflora*, *Ricinus communis* were found to be of moderate clinical significance. Specificity of *Prosopis* and *Ricinus* RASTs was established by performing inhibition assays with homologous allergen extracts. Inhibition of *Prosopis* RAST was also attempted with heterologous allergen extracts of pollen species: *Ricinus communis, Holoptelia integrifolia, Morus alba,* fungal species: *Alternaria* sp., *Mucor* sp., *Culex* sp., moth (*Spodoptera litura*) as liquid phase inhibitors. No significant inhibition was obtained with any of these extracts.

4. Assessment of biocontaminants from indoor environments

Air samplers have been designed to accomplish comprehensive air sampling for fine living airborne bio-particles at breathing level, without producing noise to avoid interruption in teaching programme. The three schools of Delhi selected for the study were: *(1)* Govt. Senior Secondary School, Dhaka, *(2)* Anglo Sanskriti Senior Secondary School, Daryaganj, *(3)* DAV Public School, Daryaganj. Comprehensive building survey was done for documentation of building information. Indoor and outdoor sampling stations were established in schools. Two types of samplings are being carried out using Gravimetric and volumetric sampling techniques for simultaneous quantification of indoor and outdoor microbial population (Fungi and Bacteria). Twice in a week per month sampling has been done to study seasonal, spatial and temporal variations. Indoor as well as outdoor sampling has also been done to evaluate the source of contaminants whether it is the outdoor or indoor environment itself. An innovative questionnaire has been designed containing questions based on symptoms prescribed by World Health Organization (1983) for indoor air quality. Wherever children will not respond to the questions, the mother or father of each case will be requested to provide the requisite information. Air sampling has been conducted through the academic session covering all the seasons. The prevalence and seasonal variations of various bacteria and fungal spores, different parameters of school building, and users' perceptions will be studied for assessment of the IAQ of school environment.

5. Effect of spacing device on hypothalamo pituitary adrenal axis in patients of bronchial asthma receiving high dose inhaled steroids

Inhaled corticosteroids (CS) are the mainstay in the management of bronchial asthma. The potential for adverse effects from these drugs relates to their systemic absorption. With increasing use of high doses of inhaled CS, it is important to establish whether such doses of beclomethasone dipropionate (BDP), budesonide (BUD) and fluticasone propionate (FP) produce untoward side effects specially hypothalamo pituitary adrenal axis (HPA) suppression. The present study was conducted to study the serum and urinary cortisol levels of asthmatic patients after treatment with 2000 µg / day of BDP, 2000 µg / day BUD and 1000 µg / day FP given through a spacer device. The study highlighted that inhaled corticosteroids given through spacers in such doses do not cause any significant changes in serum and urinary cortisol levels and on the HPA axis.

Respiratory Medicine

The Department is involved in the patient care (Outdoor and Indoor), research on different aspects of respiratory diseases and teaching of the postgraduate students in the subject – Pulmonary Medicine (MD and DTCD) of University of Delhi.

Research

1. The occurrence of rhinosinusitis in patients with bronchial asthma and/or allergic rhinitis

We assessed 216 patients with the clinical diagnoses of bronchial asthma and/or allergic rhinitis. Of the 216 patients, 27 (12.5%) had bronchial asthma alone and were classified as Group 1, 58 (26.5%) had both asthma and allergic rhinitis (Group 2) and 131 (60.64%) had allergic rhinitis alone (Group 3). The patients were given a questionnaire that sought information on the patient of sinusitis in asthma and/or allergic rhinitis while presence of sinusitis was confirmed by the CT scan of paranasal sinuses. Sinusitis was found in all the three groups, in 74% patients in Group 1, 82% of patients in Group 2 and 67% of patients in Group 3. In Group 1 patients with sinusitis had significantly more history of nocturnal awakenings ($p=0.05$), headache ($p=0.03$), easy fatigability ($p=0.04$), halitosis ($p=0.02$). Symptom severity score revealed that the mean scores for cough, easy fatigability, headache and halitosis, were significantly higher in patients with asthma having sinusitis when compared with patients without sinusitis ($p=0.028$). In Group 1, CT examination showed evidence of sinusitis in 20 patients with mean score of 6.45 while the mean number of sinuses involved per patient was 4.8. In Group 2, significantly more asthmatics with allergic rhinitis and sinusitis had history of nocturnal awakenings ($p=0.03$), wheezing ($p=0.03$), post nasal drip ($p=0.34$), headache ($p=0.04$) and halitosis ($p=0.02$). In Group 2, patients with sinusitis had significantly higher mean scores for nasal blockage, anterior purulent nasal discharge and posterior purulent nasal discharge ($p=0.041$) on symptom severity score analysis. In the same group CT PNS showed evidence of sinusitis in 48 patients with a mean score of 9.5 while the mean number of sinuses involved was 5.8. In Group 3 patients with sinusitis had significantly more breathlessness ($p=0.03$), nocturnal awakening ($p=0.04$), postnasal drip ($p=0.039$), nasal blockage ($p=0.037$). Purulent anterior nasal discharge ($p=0.045$), hyposmia ($p=0.028$), purulent posterior nasal discharge ($p=0.028$), headache ($p=0.05$), halitosis ($p=0.04$) and easy fatigability ($p=0.038$). Mean symptom severity score for nasal blockage, anterior purulent nasal discharge and posterior purulent nasal discharge was significantly higher in patients of allergic rhinitis with sinusitis ($p=0.001$). In Group 3, CT examination showed evidence of sinusitis in 88 patients with a mean score of 5.77 while mean number of sinuses involved per patient was 4.26. Most commonly involved sinus was maxillary sinus followed by ethmoid sinuses. The study demonstrated that CT PNS was more sensitive in diagnosing sinusitis as compared to the conventional Waters' view roentgenogram of paranasal sinuses in all the three groups.

2. Lung functions in allergic bronchopulmonary aspergillosis

We performed pulmonary function testing in 24 patients of ABPA who were either in acute or exacerbation stage. Twenty patients fulfilled all eight criteria for ABPA, while four patients, apart from asthma, met the other seven criteria. The mean duration of illness was less than 10 years in 9 patients (Group 1) and longer than 10 years in 15 (Group 2). Apart from obstructive airways disease, restriction as well as a mixed pattern was also observed in our patients. The FEV_1, FEV_1/FVC ratio and FEF_{25-75} were significantly reduced in Group 2 ($p<0.05$). A reduced diffusing capacity was also found in almost half of the patients tested.

3. Airway obstruction in patients suffering from allergic rhinitis only

A study was undertaken to find out incidence of airways obstruction in patients of allergic rhinitis. The diagnosis of allergic rhinitis was made if the patient was having at least two of the following symptoms for over two years: (1) blocked nose, (2) running nose, (3) itching nose and (4) sneezing. Out of a total of 50 patients enrolled for the study, 70% were males. All the patients were subjected to pulmonary function test. The parameters recorded were FVC, FEV_1, $FEV_1/FVC\%$, FEF_{25-75}. Sneezing and running nose were the most common symptoms observed in the study. Family history of atopy was present in 44% of the patients. Results of this study showed mild airflow limitation in 12% of the patients while 32% of the patients had peripheral airflow obstruction.

4. Allergy to rice in Indian population : a chest hospital based survey

The knowledge about food allergy in India is scarce compared, to western countries. A large number of food items, such as peanut, fish, egg, lentil, banana, milk, wheat, etc., have been reported allergenic inciting rhinitis, asthma and skin allergies. Rice is cultivated throughout and used as staple diet by a large population of the world. In India many asthmatics believe that rice can induce allergic reaction and thus aggravate breathlessness, hence prefer to avoid it from their diet. The present study was undertaken to diagnose cases of rice allergy and to educate patients to manage their respiratory ailments effectively. Out of 1200 cases screened using a questionnaire, 327 patients gave history of rice allergy. Skin prick tests carried out with rice extract demonstrated marked positive reactions in 20 (6.1%) patients. Specific IgE to rice was highly raised in these patients (ODs 0.51 to 0.70) as compared to normal controls (ODs 0.16). Oral food challenge in these 20 cases confirmed allergy to rice in 10 (50%) patients. After the rice challenge test, symptoms experienced by these patients include rhinorrhoea, sneezing, severe breathlessness, chest tightness, oral thrust, abdominal pain, urticaria, etc. The symptoms appeared within 15 to 60 minutes of rice intake. Rice allergy was confirmed in about 3% cases out of 327 patients who complained sensitization (history) with rice. The patients of asthma or rhinitis should undergo appropriate *in vivo* as well as *in vitro* tests to prepare their diet elimination programme.

5. Clinico-sero-radiological profile of sarcoidosis – an indian perspective

To study clinico-sero-radiological profile of sarcoidosis in Indian perspective, 29 patients attending the Clinical Research Centre of the Institute and having symptoms of cough, breathlessness, and bilateral hilar prominence were included in this study. The detailed clinical and serological evaluation of each patient was done. HRCT, bronchial and transbronchial needle lung biopsy was done in each patient. Bronchoscopy was done in all cases. The average age of the patients was 42.9±12.7 years. Fourty-five percent of the subjects were housewives. Ten percent of the patients were smokers. There was history of previous antituberculosis treatment in 31% of the patients, while family history of sarcoidosis was observed in only one patient. Prominent symptoms were cough (90%), breathlessness (38%), fever (20.7%), breathlessness on exertion (69%), joint pain (27.6%), skin nodules (10.3%) and dysphagia(3.4%). Spirometry revealed restrictive lung disease of mild to moderate severity. Diagnosis of sarcoidosis was confirmed histologically in 28 patients. Skin biopsy done in two cases also confirmed sarcoidosis. Radiologically patients were diagnosed to have Stage-I (58.6%), Stage-II (34.5%), Stage-IIII (3.4%) and Stage-IV (3.4%) disease. Sarcoidosis is prevalent in India. The diagnosis of sarcoidosis is confused because of prevalence of tuberculosis in India. One third of the patients are treated as tuberculosis but actually they are of sarcoidosis.

6. Computed tomography observation in patients with allergic bronchopulmonary aspergillosis

The role of computed tomography in diagnosing cases of bronchopulmonary aspergillosis has not been given much importance. To observe it , a study was undertaken and CT scan records of 29 patients of ABPA were evaluated for bronchial, parenchymal and pleural abnormalities. CT scans of eleven patients (38%) were found to be normal and these patients were labeled as ABPA-S (ABPA-Serologically positive) and other 18 (62%) as ABPA-CB (ABPA with central bronchiectasis). Among these 18 patients, bronchial abnormalities were – central bronchiectasis (100%) as evidenced by 'signet ring' and 'string of pearls appearance', 'cluster of grapes' (11%), 'air fluid level' (11%) in bronchiectatic area, tubular opacity (22%). The parenchymal abnormalities included consolidation in six patients (33%), lobulated tissue density in right lower lobe in three patients (16%), parenchymal scarring in twelve patients (66%), emphysematous changes in 4 patients (22%), fibrocavitary lesion in right upper zone in two patients (11%), aspergilloma in a cavity with right pleural effusion in one patient (5%). Ground-glass opacity and pleural thickening were observed in only one patient. Two patients (11%) showed mediastinal lymphadenopathy. Evaluation with CT scan facilitates, the diagnosis of ABPA-CB and differentiation from ABPA-S, allowing early treatment which may prevent ABPA-S group to progress into permanent damage to lungs. Findings of CT scan other than CB were found to be of diagnostic and prognostic importance.

7. Epidemiology of smoking habits of college students of University of Delhi, Delhi

To study the smoking habits of college students of University of Delhi, Delhi, India, 1001 (673 males and 328 females) students were surveyed and information was collected through pre-designed printed

questionnaires. Eight hundred and thirty-one (83%) students (619 males and 212 females) responded. Prevalence of tobacco use was 25 percent. Majority of the students (56.7%) started tobacco use between the age of 16-20 years. Seventy-two percent were smoking for the last 1-5 years. "For fun and pleasure" (82.7%) and "Peer pressure" (32.7%) were the most common reason for starting smoking. Cigarette (98.6%) was the most common tobacco product used. Fourty-two percent of current smokers had previous history of quitting, and 54.3% were willing to quit at the time of survey. The reason for willingness to quit given by majority (64.6%) was awareness of harmful effect of tobacco. Fifty-two percent respondents (65.9% smokers and 46.9% non-smokers) had a positive family history of tobacco use. Public awareness measures should be the primary focus of the governments, especially in developing countries. Misleading advertising should also be dealt with severely.

8. Prevalence of bronchial asthma and allergic rhinitis in a girl's school in Delhi

A questionnaire-based study was undertaken to determine the prevalence of childhood asthma and rhinitis in girl's school in Delhi, and to establish the relationship between various factors associated with the disease. Two thousand three hundered questionnaires were distributed among the students of a girl's school in Delhi, to be completed by their parents at home. In total 2139 (93%) of the questionnaire were completed. Overall 543 (25.4%) children were found to have some form of respiratory allergy, either bronchial asthma or allergic rhinitis. Fifteen percent of the children gave history of wheezing at some or the other time in their life. The prevalence of bronchial asthma and allergic rhinitis was found as 8.8% and 21.3% respectively. Twenty-two percent children with allergic rhinitis had co-existent bronchial asthma, while 53.2% of bronchial asthma patients have co-existent allergic rhinitis. The prevalence of allergic rhinitis increased with increasing age. Birth order and family income did not have any significant impact, except that bronchial asthma was more common in very poor socio-economic group. The family history of allergic rhinitis or bronchial asthma was significantly more ($p<0.05$) in students suffering from allergic rhinitis or bronchial asthma. The prevalence of bronchial asthma and allergic rhinitis was found as 8.8% and 21.3% respectively.

9. Association of passive smoking on the pulmonary function of children aged 7-15 years at the Ashok Vihar, Delhi

The health consequences of exposure to environmental tobacco smoke (ETS) among children have been the subject of intense scientific and public health concern. This is a study to determine the association of exposure to parental smoking to changes in pulmonary functions in children. Four hundred fourty-one children aged 7-15 years from lower, middle and higher socio-economic classes of the Ashok Vihar, area of Delhi were included in the study. The consent from the parents of all the subjects was taken. The demographic details including in-house smoking, ETS exposure, respiratory illness, etc., were collected. All children were subjected to spirometric evaluation including forced expiratory volume in one second (FEV_1), forced vital capacity (FVC), FEV_1/FVC ratio. Peak expiratory flow rate (PEFR) was measured in case children failed to perform spirometry. Indoor samples were collected to measure levels of SO_2, NO_2 and SPM (suspended particulate matter). Thirty-five percent of the children were exposed to ETS. Out of these 74.2% of family members used to smoke in front of children and 83% were aware about harmful effects of smoking on the child health ($p=0.019$). The spirometry revealed mild to moderate degree of airways obstruction in 18% of the children. The children (34.9%) exposed to ETS had respiratory symptom in the form of cough, phlegm, shortness of breath, rhinitis, wheezing, common cold, etc. Family history of smoking has significant effect on respiratory symptoms of children ($p=0.01$). In smokers house significantly high levels of SO_2 ($p=0.07$), NO_2 ($p=0.028$) and SPM ($p=0.001$) were observed. The study showed that parental smoking has significant bad effect on the respiratory health of the children.

Respiratory Virology

Research

1. Role of TGF-β on expression of inducible nitric oxide synthase and dsRNA dependent protein kinase during experimental influenza infection in mice

Influenza virus infection activates the interferon (IFN) inducible gene, nitric oxide synthase 2 (iNOS) and double stranded RNA dependent protein kinase (PKR). The production of nitric oxide (NO) *via* the iNOS is regulated by a complex network of cytokines. Among these, cytokines transforming growth factor-β1 (TGF-β1) is known to suppress iNOS expression and NO production. NO has been shown to contribute to the pathogenesis of influenza virus *via* the formation of a more reactive species peroxynitrite. However, PKR leads to demise of cells.

Eight-week-old BALB/c mice was intranasally instilled with influenza A virus (A/Udorn/317/72/H3N2), $4.1x10^3$ PFU of virus in 50µl of allantoic fluid or mock infected 50µl of allantoic fluid. rTGF-β1 administered to mice by giving intravenous injection of rTGF-β1, 0.5µg/kg body weight of mouse. The mice were euthanized on day 3 and 6 post infection (p.i.) for analysis of the parameters. Peripheral blood monocytes separated and total RNA extracted for RT-PCR of iNOS, expression and blood lymphocytes isolated for PKR and pPKR assay by Western blot.

We observed expression of iNOS on 3rd day and 6th day as well. However, PKR and pPKR observed on Western blot on 3rd day p.i. only. Simultaneous administration of rTGF-β1 with virus significantly reduced the level of expression of iNOs on 3rd and 6th day p.i. but expression of PKR remain unaffected. However, phosphorylation of PKR was found inhibited.

rTGF-β1 acts as an immunomodulatory cytokine and inhibits lymphopoesis after virus infection and lymphocyte activation. It modulates the inflammatory process by inhibiting INF-γ, down regulating expression of iNOS and inhibiting activation of PKR.

2. Regulatory mechanism of influenza A virus induced apoptosis in murine model of allergic asthma

Destruction of airway and lung tissue, associated with several acute and chronic diseases, is in part mediated through apoptosis or programmed cell death. It has been shown that both increased endothelial/epithelial cell apoptosis and decreased cell death of inflammatory cells are associated with asthma. Programmed cell death (apoptosis) is one of those important mechanisms occuring in every immune response. Because inflammatory cells are commonly seen in the airway mucosa in asthma, the expression of these apoptotic molecules in the airway epithelium may modulate the inflammatory state. Whereas inflammatory cells such as eosinophils express these apoptotic molecules on their surface, less is understood regarding the apoptotic mechanisms in acute or chronic inflammatory states and cell damage or epithelial shedding, such as that seen in viral asthma.

The aim of our study was to investigate the influence of influenza virus infection on the apoptosis of ovalbumin (OVA)-induced allergy in BALB/c mice. We determined fasL in serum and BAL, fas receptor, DNA fragmentation and caspase-3 assay in lungs of OVA-allergic mice after influenza virus infection. OVA sensitization and challenge induced Th2 response which in turn led to the downregulation of Th1 response in the lungs. Influenza virus inoculation during the challenge period in OVA allergic mice showed the considerable lower degree of DNA fragmentation, whereas the simply influenza virus inoculated mice showed the higher degree of fragmentation in DNA which might be correlated with the increased occurence of apoptosis. Influenza virus further led to the downreguation of Fas Ligand and Fas receptor in the OVA-induced hypertrophied mice. In addition to these caspase3 assay also showed the similar trend.

In general, lung and airway destruction/damage appears to be caused by increased epithelial and endothelial cell death or inhibition of apoptosis of inflammatory cells. Moreover, hypoexpression of apoptotic markers by pulmonary T cells, with subsequent impairment of apoptosis in allergic asthma, may be the molecular basis for the development and persistence of inflammatory infiltrate in the mucosa of the respiratory tract. It may be hypothesized that influenza virus induced in OVA allergic mice do not lead to marked

apoptosis rather leads to cytolysis, resulting in enhanced airway inflammation and severe exacerbation of asthma.

3. Identification of new influenza virus variants in clinical specimens by multiplex reverse transcription-PCR and the heteroduplex mobility assay

One hundred and fifty-five nasopharyngeal swab (NPS) and throat swab (TS) specimens are collected from the Clinical Research Centre of the Institute and Kalawati Saran Children's Hospital (KSCH), New Delhi. AIl the clinical specimens are inoculated in MDCK and Hep2 cell lines after processing. Six specimens are declared as positive through immunofluorescence method. Presently, influenza viruses are isolated from two clinical specimens exhibiting cytopathic effect (CPE) after 48 and 72 hours of incubation respectively, which are confirmed by haemagglutination inhibition (HAI) test and through RT-PCR using H3N2 specific primer. These specimens are stored at –80 ^{0}C for the further characterization and sub-typing of influenza virus by restriction fragment length polymorphism (RFLP), single strand conformation polymorphism (SSCP) and heteroduplex mobility assay (HMA) techniques. A number of suspected clinical specimens are also presently under process.

A rapid analysis protocol has been developed in our lab for the screening of influenza virus isolates obtained from the clinical specimens. For the first time, we are using 400bp of HA1 gene for the amplification by RT-PCR. The primers for RT-PCR and HMA are selected by Lasergene DNASTAR Software (DNASTAR Inc., Madison, Wisconsin, USA). The variants in the amplified fragments by RT-PCR will be characterized by HMA, on the basis of mobility shift of amplicons. Hence, the technique is promising for identification of influenza virus variants. The advantage of this technique is it being rapid and economical as compared to lengthy sequencing procedure.

4. Cloning of M1 and PB1 gene for antiviral approach against influenza A virus

The M1 and PB1 gene are responsible for pathogenicity of influenza virus. It is possible that if these two genes are silenced, the infection of influenza virus can be inhibited. For this, these genes were cloned in the phagemid vector (pcDNA3).

The Amp (-ve) strain of *E. coli* (DH5-α) were grown on LB Agar and LB Broth. This DH5-α strain was transformed with pcDNA3 and successful transformation was checked by growing the transformed cells on amp (+ve) LB agar and LB broth. The plasmid was isolated from the transformed cell and stored in –20 ºC for further cloning of M1 and PB1 gene of influenza virus. The primers for the above genes were designed using Lasergene DNASTAR software and PCR was done to obtain the full-length PB1 and M1 gene of influenza virus. Further work of cloning the genes is under process. We will ligate the genes in the plasmids stored in our lab and clone it and then further work related to antiviral approach will be done.

Dignitaries on the dais during the 5th CME: National Update on COPD, on 24th April, 2005; *left to right*: Dr V.K. Vijayan, Prof. S.K. Jindal (PGI, Chandigarh) and Dr Raj Kumar

7th Annual Conference-cum-Workshop of the Indian Association of Mycoplasmologists was organised by the Institute on April 28-29, 2005; Dr V.K. Vijayan welcoming the distinguished guests. *Dignitaries on dais*: Dr Rama Chaudhary (AIIMS, New Delhi), Dr Usha Gupta (NHI, New Delhi), Dr Y. Singh (CCSHAU, Hissar) and Dr Mandira Varma

Postgraduate Training and Teaching

The Institute has been conducting PhD programmes (Medical Sciences) since its inception in various specialities relating to chest diseases, *e.g.*, allergy and immunology, bacteriology, respiratory medicine, mycology, pharmacology, physiology, virology, etc. Besides this, the Institute conducts MD courses in pulmonary medicine, biochemistry, microbiology, pharmacology and physiology. It also conducts a Diploma course in tuberculosis and chest diseases (DTCD).

DTCD

Session 2004-2006	Session 2005-2007
Dr Pengovile Ltu	Dr Amita Singh
Dr Rajat Rai	Dr Sumit Wadhawa
Dr Ajay Kukreja	Dr Bhumika Agarwal
Dr Anuradha Garg	Dr Jain Pankaj Fulchand
Dr Shishu Chawla	Dr Hitesh Verma
Dr Priyanka Chaudhary	Dr Saurabh Sharma
Dr Hemant Kalra	Dr Jaya Kala
Dr Amit Kumar Gupta	Dr Shweta Gupta
Dr Rashmi Dhir	Dr Sandhya Sri Korbathina
Dr Rajesh Mohan	Dr Vibhu Kawatra

MD Degrees (Awarded)

(Session: 2002-2005)

Name	Discipline
Dr Rohit Caroli	Pulmonary Medicine
Dr Susheel K. Bindroo	Pulmonary Medicine
Dr Amit Sharma	Pulmonary Medicine
Dr Tarun Chugh	Pulmonary Medicine
Dr Parag Vohra	Biochemistry
Dr Shweta Rawall	Microbiology
Dr Anurag Yadav	Pharmacology
Dr Manoj Kumar	Physiology

MD Theses (Submitted)

(Session: 2003-2006)

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)
1.	Dr Amit Bansal (Pulmonary Medicine)	A study of sleep-related breathing disorders in chronoc obstructive pulmonary disease patients with or without cor-pulmonale	Dr V.K. Vijayan
2.	Dr Om Prakash (Pulmonary Medicine)	Clinico-physiological effect of inhaled tiotropium bromide and inhaled ipratropium bromide in stable chronic obstructive pulmonary disease patients: a comparative study	Prof. S.N. Gaur and Dr Raj Kumar
3.	Dr Vikas Mittal (Pulmonary Medicine)	Assessment of subjective symptom perceptual accuracy of children with asthma and their parents	Prof. Ashok Shah
4.	Dr Pankaj Chhabra (Pulmonary Medicine)	Gender differences in perception of dyspnoea, quality of life and pattern of lung function abnormalities in asthma	Prof. S.K. Chhabra
5.	Dr Nitin Goel (Pulmonary Medicine)	Assessment of serum total IgE levels, in smokers, non-smokers & ex-smokers and its relation to lung function, lung function, airway symptoms and atopic predisposition	Dr Raj Kumar
6.	Dr Ruchika Gulati (Biochemistry)	Studies on acetoxy drug: protein transacetylase mediated modification of protein kinase-C activity of peripheral blood lymphocytes obtained from patients of bronchial asthma	Prof. S.K. Bansal Prof. H. G. Raj and Dr V.K. Vijayan
7.	Dr Rashmi Puri (Microbiology)	Molecular characterization of respiratory tract isolates of *Moraxella catarrhalis*	Prof. S.S. Thukral
8.	Dr Priyanka Narayan (Pharmacology)	A pharmacological assessment of fluoroquinolone convulsiogenesis in experimental animals	Prof. A. Ray and Dr V.K. Vijayan

MD Theses (Pursued)

(Session: 2004-2007)

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)
1.	Dr Pankaj Sayal (Pulmonary Medicine)	Characterization of lower respiratory tract inflammation and its relationship with changes in pulmonary patho-physiology and thoracic imaging in bronchial asthma	Dr V.K. Vijayan and Dr B. Menon
2.	Dr Amit Diwakar (Pulmonary Medicine)	A study of multi-drug resistant pulmonary tuberculosis cases to observe the initial clinical, bacteriological and radiological response to treatment correlated with modulation of TNF-α, nitric oxide and IFN-γ receptor response	Prof. S.N. Gaur and Prof. Mridula Bose
3.	Dr Sandeep Sahay (Pulmonary Medicine)	The occurrence of rhinosinusitis in patients with bronchial asthma and / or allergic rhinitis	Prof. Ashok Shah and Prof. Satish K. Bhargava (UCMS, Delhi)
4.	Dr Margaret Z. Khuma (Pulmonary Medicine)	Assessment of outcome measures for treatment in chronic obstructive pulmonary disease	Prof. S.K. Chhabra
5.	Dr Ravneet S. Grover (Pulmonary Medicine)	Breath carbon monoxide levels as a marker of clinical severity and control of asthma	Dr Raj Kumar
6.	Dr Usha Singh (Biochemistry)	Studies on acetoxy drug: protein transacetylase catalysed modification of the TNF-α mediated pathway in human peripheral blood mononuclear cells by polyphenolic acetates	Prof. H.G. Raj, Prof. S.K. Bansal and Prof. Mridula Bose
7.	Dr Latika Sharma (Microbiology)	Comparative analysis of *ex-vivo* mycobactericidal activity and activation markers of peripheral blood macrophages from pulmonary tuberculosis patients challenged with a multidrug-resistant strain of *Mycobacterium tuberculosis*	Prof. Mridula Bose and Prof. S.N. Gaur
8.	Dr Neeraj Tyagi (Pharmacology)	A study to monitor adverse drug reactions in patients of chronic obstructive pulmonary disease	Prof. A. Ray and Dr V.K. Vijayan
9.	Dr Monika Gupta (Physiology)	Cholesterol lowering potential of Seabuckthorn in rats	Prof. M. Fahim and Prof. K. Ravi

MD-Ist Year

(Session: 2005-2008)

Name	Discipline
Dr Anupam Kumar Singh	Pulmonary Medicine
Dr Danish Jamal	Pulmonary Medicine
Dr Priyanka Agarwal	Pulmonary Medicine
Dr Ramaraju Karthikeyan	Pulmonary Medicine
Dr Ankur Girdhar	Pulmonary Medicine
Dr Anjali Vinocha	Biochemistry
Dr Archana Angrup	Microbiology
Dr Gaurav Vishnoi	Pharmacology
Dr Payal Bhalla	Physiology

PhD Awarded/Submitted

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)	Status
1.	Mr Ajit Kumar (Biochemistry)	Studies on biochemical actions of oxygen containing heterocyclic polyphenols and their acetates on drug metabolism	Prof. H.G. Raj and Dr A.K. Prasad (Chemistry Deptt., University of Delhi)	Awarded
2.	Mr Sugata Roy (Microbiology)	Cytokine mediated transcriptional induction of human inducible nitric oxide synthase gene in the lung epithelial cell line A549 infected with *Mycobacterium tuberculosis*	Prof. Mridula Bose and Dr Mandira Varma	Awarded
3.	Mr Sujeet Kumar (Microbiology)	Molecular analysis of *Mycobacterium avium* complex isolates by using restriction fragment length polymorphism and PCR typing	Prof. Mridula Bose and Prof. Madalsa Mathur (UCMS, Delhi)	Awarded
4.	Ms Anbrin Masood (Pharmacology)	Studies on the neuroimmunomodulatory role of nitric oxide (NO) in stress	Prof. A. Ray and Prof. B.D. Banerjee (UCMS, Delhi)	Awarded
5.	Mr Namdar Yousefvand (Physiology)	Cardiovascular functions on exposure to arsenic in rats	Prof. M. Fahim	Awarded
6.	Ms Sujata Upadhyay (Physiology)	Role of oxidative stress in the induction of bronchial hyperresponsiveness and its modulation by dietary anti-oxidant vitamins C and E in guinea pigs	Prof. K. Ravi and Prof. S.K. Chhabra	Awarded
7.	Mr Manoj Tyagi (Biochemistry)	Signalling mechanism during the expression of proinflammatory cytokines in asthma : a study on role of protein kinase C in macrophage activation and release of interleukin-1 beta	Prof. S.K. Bansal and Dr V.K. Vijayan	Submitted
8.	Dr Anurag Aggrawal (Physiology)	Effect of mucus hyper secretion on respiratory impedance in a murine model of asthma	Prof. M. Fahim and Dr Burton F. Dickey (MD Anderson Cancer Center, Houston)	Submitted

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)	Status
9.	Ms Mahin Dianat (Physiology)	Effect of morphine on neural regulation of blood pressure and behaviour in animals	Prof. M. Fahim and Prof. Mohd. Reza Zarrindast (Tehran Medical University, Iran)	Submitted
10.	Dr Vishal Bansal (Physiology)	Mechanism of action of estrogen on hemodynamic parameters in rabbits	Prof. M. Fahim and Prof. Rashmi Babbar (MAMC, New Delhi)	Submitted

PhD Theses (Pursued)

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)	Year of Registration
1.	Ms Garima Gupta (Biochemistry)	Studies on purification, characterization and molecular cloning of acetoxy drug: protein transacetylase from *Mycobacterium smegmatis*	Prof. H.G. Raj and Prof. Mridula Bose	2002
2.	Mr Mohd. Adnan Kausar (Biochemistry)	Biochemical and clinico-immunologic characterization of mosquito (*Culex quinquefasciatus*) allergens	Prof. S.K. Bansal, Prof. M.K. Agarwal and Dr V.K. Vijayan	2005
3.	Ms Prachi Gupta (Biochemistry)	Lipid rafts in bronchial asthma: a study on membrane lipid metabolism in asthmatic patients	Prof. S.K. Bansal and Dr V.K. Vijayan	2005
4.	Mr Tapesh Kumar Tyagi (Biochemistry)	Studies on the novel enzyme acetoxy drug: protein transacetylase from mesophilic fungus *Starkeomyces Sp.*	Prof. H.G. Raj and Prof. R.K. Saxena (Microbiology Deptt., South Campus, University of Delhi)	2005
5.	Ms Shwetambari Arora (Biochemistry)	Studies on acetoxy drug: protein tranacetylase in hypoxia induced pulmonary hypertension	Prof. H.G. Raj and Prof. Daman Saluja (ACBR, University of Delhi)	2005
6.	Mr Anil Singh Baghel (Biochemistry)	Studies on molecular cloning and expression of acetoxy drug: protein transacetylase of *M. tuberculosis* with special reference to the role of polyphnolic acetates as antituberculous drugs	Prof. H.G. Raj and Prof. Mridula Bose	2005
7.	Mr Rakesh Kumar Mishra (Biochemistry)	Experimental asthma: a study on transmembrane signalling in airway smooth muscles and peripheral blood lymphocytes during the development of airway hypersensitivity in guinea pigs	Prof. S.K. Bansal, Prof. S.K. Chhabra and Dr Ritu Kulshrestha	2006

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)	Year of Registration
8.	Ms Amita Chandolia (Microbiology)	Functional analysis of *mce 4* genes of *Mycobacterium tuberculosis* H37Rv using antisense approach	Prof. Mridula Bose, Prof. Vani Brahmachari (ACBR, University of Delhi) and Dr Pawan Malhotra (ICGEB, New Delhi)	2004
9.	Ms Monika Sharma (Microbiology)	To study the effect of *Mycobacterium tuberculosis* infection of macrophages on T-cell viability	Prof. Mridula Bose and Prof. H.G. Raj	2004
10.	Mr Vikram Srivastava (Microbiology)	Role of apoptosis in the pathogenesis of influenza A virus, correlation of virological and immunological parameters: a study in human and murine model	Dr Madhu Khanna and Dr V.K. Vijayan	2004
11.	Mr M.K.R. Khan (Microbiology)	A study of ESBLs and ESBL plasmids in clinical isolates of *E. coli, Klebsiella spp., Proteus spp.*, and *Pseudomonas aeruginosa*	Prof. S.S. Thukral	2005
12.	Ms Rashmi Pasricha (Microbiology)	Functional analysis of lprN of *mce4* operon of *M. tuberculosis*	Prof. Mridula Bose and Prof. Vani Brahmachari (ACBR, University of Delhi)	2005
13.	Ms Ruqiaya Nazir (Microbiology)	Effect of programmed cell death and cytokines induced by influenza A virus infection in allergic asthma: a study in murine model	Dr Madhu Khanna	2005
14.	Mr Rishi Pal (Pharmacology)	Experimental studies on the role of free radicals in emotional and environmental stress	Prof. A. Ray and Prof. B.D. Banerjee (UCMS, Delhi)	2004
15.	Mr Ayanabha Chakraborty (Pharmacology)	Studies to explore gender related differences in stress responses with special reference on the role of nitric oxide	Prof. A. Ray and Prof. B.D. Banerjee (UCMS, Delhi)	2005
16.	Ms Rashmi Anand (Pharmacology)	Experimental studies on the role of opioids in stress and their interactions with nitric oxide in rats	Prof. A. Ray	2006

S. No.	Name (Discipline)	Title of Theses	Supervisor(s)	Year of Registration
17.	Dr Rajinder Gupta (Physiology)	Protective role of carboxylic ionophore monensin in experimentally induced septic shock in rabbits	Prof. M. Fahim and Dr S.K. Sarin (G.B.Pant Hospital, New Delhi)	2005
18.	Dr Swati Omnwar (Physiology)	Functional changes in vascular responsiveness following mercury exposure in rats	Prof. K. Ravi and Prof. M. Fahim	2005
19.	Mr Abdul Yasir (Physiology)	Responsiveness of airway rapidly adapting receptors and oxidant-antioxidant status to cigarette smoke inhalation in normal and sensitized rabbits	Prof. K. Ravi and Prof. S.K. Chhabra	2005

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

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)	Status
1.	Dr Deepa Gadre (Microbiology)	Isolation, identification and plasmid profiles of non-tuberculous mycobacteria isolated from hospital patients and environment	Prof. Vibha Talwar (UCMS, Delhi) and Prof. Mridula Bose	Awarded
2.	Mr Robinson Jhallabhai (Physiology)	Arterial baroreflex responses during experimentally induced hypercholesterolemia in rabbits	Prof. V.M. Ahuja (MAMC, New Delhi) and Prof. M. Fahim	Awarded
3.	Ms Dolly Kumari (Biomedical Sciences)	Study of food allergens	Dr Susheela Sridhara and Dr B.P. Singh (IGIB, Delhi), and Dr Raj Kumar	Pursued
4.	Mr Neeraj Kumar Saini (Biomedical Sciences)	Functional analysis of mammalian cell entry (mce) proteins in mycobacteria	Prof. Sujata K. Das (Bundelkhand University, Jhansi), Prof. G. L. Sharma (IGIB, Delhi) and Prof. Mridula Bose	Pursued
5.	Ms Seema (Chemistry)	Studies on acetoxy drug protein transacetylase from human placenta	Prof. R.C. Rastogi (Chemistry Deptt., University of Delhi) and Prof. H.G. Raj	Pursued
6.	Mr Jitendra K. Nagar (Geology)	Suspended particulate matter enriched aerosol areas and its relationship with human health	Prof. J.P. Shrivastava (Geology Deptt., University of Delhi) and Dr Raj Kumar	Pursued
7.	Mr M. Irfan Beig (Life Sciences)	Neural and cardiovascular responses during epilepsy in conscious animals	Dr Anju Katyal (Dr B.R. Ambedkar Centre for Biomedical Research, University of Delhi) and Prof. M. Fahim	Pursued

Sl No.	Name (Discipline)	Title of Theses	Supervisor(s)	Status
8.	Mr M. Shahid (Pharmacology)	Effect of remote preconditioning on myocardial reperfusion injury	Prof. K.K. Sharma (UCMS, Delhi) and Prof. M. Fahim	Pursued
9.	Mr M. Tauseef (Pharmacology)	Evaluation of the mechanism of action of aspirin as a cardioprotective agent in experimentally induced cholesterolemic rats	Prof. K.K. Sharma (UCMS, Delhi) and Prof. M. Fahim	Pursued
10.	Mr R. Rizvi (Physiology)	To study the vasoactive responses in animal models of non-cirrhotic portal hypertension (NCPH)	Prof. Rashmi Babbar (MAMC, New Delhi), Dr S.K. Sarin (G.B.Pant Hospital, New Delhi) and Prof. M. Fahim	Pursued
11.	Ms Bano Saidullah (Zoology)	Bronchial reactivity in diabetic guinea pigs/rats	Prof. K. Muralidharan (Zoology Deptt., University of Delhi) and Prof. M. Fahim	Pursued

Distinguished Visitors

- **Dr Sunirmal Chanda**, Professor-Emeritus, Department of Botany, Bose Institute, Kolkata. Delivered a lecture on: "Origin, evolution and diversification of life on earth" (June 14, 2005).

- **Dr O.D. Gulati**, Emiritus-Professor, National Academy of Medical Sciences, New Delhi. Delivered lectures on*: a.* "Autonomic disorders" (November 21, 2005); *b.* "Emerging trends in pharmacotherapeutics" (November 22, 2005) and *c.* "Growth of pharmacology in India" (November 23, 2005).

- **Dr Kathleen Holloway**, Medical Officer, Department of Policy, Access and Rational Use, WHO, Geneva. Delivered a lecture on: "Community surveillance of antimicrobial use and resistance" (November 22, 2005).

- **Dr Chand Wattal**, Senior Consultant and Head, Micrbiology Department, Sir Ganga Ram Hospital, New Delhi. Delivered a lecture on: "Surveillance of antimicrobial resistance in the community" (November 22, 2005).

Awards/Honours

Dr V.K. Vijayan

- **Rastriya Rattan Award** for excellence in Medical Science, International Study Circle affiliated to the Institute of Economic Studies, New Delhi.
- **International Regent,** American College of Chest Physicians, U.S.A.
- **Vice President,** World Lung Foundation, South Asia.
- **President,** Indian Association for Bronchology.
- **Editor-in-Chief and Publisher**, *The Indian Journal of Chest Diseases & Allied Sciences*, an official publication of the V.P. Chest Institute and the National College of Chest Physicians (India).
- **Member,** Editorial Advisory Board, *Chest*, an official publication of American College of Chest Physicians, U.S.A.
- **Member,** Editorial Advisory Board, *Chest* (Indian Edition), an official publication of American College of Chest Physicians, U.S.A.
- **Member,** Editorial Advisory Board, *Thorax* (South Asian Edition), an official publication of British Thoracic Society, U.K.
- **Member,** International Advisory Board, *Internal Medicine Journal of Thailand*, an official publication of the Royal College of Physicians of Thailand.
- **Member,** Editorial Board, *Lung India*, an official publication of the Indian Chest Society.
- **Member,** Editorial Board**,** *Indian Journal of Tuberculosis*, an official publication of the Tuberculosis Association of India.
- **Member,** Editorial Advisory Committee, *Pulmon*, an official publication of the Academy of Pulmonary and Critical Care Medicine.
- **Member**, Programme Advisory Committee (PAC) on Health Sciences under Science & Engineering Research Council (SERC), Department of Science and Technology, Government of India, New Delhi.
- **Member**, Data Safety Monitoring Bureau (DSMB), Department of Biotechnology (DBT) project on "Efficacy and safety of immunomodulator *Mycobacterium w.* as an adjunct therapy in pulmonary tuberculosis".
- **Member**, Scientific Advisory Committee, New Delhi Tuberculosis Centre, New Delhi.

Prof. M. Fahim

- **Member**, Steering Committee to monitor progress of the project on "Development of Integrated Software for Quantification of Autonomic Tone" submitted by AIIMS, New Delhi, Funding Agency: Ministry of Information Technology, Govt. of India, New Delhi.
- **Member**, Academic Council, University of Delhi, Delhi.
- **Member**, University Court, University of Delhi, Delhi.
- **Member**, Academic Council, Jamia Millia Islamia University, New Delhi.
- **External Expert** in the Board of Research Studies, Jamia Millia Islamia University, New Delhi.
- **Expert Panel**, Recruitment and Assessment Centre, Defence Institute of Physiology and Allied Sciences, Delhi and other DRDO Institutions.

Prof. M.K. Agarwal

- **Editor**, Biotechnology Society of India.
- **Member**, Editorial Board, *The Indian Journal of Allergy, Asthma and Applied Immunology*, an official publication of the Indian College of Allergy, Asthma and Applied Immunology.
- **Member**, Vision Committee (VISION 2020) of National Institute of Biologicals (NIB), Ministry of Health and Family Welfare, Govt. of India, New Delhi.
- **Member**, Academic Council, University of Delhi, Delhi.
- **Member**, Academic Advisory Committee, School of Environmental Studies, University of Delhi, Delhi.

Prof. S.N. Gaur

- **Member**, Asthma Care Committee, Municipal Corporation of Delhi, Delhi.
- **Member**, Institutional Ethics Committee, IGIB (CSIR), Delhi.
- **Member**, Board of Studies, Department of TB & Respiratory Diseases, Aligarh Muslim University, Aligarh.

Prof. S.S. Thukral

- **External Expert Member**, Board of Postgraduate and Research Studies, Kurukshetra University, Kurukshetra.

Prof. Mridula Bose

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

Prof. Ashok Shah

- **Head**, University Department of Tuberculosis and Respiratory Diseases, Faculty of Medical Sciences, University of Delhi, Delhi (*till September 2005*).
- **Vice President**, Indian College of Allergy, Asthma & Applied Immunology, Delhi.
- **Member**, Scientific Advisory Committee, Indian Council of Medical Research – National Informatics Centre for Biomedical Information, National Informatics Centre, New Delhi, since 2003.
- **Editor**, *The Indian Journal of Chest Diseases and Allied Sciences*, an official publication of the V.P. Chest Institute and the National College of Chest Physicians (India).
- **Member,** Editorial Board, *Clinical and Molecular Allergy*, an official publication of the East Tennessee State University, Tennessee.
- **Member,** Editorial Board, *Indian Journal of Tuberculosis*, an official publication of the Tuberculosis Association of India.
- **Member**, Editorial Board, *The Indian Journal of Allergy, Asthma and Applied Immunology*, an official publication of the Indian College of Allergy, Asthma and Applied Immunology.
- **Member,** Editorial Board, *Lung India*, an official publication of the Indian Chest Society.
- **Member**, Editorial Board, *Current Medical Trends*, Jaipur.
- **Member**, *Institutional Human Ethics Committee*, Institute of Genomics and Integrative Biology, Delhi.
- **Member**, Technical Committee, L.R.S. Institute of Tuberculosis and Respiratory Diseases, New Delhi.

Prof. S.K. Chhabra

- **Advisor,** Environmental Health, Tata Energy Research Institute (TERI), New Delhi.
- **Associate Editor**, *The Indian Journal of Chest Diseases and Allied Sciences*, an official publication of the V.P. Chest Institute and the National College of Chest Physicians (India).
- **Member**, Editorial Board, *The Indian Journal of Allergy, Asthma and Applied Immunology*, an official publication of the Indian College of Allergy, Asthma and Applied Immunology.
- **Member,** Project Review Committee (Non Communicable Diseases -Environment), Indian Council of Medical Research.
- **Head**, University Department of Tuberculosis and Respiratory Diseases, Faculty of Medical Sciences, University of Delhi, Delhi (*w.e.f. October 2005*).

Prof. K. Ravi

- **Head**, Department of Physiology, University of Delhi, Delhi.
- **Member**, Academic Council, University of Delhi, Delhi.
- **Member**, University Court, University of Delhi, Delhi.
- **Expert Panel**, Recruitment and Assessment Centre, Defence Institute of Physiology and Allied Sciences, Delhi and other DRDO Institutions.

Prof. S.K. Bansal

- **General Secretary**, Biotechnology Society of India.
- **Member,** Doctoral Committee**,** National Institute of Immunology, New Delhi.

Dr Anita Kotwani

- **Member**, WHO-HAI (World Health Organization-Health Action International) Project on Medicine Prices.

Dr Raj Kumar

- **Member**, Editorial Board, *International Journal of Occupational Health and Environmental Health*, U.S.A.
- **Member**, Editorial Board, *The Indian Journal of Chest Diseases and Allied Sciences*, an official publication of the V.P. Chest Institute and the National College of Chest Physicians (India).
- **Member**, Editorial Board, *The Indian Journal of Allergy, Asthma and Applied Immunology*, an official publication of the Indian College of Allergy, Asthma and Applied Immunology.
- **Member**, Project Review Committee, Department of Anthropology, University of Delhi, Delhi.
- **Expert Member**, in different activities of the Distance Education Department, Punjab Technical University, Jalandhar, Punjab.
- **" David A. and Julie A. Steven Scholar" Scholarship award** for work on ABPA at 2nd Advances Against Aspergillosis, Feb 22nd 2006 at Athens, Greece.

Dr Rajinder Bajaj

- **Member**, Animal Ethics Committee, Department of Biosciences, Jamia Millia Islamia University, New Delhi.
- **Member**, Animal Ethics Committee, Institute of Genomics and Integrative Biology, Delhi.

Dr Vikas Mittal [MD Student-Pulmonary Medicine]

- **First Prize** for his paper entitled, "Assessment of subjective symptom perceptual accuracy in asthmatic children and their parents", *(Guide: Prof. Ashok Shah)* at NAPCON-2005, Kolkatta, November 16-20, 2005.

Dr Amit Bansal [MD Student-Pulmonary Medicine]

- **Third Prize** (in the category of ICS JC Kothari Young Scientist Research Award) for his paper entitled, "Do right-sided heart failure patients have increased risk of developing central sleep apneas and Cheyne-Strokes respiration?", *(Guide: Dr V.K. Vijayan)* at NAPCON-2005, Kolkatta, November 16-20, 2005.

Sponsored Research Projects

Sl No.	Faculty Member (Department)	Title of Project	Funding Agency, Date of Sanction and Duration	Budget (in Rs.)
1.	Prof. H.G. Raj (Biochemistry)	Discovery of the new enzyme acetocxy drug: protein transacetylase from lung and liver-studies on isolation, purification and molecular cloning	D.B.T. June 3, 2002 (Four years)	36.35 Lakhs
2.	Prof. S.K. Bansal (Biochemistry)	Studies on mechanism of signal transduction during release of proinflammatory cytokines IL- 1β and TNF-α by alveolar macrophages in asthma	I.C.M.R. November 20, 2001 (Four years)	19.79 Lakhs
3.	Dr Anuradha Chowdhary (Medical Mycology)	Environmental prevalence of *Cryptococcus neoformans*, its mycose-rologic and genotypic characteriztion and role in pulmonary infections	D.S.T. May 20, 2005 (Three years)	11.22 Lakhs
4.	Prof. S.S. Thukral (Microbiology)	Molecular charcterization of respiratory isolates of *Moraxella catarrhalis*	I.C.M.R. January 14, 2005 (Three years)	5.02 Lakhs (up to 1½ years)
5.	Prof. S.S. Thukral (Microbiology)	Molecular characterization of ESBL plasmids responsible for resistance to III/IV generation cephalosporins in clinical isolates of *E. coli*, *Klebsiella* spp, *Proteus* spp and *Pseudomonas aeruginosa*	C.S.I.R. March 17, 2005 (Three years)	9.64 Lakhs (up to 2nd year)
6.	Prof. Mridula Bose (Microbiology)	Analysis of polymorphism and expression profile of genes of the mammalian cell entry (mce) operons in clinical isolates of *M. tuberculosis*	I.C.M.R. March 8, 2002 (Four years)	18.91 Lakhs
7.	Prof. Mridula Bose (Microbiology)	Mycobacterial-epithelial interaction in innate immune response to tuber-culosis and its role in transcriptional regulation of inducible nitric oxide synthase (iNOS)	I.C.M.R. December 5, 2003 (Two years)	9.62 Lakhs
8.	Prof. Mridula Bose (Microbiology)	Analysis of isoniazid and rifampicin resistance mutations in the clinical isolates of *M. tuberculosis* by sequencing and dot-blot hybridization	I.C.M.R January 8, 2003 (Three years)	14.64 Lakhs
9.	Dr Mandira Varma (Microbiology)	Prevalence of *Mycoplasma pneumoniae* infection in patients of acute exacer-bation of COPD: evaluation by different diagnostic techniques	I.C.M.R March 12, 2003 (Three years)	11.74 Lakhs

Sl No.	Faculty Member (Department)	Title of Project	Funding Agency, Date of Sanction and Duration	Budget (in Rs.)
10.	Prof. A. Ray (Pharmacology)	Possible protective role of Livina (a polyherbal preparation) against anti-tubercular therapy (ATT)-induced hepatotoxicity	Day's Medical Stores Mfg. Ltd. June 6, 2003 (Two years)	2.99 Lakhs
11.	Prof. A. Ray (Pharmacology)	A multicentric, double blind randomized placebo controlled study evaluating the efficacy and tolerability of the polyherbal preparation LL-2123 HP against hepatotoxicity in patients with pulmonary tuberculosis	Lupin Ltd. August 18, 2003 (Two years)	2.11 Lakhs
12.	Prof. A. Ray (Pharmacology)	A study to assess the efficacy of UNIM-352 (ZN_5) in bronchial asthma	Central Council for Research in Unani Medicine March 11, 2005 (Three years)	2.21 Lakhs (up to 1st year)
13.	Dr Anita Kotwani (Pharmacology)	Impact of standard treatment guidelines and patient education on quality of asthma management	Health Action International Asia-Pacific December 23, 2005 (I½ years)	0.72 Lakhs (up to 1st year)
14.	Dr Kavita Gulati (Pharmacology)	Role of free radicals in theophyline induced seizures in experimental animals	C.S.I.R. March 1, 2002 (Upto May 2, 2005)	4.57 Lakhs
15.	Dr Kavita Gulati (Pharmacology)	Pharmacological studies on the role of nitric oxide (NO) in stress adaptation in rats	D.S.T. March 29, 2005 (Three years)	16.26 Lakhs
16.	Prof. M. Fahim (Physiology)	Cardio-protective role and mechanism of action of 17 β estradiol in anaesthetized animals	C.S.I.R. May 2, 2003 (Three years and one month)	8.12 Lakhs
17.	Prof. M. Fahim (Physiology)	Antiatherogenic potentials of Seabuckthorn and Rhodiola in experimental animals	D.R.D.O. March 18, 2004 (Two years)	4.68 Lakhs
18.	Prof. M. Fahim (Physiology)	Bronchial reactivity in diabetic guinea pigs	I.C.M.R December 28, 2005 (Three years)	2.56 Lakhs (up to 1st year)
19.	Prof. K. Ravi (Physiology)	Behaviour of pulmonary vagal sensory receptors during high altitude exposure	D.I.P.A.S. March 16, 2005 (Three years)	8.92 Lakhs

Sl No.	Faculty Member (Department)	Title of Project	Funding Agency, Date of Sanction and Duration	Budget (in Rs.)
20.	Prof. K. Ravi (Physiology)	Responsiveness of airway rapidly adapting receptors to cigarette smoke inhalation in normal and sensitized rabbits	I.C.M.R. July 21, 2005 (Three years)	8.45 Lakhs (up to 1st year)
21.	Prof. K. Ravi (Physiology)	Behaviour of pulmonary vagal sensory receptors with myelinated afferents during oxidative stress induced airway hyperreactivity and its modulation by anti-oxidants in guinea pigs	D.S.T. November 8, 2005 (Three years)	23.78 Lakhs
22.	Prof. M. Fahim, Prof. K. Ravi and Dr Vishal Bansal (Physiology)	Establishment of Patch Clamp Lab & Cell Culture Facility under Funds for Improvement in Science and Technology (FIST) programme	D.S.T. February 3, 2003 (Five years)	56.70 Lakhs
23.	Dr V.K.Vijayan (Respiratory Medicine)	Prevalence of sleep related breathing disorders in Indian adults	D.S.T. September 11, 2002 (Three years)	10.21 Lakhs
24.	Dr V.K. Vijayan (Respiratory Medicine)	The effects of tiotropium bromide with or without inhaled fluticasone dipropionate and salmetrol on lung inflammation in bronchial asthma	M/s. Cipla Ltd. March 8, 2005	2.50 Lakhs
25.	Dr V.K. Vijayan and Dr Raj Kumar (Respiratory Medicine)	Tobacco Cessation Clinic at V.P. Chest Institute during the year 2005 and conducting related activities	W.H.O. December 23, 2004 (One year)	2.14 Lakhs
26.	Prof. S.N. Gaur (Respiratory Medicine)	Clinico-immunologic studies on allergen specific immunotherapy in patients of respiratory allergy	D.S.T. January 16, 2004 (Three years)	5.08 Lakhs
27.	Dr Raj Kumar (Respiratory Medicine)	Effect of indoor air pollution on respiratory function of children	Ministry of Environment and Forest October 7, 2003 (Three years)	20.97 Lakhs
28.	Dr Raj Kumar (Respiratory Medicine)	Tobacco Cessation Clinic at V.P. Chest Institute during the year 2006 and conducting related activities	W.H.O. January 27, 2006 (One year)	2.41 Lakhs
29.	Dr Madhu Khanna (Respiratory Virology)	Genetic analysis of influenza virus in clinical specimens by rapid molecular techniques	D.S.T. October 1, 2003 (Three years)	18.27 Lakhs

Sl No.	Faculty Member (Department)	Title of Project	Funding Agency, Date of Sanction and Duration	Budget (in Rs.)
30.	Dr Madhu Khanna (Respiratory Virology)	Study of virological and biochemical regulatory mechanism of influenza virus induced apoptosis in murine model of allergic asthma	C.S.I.R. March 5, 2003 (Three years)	13.51 Lakhs
31.	Dr Madhu Khanna (Respiratory Virology)	A combinatorial antiviral approach against influenza A virus using ribozyme and siRNA	D.B.T. March 21, 2006 (Three years)	44.53 Lakhs
32.	Dr Sujata K. Dass DST's SERC Fast Track Scheme for Young Scientist (Biochemistry)	Role of meta-alloporphyrins in modulating the malaria induced hemolytic anaemia in mouse model	D.S.T. February 21, 2003 (Three years)	11.70 Lakhs
33.	Dr Yogesh Kumar Tyagi DST's SERC Fast Track Scheme for Young Scientist (Biochemistry)	Designing substrates specific for the acetoxy drug: protein transacetylase with a view to target functional proteins	D.S.T. June 12, 2003 (Three years)	11.94 Lakhs
34.	Dr Vinita Katiyar DST's SERC Fast Track Scheme for Young Scientist (Respiratory Allergy & Applied Immunology)	Assessment of biocontaimnants from indoor environment	D.S.T. August 13, 2004 (Three years)	10.08 Lakhs
35.	Mr Sujeet Kumar Senior Res. Fellow *Guide*: Prof. Mridula Bose (Microbiology)	PCR and RFLP typing of the Indian *M. avium* strains using IS1245 insertion sequence marker	C.S.I.R. August 1, 2001 (Five years)	6.19 Lakhs
36.	Mr Vikram Srivastava Senior Res. Fellow *Guide*: Dr Madhu Khanna (Respiratory Virology)	Role of apotosis in the pathogenesis of influenza A virus, correlation of virological and immunological parameters: a study in human and murine model	I.C.M.R. September 11, 2003 (Three years)	4.34 Lakhs (up to 2½ years)
37.	Ms Swati Omanwar Senior Res. Fellow *Guide:* Prof. M. Fahim (Physiology)	Role of free radicals in functional changes in cardiovascular regulatory mechanisms and vascular responsiveness on mercury exposure in rabbits	I.C.M.R. September 2, 2004 (Three years)	2.98 Lakhs (up to 2nd year)

Sl No.	Faculty Member (Department)	Title of Project	Funding Agency, Date of Sanction and Duration	Budget (in Rs.)
38.	Ms Sujata Upadhayay Senior Res. Fellow *Guide:* Prof. K. Ravi (Physiology)	Role of oxidative stress in the induction of bronchial hyper responsiveness and its modulation by dietary antioxidant vitamin C and F in guinea pigs	I.C.M.R. Feburary 5, 2004 (Two years)	2.34 Lakhs
39.	Mr Mohd. Shahid Senior Res. Fellow *Guide:* Prof. M. Fahim (Physiology)	Remote preconditioning protect the myocardial from reperfusion injury	I.C.M.R. October 7, 2005 (Two years)	1.43 Lakhs (up to 11 months)
40.	Mr Mohammad Tauseef Senior Res. Fellow *Guide:* Prof. M. Fahim (Physiology)	Evaluation of the mechanism of action of aspirin as a cardioprotective agent in experimentally-induced hypercholesteroleic rats	I.C.M.R. October 19, 2005 (Two years)	1.56 Lakhs (up to 1st year)
41.	Mrs Uma Tyagi (Librarian)	For establishment of UGC-Network Resource Centre (NRC) at V.P. Chest Institute	U.G.C. March 25, 2005	1.50 Lakhs
42.	Dr Ashima Anand (Principal Scientific Officer) DST Centre for Visceral Mechanisms	Studies on exertional breathlessness (Under development of practical applications arising from advances in visceral mechanisms *i.e.* J receptors, chemoreceptors, etc)	I.C.M.R. October 29, 2003 (Three years)	27.26 Lakhs
43.	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	2.25 Lakhs (up to 6th year)
44.	Prof. H.S. Randhawa (INSA Honorary Scientist)	*In vitro* bio-interactions between *Candida* species, *Aspergillus fumigatus* and some other human pathogenic fungi	I.C.M.R. January 31, 2003 (Three years)	7.43 Lakhs

Orations/Guest Lectures

Sl No.	Faculty Member	Title of Lecture	Organizer(s)	Conference, Place and Date
1.	Dr V.K. Vijayan	Latent tuberculosis and extra-pulmonary tuberculosis and their management	Seth G.S. Medical College and KEM Hospital and US Department of Health and Human Services	National Consultation on Drug Resistance in Malaria, Tuberculosis and HIV/AIDS Mumbai September 19-21, 2005
2.	Dr V.K. Vijayan	Prevalence of sleep-related breathing disorder symptoms in Delhi, India	All India Institute of Medical Sciences	Second Interim Congress of World Federation of Sleep Research and Sleep Medicine Societies New Delhi September 22-26, 2005
3.	Dr V.K. Vijayan	Occupational and environmental respiratory diseases	Industrial Toxicology Research Centre	International Conference on Toxicology, Environmental and Occupational Health Lucknow November 14-17, 2005
4.	Dr V.K. Vijayan	Sarcoidosis in India: problems in diagnosis	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2005) Kolkata November 16-20, 2005
5.	Dr V.K. Vijayan	Environmental respiratory diseases	Acharya NG Ranga Agriculture University	93rd Indian Science Congress Hyderabad January 3-8, 2006
6.	Dr V.K. Vijayan	Flow volume loops	Indian Association for Bronchology	11th National Conference of the Indian Association for Bronchology Chennai January 20-22, 2006
7.	Prof. H.G. Raj	New insight into the unique biological action of polyphenolic peracetates	University of Florida	7th Annual Florida Heterocyclic IUPAC Sponsored Conference Florida, U.S.A. March 12-15, 2006

Sl No.	Faculty Member	Title of Lecture	Organizer(s)	Conference, Place and Date
8.	Prof. M. Fahim	Cardiac sensory receptors and their regulatory functions	Department of Pharmacology, East Carolina University	East Carolina University Greeenville, North Carolina, U.S.A. June 27, 2005
9.	Prof. M. Fahim	• Time course of neurohumoral regulation of cardiovascular functions in chronic heart failure • Neural regulation of cardiovascular functions	Department of Physiology and Biophysics, Tulane University Medical School	Tulane University Medical School New Orleans, Louisiana, U.S.A. August 15, 2005
10.	Prof. M. Fahim	Interaction of sensory inputs in reflex control of cardiovascular system	Department of Physiology and Biophysics, Case Western Reserve University	Case Western Reserve University, Cleveland, Ohio, U.S.A. September 12, 2005
11.	Prof. M. Fahim	Neurohumoral regulation of cardiovascular functions	Department of Internal Medicine, University of Nebraska Medical Centre	University of Nebraska Medical Centre, Omaha, Nebraska, U.S.A. September 16, 2005
12.	Prof. M. Fahim	Neural control of cardiovascular functions during oxygen deficiency	Department of Pharmacology, University of Illinois	University of Illinois Chicago, Illinois, U.S.A. October 3, 2005
13.	Prof. M. Fahim	Abnormal baroreflex function is dissociated form central angiotensin II receptor expression in chronic heart failure	University of Nebraska Medical College	American Heart Association U.S.A. November 12-15, 2005
14.	Prof. M. Fahim	Cardio sensory receptor mediated hemodynamic and autonomic responses in cardiovascular disorders	Department of Physiology, M.R. Medical College	PHYSICON 2005 Gulbarga, Karnataka December 2-5, 2005
15.	Prof. M. Fahim	Neurohumoral control of cardiovascular functions in chronic heart failure	Department of Physiology, J.I.P.M.E.R.	APPICON-2005 Conference Pondichery December 12-15, 2005
16.	Prof. M.K. Agarwal	Insects and allergy	Indian College of Allergy, Asthma and Applied Immunology	39th National Convention of the Indian College of Allergy, Asthma and Applied Immunology Jaipur October 15-17, 2005

Sl No.	Faculty Member	Title of Lecture	Organizer(s)	Conference, Place and Date
17.	Prof. M.K. Agarwal	Immune response to insects derived aeroallergens in patients suffering with IgE mediated Type I allergic respiratory disorders in India	Institute of Life Science and Chhatrapati Shahuji Maharaj University	National Conference on Immunology in Health & Disease-2006 Kanpur January 11-12, 2006
18.	Prof. M.K. Agarwal	Aeroallergen research and quality control of allergen vaccines in India	National Institute of Biologicals	National Institute of Biologicals Delhi February 2, 2006
19.	Prof. S.N. Gaur	Global consensus in immunotherapy	Indian College of Allergy, Asthma and Applied Immunology	39th National Convention of the Indian College of Allergy, Asthma and Applied Immunology Jaipur October 15-17, 2005
20.	Prof. S.N. Gaur	Immunotherapy in asthma - a critical review	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2005) Kolkata November 16-20, 2005
21.	Prof. S.N. Gaur	Role of allergy testing and immunotherapy in asthma	Lady Hardinge Branch of IMA, Sanjeevan Hospital & Central Railway Hospital	MEDICON-2005 New Delhi December 3, 2005
22.	Prof. S.N. Gaur	Skintesting and allergen immunotherapy – an overview	Tuberculosis Association of India	60th National Conference of Tuberculosis and Chest Diseases Lucknow February 23-26, 2006
23.	Prof. S.N. Gaur	Recent management of nasobronchial allergies	Indian Medical Association and Association of Medical Specialists, Uttaranchal State	1st Annual IMA-AMS State Conference of Uttaranchal Kashipur, Uttaranchal March 25-26, 2006
24.	Prof. S.S. Thukral	β-Lactamases mediated drug resistance in gram negative bacterial pathogens	National Dairy Research Institute	National Dairy Research Institute Karnal October 14, 2005
25.	Prof. A. Ray	Free radicals, stress and anxiety	Society of Cellular and Molecular Biology	4th World CMB Congress Poitiers, France October 7-12, 2005

Sl No.	Faculty Member	Title of Lecture	Organizer(s)	Conference, Place and Date
26.	Prof. A. Ray	Free radicals and stress: in search for an adaptogen	Indian Pharmacological Society (Rajasthan Branch)	1st Rajasthan State Conference of Indian Pharmacological Society Jaipur October 1, 2005
27.	Prof. A. Ray	Nitric oxide: its role in neurobehavioral and immunotoxicity	Acharya NG Ranga Agriculture University	93rd Indian Science Congress Hyderabad January 3-8, 2006
28.	Prof. A. Ray	Nitric oxide and immunomodulation	Society of Free Radical Research (India)	International Conference on Free Radicals and Antioxidants in Health, Disease and Radiation Kolkata January 16-18 2006
29.	Prof. Ashok Shah	• Ethnic and geographical differences in the presentation of sarcoidosis • Seminal fluid allergy	University of Mississippi Medical Centre	Pulmonary Grand Round Jackson, Mississippi U.S.A. June 17-20, 2005
30.	Prof. Ashok Shah	Allergic sinus and bronchopulmonary aspergillosis	Department of ENT, Faculty of Medicine, University of Indonesia and Indonesian ORL-HNS Society	11th ASEAN ORL-HNS Congress and 6th Hearing International Annual Meeting Bali, Indonesia August 23-25, 2005
31.	Prof. Ashok Shah	Rationale of ATT	Indian Academy of Paediatrics (Respiratory Chapter), Delhi Medical Association (East Delhi Branch) and Indian National Science Academy	Update on Childhood Tuberculosis New Delhi September 4, 2005
32.	Prof. Ashok Shah	• Allergic rhinitis: current management strategies • Human seminal plasma allergy	Indian College of Allergy, Asthma and Applied Immunology	39th National Convention of the Indian College of Allergy, Asthma and Applied Immunology Jaipur October 15-17, 2005

Sl No.	Faculty Member	Title of Lecture	Organizer(s)	Conference, Place and Date
33.	Prof. Ashok Shah	• Allergic bronchopulmonary aspergillosis • Our sarcoids, their sarcoids	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2005) Kolkata November 16-20, 2005
34.	Prof. Ashok Shah	• Anaerobic lung infections • Allergic bronchopulmonary aspergilosis	American College of Chest Physicians (Western India Chapter)	Heart Lung Congress-2006 Mumbai January 6-8, 2006
35.	Prof. Ashok Shah	Smoking and tuberculosis: an association overlooked	Department of Pulmonary Medicine, King George Medical University	60th National Conference of Tuberculosis and Chest Diseases Lucknow February 23-26, 2006
36.	Prof. S.K. Chhabra	Oxidative stress in bronchial asthma and role of antioxi-dants	Indian College of Allergy, Asthma and Applied Immunology	39th National Convention of the Indian College of Allergy, Asthma and Applied Immunology Jaipur October 15-17, 2005
37.	Prof. S.K. Chhabra	Near fatal asthma-pathological and biological factors	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2005) Kolkata November 16-20, 2005
38.	Dr Anita Kotwani	Surveillance of antimicrobial drug use in the community	Department of Academics and Research, Sir Ganga Ram Hospital	Academic Meet Sir Ganga Ram Hospital New Delhi October 28, 2005
39.	Dr Anita Kotwani	Medicine prices and availability in India	Erasmus University, Rotterdam, Germany and BIMTECH, India	Cross Cultural Study for Micro Health Insurance Greater NOIDA, December 6, 2005
40.	Dr Anita Kotwani	Measuring medicine prices and availability- a new methodology and few Indian survey results	Indian Pharmacological Society	38th Annual Conference of Indian Pharmacological Society Chennai December 28-30, 2005

Sl No.	Faculty Member	Title of Lecture	Organizer(s)	Conference, Place and Date
41.	Dr Raj Kumar	Smoking cessation	P.G.I.M.E.R.	1st National Conference of the Indian Society for Study of Lung Cancer Chandigarh April 2-3, 2005
42.	Dr Raj Kumar	Interstial pulmonary fibrosis – Indian perspective	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2005) Kolkata November 16-20, 2005
43.	Dr Madhu Khanna	Infectious disease networking	World Health Organization	Plenary Meeting of the WHO Collaborating Laboratories and National Referral Laboratories in India Pune April 13-15, 2005
44.	Dr Madhu Khanna	Influence of influenza virus infection on cytokine and inflammatory response in murine model of allergic asthma	Queens College, Cambridge University	3rd Orthomyxo Virus Conference London, U.K. July 29-31, 2005
45.	Dr Balakrishnan Menon	Pulmonary function testing	Babu Jagjivan Ram Hospital	Respiratory Update New Delhi July 28, 2005
46.	Dr Balakrishnan Menon	Our experience with PACS	Vepro India	2nd International PACS Conference Hotel Park Sheraton, Chennai September 2-3, 2005
47.	Dr Balakrishnan Menon	Digital radiography and PACS	All India Institute of Medical Sciences	2nd National Conference of Radiological Technologists New Delhi October 14-15, 2005

Conferences/Symposia/Seminars/Workshops/CMEs

Sl No.	Participant	Role/Topic	Organizer(s)	Name, Venue and Date
1.	Dr V.K. Vijayan	Chaired a session on Clinical consideration	P.G.I.M.E.R.	1st National Conference of the Indian Society for Study of Lung Cancer Chandigarh April 2-3, 2005
2.	Dr V.K. Vijayan	Chaired key note address on Respiratory viral infections	V.P.C.I. University of Delhi	National Symposium on Influenza: Epidemiology and Control on the eve of 56th Foundation Day of V.P.C.I. Delhi April 5, 2005
3.	Dr V.K. Vijayan	Lecture on: Oxygen therapy	V.P.C.I. University of Delhi	5th CME: National Update on COPD Delhi April 24, 2005
4.	Dr V.K. Vijayan	Lecture on: Future research needs in clinical tuberculosis	Department of Biotechnology and International Centre for Genetic Engineering and Biotechnology	DBT-ICGEB Brainstorming Workshop on Tuberculosis New Delhi May 19-21, 2005
5.	Dr V.K. Vijayan	Lecture on: Pulmonary function tests	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	32nd Workshop on Respiratory Allergy: Diagnosis and Management Delhi May 25 - June 1, 2005
6.	Dr V.K. Vijayan	Lecture on: Pulmonary function tests-why?	Sant Parmanand Hospital	CME-XII Chest Diseases Update Delhi September 11, 2005
7.	Dr V.K. Vijayan	Presented a paper on: Prevalence of bronchial asthma in Delhi, India	International Union Against Tuberculosis and Lung Disease	36th Union World Conference on Lung Health Paris, France October 21, 2005
8.	Dr V.K. Vijayan	Presented a paper on: Gender differences in the prevalence of bronchial asthma in Delhi, India	Asian Pacific Society of Respirology and American College of Chest Physicians	10th Congress of the Asian Pacific Society of Respirology and 1st Joint Congress of the Asian Pacific Society of Respirology and American College of Chest Physicians China November 11-14, 2005

Sl No.	Participant	Role/Topic	Organizer(s)	Name, Venue and Date
9.	Dr V.K. Vijayan	Chaired a scientific session on Occupational and environmental respiratory diseases and asthma	Industrial Toxicology Research Centre	International Conference on Toxicology, Environmental and Occupational Health Lucknow November 14-17, 2005
10.	Dr V.K. Vijayan	Lecture on: Epidemiology of OSAS	Vardhman Mahvir Medical College and Safdarjung Hospital and Indian Sleep Disorders Association	National Conference-cum-Workshop on Sleep Disorders New Delhi December 9-11, 2005
11.	Dr V.K. Vijayan	Associated as National Coordinator	American College of Chest Physicians (Western India Chapter)	Heart Lung Congress-2006 Mumbai January 6-8, 2006
12.	Dr V.K. Vijayan	Chaired Dr M. Santosham Memorial Oration	Indian Association for Bronchology	11th National Conference of the Indian Association for Bronchology Chennai January 20-22, 2006
13.	Prof. H.G. Raj	Lecture on: Polyphenolic peracetates are the novel potent enhancers of intracellular nitric oxide	Chemistry Department, University of Delhi	Indo-Italian Workshop on Chemistry and Biology of Antioxidant Delhi January 8-9, 2006
14.	Prof. H.G. Raj	Associated as Member, Organising Committee	International Union of Pure and Applied Chemistry (IUPAC)	Second International Symposium on Green / Sustainable Chemistry Delhi January 10-13, 2006
15.	Prof. M.K. Agarwal	Lectures on: • Introduction and basic immune response with special reference to Type I and Type III hypersensitivity disorders • Allergy to common Indian insects • *In vitro* diagnosis of allergic diseases- principles and methods	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	32nd Workshop on Respiratory Allergy: Diagnosis and Management Delhi May 25-June 1, 2005

Sl No.	Participant	Role/Topic	Organizer(s)	Name, Venue and Date
16.	Prof. M.K. Agarwal	Chaired a session on Xenobiotic immunology	Institute of Life Science and Chhatrapati Shahuji Maharaj University	National Conference on Immunology in Health & Disease-2006 Kanpur January 11-12, 2006
17.	Prof. M.K. Agarwal	Lectures on: • Etiologic significance of environmental insects as inhalant allergens in India • *In vitro* diagnosis of allergy	Indian College of Allergy, Asthma and Applied Immunology	Workshop on the Management of Allergic Disorders Bangalore February 10-12, 2006
18.	Prof. S.N. Gaur	Lecture on: Pulmonary rehabilitation programme in COPD	V.P.C.I., University of Delhi	5th CME: National Update on COPD Delhi April 24, 2005
19.	Prof. S.N. Gaur	Lectures on: • Clinical aspects of respiratory allergic disorders • Extrinsic allergic alveolitis • Clinical demonstration of skin testing in allergic patients — methods and interpretation • Allergen immunotherapy - an overview • Management of difficult asthma	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	32nd Workshop on Respiratory Allergy: Diagnosis and Management Delhi May 25 - June 1, 2005
20.	Prof. S.N. Gaur	Chaired a session on Lung cancer, chronic cough and chronic asthma	IMA-South Delhi Branch and L.R.S. Institute of TB & Respiratory Diseases	Respiratory Update New Delhi November 11, 2005
21.	Prof. S.N. Gaur	Chaired a session on Sleep disorders	Vardhman Mahvir Medical College and Safdarjung Hospital and Indian Sleep Disorders Association	National Conference -cum-Workshop on Sleep Disorders New Delhi December 9-11, 2005
22.	Prof. S.S. Thukral	Presented a paper on Comparative evaluation of screening tests for detection of *Proteus mirabilis* producing extended spectrum and AmpC β-lactamases	Indian Association of Medical Microbiologists and Sri Ramachandra Medical College & Research Institute	XXIX National Congress of Indian Association of Medical Microbiologists Chennai October 19-23, 2005

Sl No.	Participant	Role/Topic	Organizer(s)	Name, Venue and Date
23.	Prof. Mridula Bose	Participated in the round table discussion on Major infectious diseases	Indian National Science Academy	Indo-EU Workshop on Genomics & Biotechnology for Health New Delhi April 27-28, 2005
24.	Prof. Mridula Bose	Chaired a session on Microbiology of pulmonary infections	Indian Society for Respiratory Infections	1st National Conference on Current Perspectives of Pulmonary Infections New Delhi September 4, 2005
25.	Prof. Mridula Bose	Lectures on: • Impact of enviornmental pollution on human health • Prevention and control of water borne diseases	UGC-CPDHE, University Grants Commission-Centre for Professional Development of Higher Education	Refresher Course in Environmental Studies School of Environmental Studies, University of Delhi, Delhi January 24- February 28, 2006
26.	Prof. Ashok Shah	Lecture on: Chronic obstructive pulmonary disease: definition and classification Chaired a session on Pathophysiology, and management of COPD	V.P.C.I. University of Delhi	5th CME: National Update on COPD Delhi April 24, 2005
27.	Prof. Ashok Shah	Lectures on: • Allergic rhinitis: diagnosis and management • Self management and patient education in bronchial asthma • Allergic bronchopulmonary aspergillosis	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	32nd Workshop on Respiratory Allergy: Diagnosis and Management Delhi May 25 - June 1, 2005
28.	Prof. Ashok Shah	Chaired a session on Young investigator award recipients Presented a paper on Sarcoidosis in India: a profile of 118 patients	National Jewish Medical and Research Centre	8th World Association of Sarcoidosis and Other Granulomatous Disorders (WASOG) Congress Denver, Colorado, U.S.A. June 12-15, 2005

Sl No.	Participant	Role/Topic	Organizer(s)	Name, Venue and Date
29.	Prof. Ashok Shah	Presented a paper on Biweekly therapy with prednisolone is effective in the management of allergic bronchopulmonary aspergillosis	German Society for Allergology and Clinical Immunology	XIX World Allergy Organization (WAO) Congress – XXIV Congress of the European Academy of Allergology and Clinical Immunology (EAACI) Munich, Germany June 26-July 1, 2005
30.	Prof. Ashok Shah	Chaired a session on Sleep apnoea	Indian Medical Association (North Zone Branch) and Max Heart and Vascular Institute	24th Annual Medical Conference New Delhi September 25, 2005
31.	Prof. Ashok Shah	Chaired a session on Asthma in special situations	Indian College of Allergy, Asthma and Applied Immunology	CME of the 39th National Convention of the Indian College of Allergy, Asthma and Applied Immunology Jaipur October 15-17, 2005
32.	Prof. Ashok Shah	Chaired a session on Management of invasive pulmonary aspergillosis: are there new drugs beyond amphotericin B?	Sir Ganga Ram Hospital	National Conference on Fungal Infections Hotel Le Meridien, New Delhi November 12, 2005
33.	Prof. Ashok Shah	Lecture on: Medical literature search in the digital era (delivered in Workshop on "Medical Research: Planning to Publication)	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2005) Kolkata November 16-20, 2005
34.	Prof. Ashok Shah	Chaired a session of two invited lectures on Neurobiology of narcolepsy and Upper airway resistance syndrome, What do we know about it? Presented a paper on Nocturnal symptoms and sleep disturbances in clinically stable asthmatic children	Vardhman Mahvir Medical College and Safdarjung Hospital and Indian Sleep Disorders Association	National Conference-cum-Workshop on Sleep Disorders New Delhi December 9-11, 2005

Sl No.	Participant	Role/Topic	Organizer(s)	Name, Venue and Date
35.	Prof. Ashok Shah	Chaired the keynote address on MDR tuberculosis	Organised as a part of the Golden Jubilee Celebrations, All India Institute of Medical Sciences	HIV / AIDS and TB: Past, Present and Future: 2006 New Delhi January 13-15, 2006
36.	Prof. Ashok Shah	Chaired free paper sessions	Department of Pulmonary Medicine, King George Medical University	60th National Conference of Tuberculosis and Chest Diseases Lucknow February 23-26, 2006
37.	Prof. S.K. Chhabra	Lecture on: Pathophysiology of COPD	V.P.C.I. University of Delhi	5th CME: National Update on COPD Delhi April 24, 2005
38.	Prof. S.K. Chhabra	Lectures on: • Epidemiology and pharmacological treatment of bronchial asthma • Pulmonary function testing lecture-demonstration • Management of asthma in special situations	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	32nd Workshop on Respiratory Allergy: Diagnosis and Management Delhi May 25 - June 1, 2005
39.	Prof. S.K. Chhabra	Chaired a session on Severe community acquired pneumonia	Indian Society for Respiratory Infections	1st National Conference on Current Perspectives of Pulmonary Infections New Delhi September 4, 2005
40.	Prof. S.K. Chhabra	Lecture on: Acute bronchial asthma: management	Sant Parmanand Hospital	CME XII-Chest Diseases Update New Delhi September 11, 2005
41.	Prof. S.K. Chhabra	Presented a paper on Potentiation of allergic asthma by air pollution: the ozone-allergen interaction and its modulation by dietary antioxidants, alpha-tocopherol and ascorbic acid	Indian College of Allergy, Asthma and Applied Immunology	39th National Convention of the Indian College of Allergy, Asthma and Applied Immunology Jaipur October 15-17, 2005

Sl No.	Participant	Role/Topic	Organizer(s)	Name, Venue and Date
42.	Prof. S.K. Chhabra	Chaired Awards session for free papers	Vardhman Mahvir Medical College and Safdarjung Hospital and Indian Sleep Disorders Association	National Conference-cum-Workshop on Sleep Disorders New Delhi December 9-11, 2005
43.	Prof. S.K. Chhabra	Lecture on: NOX, air pollution and health	Society for Conservation of Nature	Workshop on Nitrogen in Environment, Industry and Agriculture New Delhi March 16-17, 2006
44.	Prof. S.K. Chhabra	Lecture on: Ozone and health	Dr M. Mittal, Ohio Super Computer Centre, U.S.A.	Workshop on Air Pollution in the Indian Region New Delhi March 21, 2006
45.	Prof. S.K. Bansal	Associated as Vice President of Conference Executives and Member, Organising Committee	Centre for Biotechnology, Jawaharlal Nehru University	3rd National Conference of Biotechnology Society of India "Biotech 2005" Manesar, Gurgoan December 22-24, 2005
46.	Dr Malini Shariff	Presented a paper on Phenotypic and genetic characterization of *Streptococcus pneumoniae* isolates from patients with respiratory infections in India	Sri Ramachandra Medical College and Research Institute	XXIX Annual Conference of Indian Association of Medical Microbiologist Chennai October 19-23, 2005
47.	Dr Anita Kotwani	Asoociated as Chairman, Scientific Committee Lecture on: Data checking and cleaning, informative comparison and presenting these graphically Chaired sessions on Presentation of state experiences, Problems encountered during survey and Advocacy of tools	World Health Organization-Health Action International	Post Survey Workshop on Medicine Prices Goa June 21-23, 2005
48.	Dr Anita Kotwani	Presented a paper on: Prices and availability of antituber-cular medicines in Rajasthan	Indian Pharmacological Society (Rajasthan Branch)	1st Rajasthan State Conference of Indian Pharmacological Society Jaipur October 1, 2005

Sl No.	Participant	Role/Topic	Organizer(s)	Name, Venue and Date
49.	Dr Anita Kotwani	Associated as Co-chairman, Scientific Committee	World Assembly on Tobacco Counters Health (WATCH)	4th World Assembly on Tobacco Counters Health (WATCH) Delhi December 5-9, 2005
50.	Dr Anita Kotwani	Associated as Member, Organising Committee	Indian Pharmacological Society	38th Annual Conference of Indian Pharmacological Society Chennai December 28-30, 2005
51.	Dr Raj Kumar	Lecture on: Smoking cessation Chaired a session on Oxygen therapy, non-invasive ventilation and pulmonary rehabilitation	V.P.C.I. University of Delhi	5th CME: National Update on COPD Delhi April 24, 2005
52.	Dr Raj Kumar	Lectures on: • Clinical demonstration, skin testing • Management of food allergy including transgenic (GMF)	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	32nd Workshop on Respiratory Allergy: Diagnosis and Management Delhi May 25 - June 1, 2005
53.	Dr Raj Kumar	Chaired a session on Bronchial asthma	Sant Parmanand Hospital	National Update on Medicine Delhi September 11, 2005
54.	Dr Raj Kumar	Chaired a session on Sleep apnea	Vardhman Mahvir Medical College and Safdarjung Hospital and Indian Sleep Disorders Association	National Conference-cum-Workshop on Sleep Disorders New Delhi December 9-11, 2005
55.	Dr Mandira Varma	Presented a paper on Diagnosis and molecular epidemiology of tuberculosis	Department of Biotechnology and International Centre for Genetic Engineering and Biotechnology	DBT-ICGEB Brainstorming Workshop on Tuberculosis New Delhi May 19-21, 2005
56.	Dr Anuradha Chowdhary	Panelist for the session on Are the conventional drugs useful against *Candida* non-albicans?	Sir Ganga Ram Hospital	National Conference on Fungal Infections Hotel Le Maridien, New Delhi November 12, 2005

Sl No.	Participant	Role/Topic	Organizer(s)	Name, Venue and Date
57.	Dr Madhu Khanna	Presented a poster on Effect of quercetin supplementation on alterations in antioxidant defences in lung after experimental influenza virus infection	Free University Berlin and German Society of Virology	Berlin International Influenza Conference Berlin, Germany May 26-29, 2005
58.	Dr Balakrishnan Menon	Chaired a session on COPD	V.P.C.I. University of Delhi	5th CME: National Update on COPD Delhi April 24, 2005
59.	Dr Balakrishnan Menon	Lecture on: CT scan and radiodiagnosis of asthma	V.P.C.I., University of Delhi and Institute of Genomics and Integrative Biology	32nd Workshop on Respiratory Allergy: Diagnosis and Management Delhi May 25 - June 1, 2005
60.	Dr Balakrishnan Menon	Lecture on: Diagnosis of asthma	Aruna Asaf Ali Hospital	CME on Bronchial Asthma New Delhi July 4, 2005
61.	Dr Balakrishnan Menon	Lecture on: Inhalation therapy	Bhimrao Ambedkar Hospital	CME on Asthma New Delhi July 7, 2005
62.	Dr Balakrishnan Menon	Lecture on: Diagnosis of tuberculosis	Delhi State TB Association and Babu Jagjivan Ram Hospital	CME on DOTS New Delhi March 20, 2006
63	Dr Kavita Gulati	Presented a poster on Experimental studies on aminophylline-induced seizures and its mechanisms	Indian Pharmacological Society (Rajasthan Branch)	1st Rajasthan State Conference of Indian Pharmacological Society Jaipur October 1, 2005
64.	Dr Kavita Gulati	Delivered a lecture in the symposium on Free radicals and drug toxicity	Society of Cellular and Molecular Biology	4th World CMB Congress Poitiers, France October 7-12, 2005
65.	Dr Kavita Gulati	Delivered a lecture in the symposium on Experimental studies on the role of NO as a neuromodulator	Society of Free Radical Research (India)	International Conference on Free Radicals and Antioxidants in Health, Disease and Radiation Kolkata January 16-18, 2006

Sl No.	Participant	Role/Topic	Organizer(s)	Name, Venue and Date
66.	Dr Chandrmani Panjabi (Senior Resident)	Lung functions in allergic bronchopulmonary aspergillosis	The Thoracic Society of Australia and New Zealand	The 2006 Annual Scientific Meeting of the Thoracic Society of Australia and New Zealand Canberra, Australia March 24-29, 2006
67.	Dr Vikas Mittal (MD Student) *Guide: Prof. Ashok Shah*	Presented a paper on Assesment of subjective symptom perceptual accuracy in asthmatic children and their parents	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2005) Kolkata November 16-20, 2005
68.	Dr Amit Bansal (MD Student) *Guide: Dr V.K. Vijayan*	Do right-sided heart failure patients have increased risk of developing central sleep apneas and Cheyne-Strokes respiration?	National College of Chest Physicians (India) and Indian Chest Society	National Conference on Pulmonary Diseases (NAPCON-2005) Kolkata November 16-20, 2005
69.	Ms Shwetambri Arora (PhD Student) *Guide: Prof. H.G. Raj*	Presented a poster on Activation of tracheal smooth muscle cell (TSMC) NOS by polyphenolicacetates (PA): the role of acetoxy drug: protein transacetylase (Tase)	Biomedical Society, U.K.	Joint 62nd Harden Conference, Royal Agricultural College, Cirencester, U.K. April 4-7, 2006
70.	Mr M.K.R. Khan *Guide: Prof. S.S. Thukral*	Presented a poster on Comparative evaluation of modified Hodge and EDTA disc synergy test for detection of metallo β-lactamase producing clinical isolates of *Pesudomonas aeruginosa*	Association of Microbiologists of India	46th Annual Conference of Association of Microbiologists of India Hyderabad December 8-10, 2005
71.	Ms Amita Chandolia (PhD Student) *Guide: Prof. Mridula Bose*	Presented a poster on Identifiaction and characterization of putative promoter sequences of of *mce 1* operon of *M. tuberculosis*	Industrial Toxicology Research Center	XXIX All India Cell Biology Conference & Symposium on Gene to Genome: Enviornment & Chemical Interaction-2006 Lucknow January 18-21, 2006
72.	Mr M.A. Kausar (PhD Student) *Guide: Prof. M. K. Agarwal*	Presented a paper on Mosquito (*Culex Quinquefasciatus*) induced IgE response in Type I allergic respiratory disorders: a clinico-immunologic study	Indian College of Allergy, Asthma and Applied Immunology	39th National Convention of the Indian College of Allergy, Asthma and Applied Immunology Jaipur October 15-17, 2005

Participation in Advanced and Specialised Training Programme

Sl No.	Participant (Department)	Course Title/ Topic	Training Duration	Host
1.	Dr Malini Shariff (Microbiology)	Training on the following techniques: pulse field gel electrophoresis (PFGE) and multilocus sequence typing (MLST)	November 2004-May 2005	Center for Disease Control and Prevention Atlanta, Georgia, U.S.A.
2.	Dr Vishal Bansal (Physiology)	5th Mini-workshop (Refresher Course) on "Evaluation Techniques" for Medical Teachers	November 22-24, 2005	National Teacher Training Center, Department of Medical Education, Maulana Azad Medical College, New Delhi
3.	Dr Kavita Gulati (Pharmacology)	Six months training course on Yoga	December 2004-May 2005	Vishwabharati Yoga Sansthan, Government of India, New Delhi
4.	Dr Kavita Gulati (Pharmacology)	Training on SOPs, designing protocols, various GCP related group tasks-hands-on-experience	November 25-26, 2005	Dept of Clinical Pharmacology, TNMC & BYL Nair Ch Hospital, in collaboration with CDSCO and WHO, India Country Office, Department of Pharmacology, VPCI, Delhi

Short Term Specialised Trainings Imparted by Faculty Members

Sl No.	Name and Organization	Subject	Faculty Member (Department)	Period
1.	Ms Gagan Deep Kaur (M.Sc. - PhD combined Courses in Biomedical Sciences) Summer Trainee Dr B.R. Ambedkar Centre for Biomedical Research, University of Delhi, Delhi	Role of free radicals in underlying mechanism of action of alcohol on vascular smooth muscle	Prof. M. Fahim and Dr Vishal Bansal (Physiology)	(January-July 2005)
2.	Ms Priyanka Raj (M.Sc. - PhD combined Courses in Biomedical Sciences) Summer Trainee Dr B.R. Ambedkar Centre for Biomedical Research, University of Delhi, Delhi	Effect of tonicity on the vascular responsiveness of isolated rat thoracic aorta to various vasoactive agents	Prof. M. Fahim and Dr Vishal Bansal (Physiology)	(January-July 2005)
3.	Ms Karabi Das (M.Sc. - PhD combined Courses in Biomedical Sciences) Summer Trainee Dr B.R. Ambedkar Centre for Biomedical Research, University of Delhi, Delhi	Role of certain endothelium dependent mechanisms on the baroreflex control of blood pressure in rats	Prof. M. Fahim and Dr Vishal Bansal (Physiology)	(January-July 2005)
4.	Mr Ashaq Hussain Dar (M.Sc. Final year) Department of Biosciences, Jamia Milia Islamia University, New Delhi	Molecular characterization of *Klebsiella pneumoniae*	Prof. S.S. Thukral (Microbiology)	February 1 - June 30, 2005
5.	Ms Priya Srivastava (M.Sc. Final year) Department of Microbiology, Bundelkhand University, Jhansi	Rapid identification of *M. tuberculosis* from clinical sputam specimens	Prof. Mridula Bose (Microbiology)	March 1, - May 31, 2005
6.	Ms Monika (M.Sc. - PhD combined Courses in Biomedical Sciences) Summer Trainee Dr B.R. Ambedkar Centre for Biomedical Research, University of Delhi, Delhi	An attempt to detect and analyse the protein(s) binding to the putative promoter sequence of *mce* operon of *Mycobacterium tuberculosis*	Prof. Mridula Bose (Microbiology)	February 15, - June 15, 2005

Sl No.	Name and Organization	Subject	Faculty Member (Department)	Period
7.	Ms Navrinder Kaur (M.Sc. - PhD combined Courses in Biomedical Sciences) Summer Trainee Dr B.R. Ambedkar Centre for Biomedical Research, University of Delhi, Delhi	An attempt at characterization putative promoter of *mce* operon in *Mycobacterium tuberculosis*	Prof. Mridula Bose (Microbiology)	February 15, - June 15, 2005
8.	Mr Kameshwar Singh (M.Sc. Final year) Department of Biomedical Science Bundelkhand University, Jhansi	Rapid identification of *M. tuberculosis* by PRA from clinical samples	Prof. Mridula Bose (Microbiology)	February 15, - June 15, 2005
9.	Mrs Krishna Banerjee (Staff Nurse) Rajan Babu TB Hospital Kingsway Camp, Delhi	Training in lung function tests	Prof. S.K. Chhabra (Cardiorespiratory Physiology)	May 2-13, 2005
10.	Ms Rati Bhola (M.Sc. Final year) Department of Biotechnology, Punjab Technical University, Jalandhar	Techniques of Biochemistry	Prof. S.K. Bansal (Biochemistry)	November 21, 2005 - January 20, 2006
11.	Prescribers / Pharmacists / NGOs from all over India (Organised by Department of Pharmacology, Government Medical College, Nagpur in collaboration with Regional Office for South East Asia, WHO, New Delhi)	Training course on Promoting Rational Medicine Use in the Community	Dr Anita Kotwani (Pharmacology)	March 1-8, 2006
12.	Ms Ritika Srivastava (M.Sc. Final year) Department of Biotechnology, Mahatma Jyoti Rao Phoole P.G. Girls College, University of Rajasthan, Jaipur	Prevalence of *Mycoplasma pneumoniae* in patients of acute exacerbation of COPD	Dr Mandira Varma (Microbiology)	April 3- Auguust 31, 2005
13.	Ms Bhumika Chawala B. Tech (Biotechnology) (Summer Trainee) Department of Biotechnology, Kota University (Rajasthan)	Identification of influenza virus	Dr Madhu Khanna (Respiratory Virology)	July 3- August 31, 2005

Cultural and Sports Activities

During this year, the staff of the Institute had a very eventful and memorable time. The performances (songs and dances, mono-actions, jokes, etc.) of the staff members at the Annual Function of the Delhi University Staff Club were highly appreciated.

In the Sports and Games event, the staff members of the Institute had participated in various Annual Tournaments of Delhi University Staff Club and won awards in various events as per details given below:

- Mr Santosh Katoch (Pathology) stood first place in the Singles and Doubles category of Table Tennis event.
- Mr Eric Harrison (Library) stood first place in the Doubles category and second place in Lucky Doubles category of Table Tennis event.
- Mr Satish Sharma (Accounts) stood third place in the Lucky Doubles category of Table Tennis event.
- Mr Mahipal (Animal House) was the member of second Runner's-up Cricket Team.

List of Publications

1. Agrawal A, Agrawal KP, Ram A, Sondhi A, Chhabra SK, Gangal SV, Mehta D. Basis of rise in intracellular sodium in airway hyperresponsiveness and asthma. *Lung* 2005; **183**: 375-87.
2. Aggarwal AN, Chaudhry K, Chhabra SK, D'Souza GA, Gupta D, Jindal SK, Katiyar SK, Kumar R, Shah B, Vijayan VK. Prevalence and risk factors for bronchial asthma in Indian adults: a multicentre study. *Indian J Chest Dis Allied Sci* 2006; **48**: 13-22.
3. Ashraf MZ, Hussain ME, Fahim M. Antiatherosclerotic effects of dietary supplementation of garlic and turmeric: restoration of endothelial function in rats. *Life Sciences* 2005; **77**: 837-57.
4. Bansal SK, Kathayat R, Tyagi M, Taneja KK, Basir Seemi F. Phospholipid metabolism and protein kinase C mediated protein phosphorylation in dietary protein deficiency in rat lung. *Indian J Exp Biol* 2005; **43**: 606-13.
5. Bist A, Kumar L, Roy I, Ravindran P, Gaur SN, Singh AB. Clinico-immunologic evaluation of allergy to Himalayan tree pollen in atopic subjects in India: a new record. *Asian Pacific J Allergy Immunol* 2005; **23**: 69-78.
6. Bose M. TB control: a long way to go. *Indian J Med Res* 2006; **123**: 107-10.
7. Chakrabarty Kavery, Fahim M. Modulation of the contractile responses of guinea-pig isolated tracheal rings after chronic intermittent hypobaric hypoxia with and without cold exposure. *J Applied Physiol* (USA) 2005; **99**: 1006-11.
8. Chhabra SK. Guidelines for management of asthma: the gaps between theory and practice. *Indian J Chest Dis Allied Sci* 2005; **47**: 77-80.
9. Chhabra SK. Premenstrual asthma. *Indian J Chest Dis Allied Sci* 2005; **47**: 109-16.
10. Chhabra SK. Acute bronchodilator response has limited value in differentiating bronchial asthma from COPD. *J Asthma* 2005; **42**: 367-72.
11. Chhabra SK, Kaushik S. Validation of the asthma quality of life questionnaire (AQLQ-UK English version) in Indian asthmatic subjects. *Indian J Chest Dis Allied Sci* 2005; **47**: 167-74.
12. Chhabra SK. Epidemiology of childhood asthma. *Indian J Paediatr* 2006; **73**: S1-S4.
13. Chhabra SK, Ailawadhi M. Effect of prednisolone on lung function and bronchodilator responses in stable COPD. *Lung India* 2006; **23**: 8-14.
14. Chowdhary A, Randhawa HS, Kowshik T. Application of an in-house swabbing technique to environmental survey of *Cryptococcus neoformans*. *SIHAM Mycoses Newsletter* 2005; **4**: 4.
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16. Dhamija A, Tyagi P, Caroli R, Rahman M, Vijayan VK. Noninvasive ventilation in mild to moderate cases of respiratory failure due to acute exacerbation of chronic obstructive pulmonary diseases. *Saudi Med J* 2005; **26**: 887-90.
17. Gaur SN, Gupta K, Rajpal S, Agarwal N, Singh AB, Rohatgi A. Prevalence of bronchial asthma and allergic rhinitis among industrial workers in Delhi, India. *Intern Med J Thai* 2005; **21**: 13-18.
18. Gaur SN, Khan ZU, Gupta K. Allergic bronchopulmonary mycosis due to *Blastomyces dermatitidis* : diagnosis and 20 year's follow-up of the case. *Indian J Allergy Asthma Immunol* 2005; **19**: 75-80.
19. Gaur SN, Mehta AK, Singh BP, Arora N. Clinical response to choline in patients of Urticaria: a pre-

liminary report. *Indian J Allergy Asthma Immunol* 2005; **19**: 93-6.

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