

Research Interests of the Department of Pharmacology, AIIMS New Delhi

The Department of Pharmacology, AIIMS New Delhi has established itself as one of India's premier centres for translational, experimental, clinical, and regulatory pharmacology research. The collective expertise of its faculty spans fundamental molecular mechanisms of disease, preclinical drug discovery, clinical pharmacology, pharmacovigilance, toxicology, precision medicine, artificial intelligence, nanomedicine, and public health. The department integrates laboratory-based experimental research with clinical investigations and national health programs to address emerging healthcare challenges.

Based on the research profiles of the faculty members, the major research interests of the department can be organized into the following thematic domains.

1. Cardiovascular Pharmacology and Cardiometabolic Research

Cardiovascular pharmacology represents one of the strongest research pillars of the department with internationally recognized expertise spanning basic science, translational research, and clinical investigations.

The department focuses on:

- Cardioprotection against ischemia-reperfusion injury
- Heart failure
- Diabetic cardiomyopathy
- Cardiac hypertrophy
- Pulmonary arterial hypertension
- Atherosclerosis
- Myocardial inflammation
- Cardiac immunology
- Vascular dysfunction
- Coronary artery disease
- Hypertension
- Erectile dysfunction associated with cardiovascular disorders
- Molecular mechanisms of cardiovascular remodeling
- Biomarker discovery
- Translational cardiovascular therapeutics

Current research also explores

- ischemic preconditioning,
- vitamin D mediated cardioprotection,
- ACE2/Ang-(1-7)/Mas receptor signalling,
- inflammatory pathways,
- stem cell therapy,
- nano-formulations,
- peptide therapeutics,
- novel cardioprotective agents,
- herbal interventions,
- drug repurposing,
- advanced molecular diagnostics.

Faculty / Scientists contributing:

- Dr. D.S. Arya
- Dr. Jagriti Bhatia
- Dr. H.N. Yadav
- Dr. Ajay Godwin Potnuri

2. Neuropharmacology and Translational Neuroscience

The department has developed extensive expertise in experimental and translational neuroscience with emphasis on understanding mechanisms of neurological disorders and identifying novel therapeutic targets.

Major research themes include

- Alzheimer's disease
- Parkinson's disease
- Ischemic stroke
- Neurodegeneration
- Neuroinflammation
- Neuroprotection
- Gut-brain axis
- Microglial biology
- Blood-brain barrier biology
- Behavioral pharmacology
- Neurodevelopmental toxicology
- Synaptic plasticity
- Drug-induced neurological disorders
- Precision therapeutics for neurological diseases

Research incorporates,

- animal disease models,
- molecular biology,
- immunohistochemistry,
- omics technologies,
- biomarker discovery,
- neuroimmune interactions,
- pharmacogenomics,
- and translational neuroscience.

Faculty / Scientists contributing:

- Dr. KH Reeta
- Dr. Jatinder Katyal
- Dr. Sudhir Chandra Sarangi
- Dr. Saima Zameer
- Dr. Devendra Singh
- Dr. Himika Wasan
- Dr. Jyoti

3. Clinical Pharmacology and Precision Therapeutics

The department is a national leader in clinical pharmacology with research spanning drug development, rational therapeutics, precision medicine and evidence-based clinical practice.

Major areas include

- Clinical pharmacology
- Pharmacokinetics
- Pharmacodynamics
- Therapeutic drug monitoring
- Drug utilization studies
- Precision medicine
- Personalized therapeutics
- Pharmacoepidemiology
- Drug efficacy and safety evaluation
- Clinical trial methodology
- Bioethics
- Regulatory pharmacology
- Pharmacoeconomics
- Rational prescribing

The department actively conducts investigator-initiated clinical studies and participates in multicentric national research projects.

Faculty contributing

- Dr D.S. Arya
- Dr Jatinder Katiyal
- Dr. KH Reeta
- Dr. Pooja Gupta
- Dr. Sudhir Chandra Sarangi

4. Toxicology and Poison Research

Toxicology is another major research strength of the department, supported by the National Poisons Information Centre (NPIC), which serves as India's leading poison information and toxicology referral centre.

Research focuses on

- Clinical toxicology
- Experimental toxicology
- Heavy metal toxicity
- Environmental toxicology
- Occupational toxicology
- Agricultural pesticide toxicity
- Poison management
- Toxicokinetics
- Toxicodynamics
- Risk assessment
- Toxicogenomics
- Toxicoinformatics
- Biomarker discovery
- Public awareness and poison prevention

Emerging areas include

- pesticide-induced neurological disorders,
- QT prolongation induced by pesticides,
- occupational exposure biomarkers,
- poisoning surveillance,
- poison informatics,
- and toxicological public health.

Faculty contributing

- Dr. Swati Sharma
- Dr. Devendra Singh
- Dr. Ajay Godwin Potnuri
- Dr Jyoti

5. Pharmacovigilance, Drug Safety and Regulatory Science

The department plays a pivotal national role in pharmacovigilance through active participation in the Pharmacovigilance Programme of India (PvPI), Materiovigilance Programme of India, vaccine safety monitoring and adverse event surveillance.

Research encompasses

- Adverse drug reactions
- Drug safety
- Vaccine safety
- Materiovigilance
- Signal detection
- Benefit-risk assessment
- Regulatory science

- Medication errors
- Drug safety databases
- Pharmacovigilance informatics
- National surveillance systems

Faculty members contribute to several national committees responsible for drug safety regulations and policy formulation.

Faculty contributing

- Dr. Pooja Gupta
- Dr. Sudhir Chandra Sarangi

6. Immunopharmacology and Inflammation Research

The department possesses internationally recognized expertise in inflammation biology and immune modulation.

Research focuses on

- Chronic inflammation
- Rheumatoid arthritis
- Autoimmune diseases
- Cardiac inflammation
- Cytokine signalling
- Immune modulation
- Inflammatory biomarkers
- Resolution pharmacology

Special emphasis is placed on identifying novel anti-inflammatory compounds derived from medicinal plants and indigenous systems of medicine.

Faculty contributing

- Dr. D.S. Arya
- Dr. Surender Singh
- Dr Jagriti Bhatia

7. Herbal Pharmacology and Traditional Medicine Research

The department has extensive experience in scientific validation of medicinal plants and traditional formulations.

Major research interests include

- Herbal pharmacology
- AYUSH formulations
- Ethnopharmacology
- Indigenous medicines
- Natural products
- Phytopharmaceuticals
- Plant-derived cardioprotective agents
- Herbal anti-inflammatory drugs
- Herbal nephroprotective agents
- Herbal thrombolytic agents

Research integrates

- phytochemistry,
- pharmacology,
- molecular biology,
- toxicology,
- and clinical validation.

Faculty contributing

- Dr D.S. Arya
- Dr. Surender Singh

- Dr. Jagriti Bhatia
- Dr. Sudhir C Sarangi
- Dr. H.N. Yadav
- Dr. Ajay Godwin Potnuri

8. Cancer Pharmacology

Cancer research focuses on identifying novel therapeutic targets, biomarkers and pharmacological interventions.

Major themes include

- Prostate cancer
- Oncopharmacology
- Drug repurposing
- Molecular oncology
- Targeted therapeutics
- Precision oncology
- Biomarker development
- Proteomics
- Anti-cancer drug evaluation

The department also investigates interactions between cancer therapeutics and neurological disorders.

Faculty contributing

- Dr. D.S. Arya
- Dr. Pooja Gupta
- Dr. Saima Zameer

9. Molecular Pharmacology and Precision Medicine

The department extensively employs advanced molecular technologies including

- Genomics
- Pharmacogenomics
- Proteomics
- Transcriptomics
- Next-generation sequencing
- Gene expression profiling
- Cell signalling
- Molecular imaging
- Biomarker discovery
- Systems biology

Research seeks to identify molecular mechanisms underlying disease pathogenesis and therapeutic responses.

Faculty contributing

- Dr D. S Arya
- Dr. Sudhir Chandra Sarangi
- Dr. H.N. Yadav
- Dr Saima Zameer
- Dr. Swati Sharma
- Dr. Devendra Singh
- Dr Ajay Godwin Potnuri
- Dr Jyoti

10. Nanomedicine and Advanced Drug Delivery

A rapidly expanding research area is nanotechnology-based therapeutics.

Research includes

- Solid lipid nanoparticles
- Nano-formulations
- Targeted drug delivery
- Nanocarriers

- Controlled release systems
- Hybrid theranostic molecules
- Nano-enabled cardiovascular therapeutics
- Nano-enabled wound healing
- Nano-biomaterials

Faculty contributing

- Dr. H.N. Yadav
- Dr. Madhuri Gupta

11. Pharmacogenomics, Artificial Intelligence and Computational Pharmacology

The department increasingly integrates computational approaches for precision medicine.

Research includes

- Pharmacogenomics
- Artificial Intelligence in pharmacology
- Machine learning
- Toxicoinformatics
- Bioinformatics
- Computational toxicology
- In-silico drug screening
- Predictive modelling
- Systems pharmacology

Faculty contributing

- Dr. Sudhir Chandra Sarangi
- Dr. Swati Sharma
- Dr. Ajay Godwin Potnuri

12. Diabetes, Metabolic Disorders and Endocrine Pharmacology

Research addresses

- Diabetes mellitus
- Diabetic nephropathy
- Diabetic neuropathy
- Diabetic cardiomyopathy
- Metabolic syndrome
- Obesity
- Metabolic inflammation
- Insulin resistance

Studies focus on molecular mechanisms, novel therapeutics, biomarker development and translational interventions.

Faculty contributing

- Dr. D.S. Arya
- Dr Jagirti Bhatia
- Dr. KH Reeta
- Dr. H.N. Yadav

13. Renal, Pulmonary and Organ Protection Pharmacology

Research aims to develop interventions for organ injury and fibrosis.

Major themes include

- Nephrotoxicity
- Pulmonary fibrosis
- Drug-induced organ toxicity
- Renal protection
- Pulmonary hypertension
- Fibrosis biology

- Organ preservation

Faculty contributing

- Dr. Jagriti Bhatia
- Dr. D.S. Arya
- Dr. H.N. Yadav

14. Public Health Pharmacology and Community Outreach

The department actively contributes to national health priorities through

- Poison prevention programs
- Community awareness initiatives
- Health communication
- Capacity building
- National poison information services
- Healthcare worker education
- National surveillance networks
- Public health toxicology

These activities support evidence-based policy formulation and strengthen national preparedness for poisoning and drug safety challenges.

Faculty contributing

- Dr. Swati Sharma
- Dr Ajay Godwin Potnuri
- Dr Jyoti

The Department of Pharmacology at AIIMS New Delhi has developed a comprehensive and internationally competitive research portfolio encompassing experimental pharmacology, molecular medicine, clinical pharmacology, toxicology, neuroscience, cardiovascular sciences, pharmacovigilance, precision medicine, nanotechnology, and public health. Supported by state-of-the-art laboratory infrastructure, the National Poisons Information Centre, advanced molecular platforms, and strong national and international collaborations, the department is well positioned to drive innovative drug discovery, translational research, precision therapeutics, and evidence-based healthcare. Its integrated research ecosystem enables seamless translation of laboratory discoveries into clinical applications and public health interventions, making it one of India's leading centres for pharmacological research and innovation.

RESEARCH ACTIVITIES OF NATIONAL POISONS INFORMATION CENTRE (NPIC):

The National Poisons Information Centre (NPIC) at All India Institute of Medical Sciences is actively engaged in multidisciplinary research activities focused on clinical toxicology, poison surveillance, toxicovigilance, analytical toxicology, and public health preparedness. The research programs are aimed at improving poisoning management, generating evidence for policy formulation, and strengthening national poison control systems.

MAJOR RESEARCH ACTIVITIES AT NPIC INCLUDE:

CLINICAL TOXICOLOGY RESEARCH:

NPIC is actively engaged in studies on the epidemiology, clinical presentation, management, and outcomes of poisoning cases involving pesticides, pharmaceuticals, household chemicals, snakebite, heavy metals, and drugs of abuse. Additionally, research activities towards 'Evaluation and metabolomic analysis of pesticide-induced toxicity using in-silico methods- an exploratory study' was taken up (Ethical approval- AIIMSA4614/12.09.2025) targeting occupational hazard. The primary objective was to estimate pesticide levels in pest control workers and to compare them with healthy controls and to characterize pesticide-induced toxicity and identify associated metabolic alterations using a comprehensive metabolomic approach. The study would lead to understand the interaction between the pesticides and its metabolites to identify key pathways involved using in-silico methods. To complete the study, health campaign was organised to collect the demographic details, blood samples of pest control workers and obtain their exposure history including physical parameters and to explain the preventive measures. The pulmonary function tests (PFTs) were also done to assess the impact of pesticide exposure on lung health. It would further help in evaluating the extent of lung function impairment and guide the management and treatment of respiratory diseases associated with pesticide exposure.



Pyrethroids are synthetic insecticides widely used in agriculture and household pest control due to their high insecticidal potency and relative safety in mammals. However, excessive or chronic exposure may cause neurotoxicity, respiratory irritation, endocrine disruption, oxidative stress, and adverse developmental effects, posing significant concerns for human health and environmental safety. At the outset, Dr Devendra Singh is analysing the association between the pyrethroid exposure with the incidence of parkinsonism in clinical subjects. The findings of this study will be crucial in analysing the neurological impact of long-term exposure to synthetic pyrethroids such as mosquito repellents.

MOLECULAR AND EXPERIMENTAL TOXICOLOGY:

Dr Swati Sharma is interested in identification of biomarkers for early and precise identification of toxin exposure. With the financial support from the AIIMS-IRG project, her team Identified potential biomarkers associated with lead toxicity using in-silico models.

Imidacloprid is a widely used neonicotinoid insecticide effective against sucking and soil insects in agriculture. It acts by targeting nicotinic acetylcholine receptors in insects, causing paralysis and death. Although considered less toxic to mammals, prolonged exposure may induce neurotoxicity, oxidative stress, reproductive toxicity, and environmental hazards, particularly affecting pollinators. Nonetheless, its cardiovascular effects are least explored. Dr Ajay Godwin Potnuri is interested in understanding the cardiovascular effects of neonicotinoids and he is currently working on exploring the effects of Imidacloprid and its metabolites on QT prologation. He is working in collaboration with Department of Biophysics and utilizes patch-clamp techniques for understading hERG channel kinetics. Preliminary data indicates that Imidacloprid and its metabolites are potential hERG channel blockers.

Another study by Dr Jyoti focuses on unravelling the effects of imidacloprid exposure on neurological and blood brain barrier functions during early development. This project is funded by AIIMS IRG scheme and the results of this project will shed light on the developmental toxicity of this class of pesticides.

EDUCATION AND CAPACITY BUILDING:

Apart from the conventional toxicological research, NPIC also focuses on education and capacity building research. Dr Swati Sharma extensively works on creating awareness among the vulnerable groups regarding the poisoning and analysis the KAP outcomes using statistical tools. The project funded by DST is instrumental in initiating both Education and Capacity Building research as well as the outreach activities of the center.

List of Research Projects sanctioned to NPIC			
Title of the project	PI details	Funding agency	Duration
Polymorphism of APOE gene in Alzheimer's disease due to exposure of residuals of DDT, BHC and Dieldrin pesticides in Indian population"	Dr Madhuri Gupta	AIIMS -IRG	2016-2017
Assessment of awareness, perception and KAP (Knowledge, Attitude &	Dr Swati Sharma	DST	2021-2023

Practices) related to common poisons and development of scientific communication modules for lifestyle modulation & year-round strategy for public awareness towards prevention of poisoning			
Identification of potential biomarkers associated with lead toxicity due to occupational exposure using in-silico methods	Dr Swati Sharma	AIIMS-IRG	2020-2022
Association of pyrethroid exposure in Parkinson's disease	Dr Devendra Singh	AIIMS-IRG	2024-2026
Understanding the QT prolongation risk of Imidacloprid and its metabolites using in vitro pharmacological studies	Dr Ajay Godwin Potnuri	AIIMS – IRG	2024-2027
Deciphering the effects of imidacloprid exposure on neurological and blood brain barrier functions during early development: a pilot study	Dr Jyoti	AIIMS-IRG	2025-2027