

## Professor Ahmed Kamal

### A Tribute



This special issue of Arkivoc (Archive for Organic Chemistry) is dedicated to Professor Ahmed Kamal to acknowledge his contribution to synthetic organic chemistry

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Dr. Ahmed Kamal was born in Hyderabad - a city in Telangana State of India in 1956. He received his B.Sc. degree in Chemistry and Biology from Osmania University, Hyderabad in 1975. Subsequently, he completed his M.Sc. (Organic Chemistry) in 1977, M.Phil. (Chemistry) in 1979 and PhD (Chemistry) in 1982 from Aligarh Muslim University, Aligarh. After his doctoral research, he joined the Indian Institute of Chemical Technology (IICT), Hyderabad, India and occupied the position of Scientist at different levels. During 1988-1989, he carried out his post-doctoral research in Medicinal Chemistry at the University of Portsmouth, UK. During his professional career, he was Chief Scientist (Scientist-G) / Professor (AcSIR) at CSIR-IICT, Hyderabad (2007-2010). He was later selected as the Outstanding Scientist (Director level) / Outstanding Professor (AcSIR) during 2010-2016 at CSIR-IICT, Hyderabad. He also took up the role of Acting Director of CSIR-IICT, Hyderabad in the year of 2012-2013 and 2015. Additionally, he served as Project Director of the National Institute of Pharmaceutical Education and Research (NIPER), Hyderabad during 2009-2016. In 2017, he joined Jamia Hamdard University, New Delhi, India as Pro-Vice Chancellor. Presently, he is the Senior Professor Emeritus at Birla Institute of Technology & Science (BITS) Pilani, Hyderabad Campus, and a Consultant for the Telangana State Council of Science & Technology (TSCOST), Environment, Forests, S&T Department, Government of Telangana. He is also an Adjunct Professor at Jamia Hamdard University; he was a Visiting Professor at the College of Chemistry-Faculty of Science, King Saud University (2011-2017) and a Visiting Scientist at the School of Pharmaceutical Sciences, University of Alberta, Edmonton, Canada (1993-1994). He is the recipient of various prestigious scientific honours and awards such as:

- YMSA Young Scientist Award from MAAS & TWAS – 1988
- CSIR Young Scientist Award in Chemical Sciences – 1991
- Fellow of National Academy of Sciences, India – 1999
- Best Patent Award from the Indian Drug Manufacturers Association (IDMA) – 2005
- Medal from the Chemical Research Society of India (CRSI) for contributions to research in Chemistry – 2005
- Ranbaxy Research Award in the field of Pharmaceutical Sciences – 2005
- UKIERI Standard Award for Biomedical Solutions between India and UK – 2006
- Andhra Pradesh Scientist Award in Chemical Sciences by A P State Council of Science & Technology – 2007
- OPPI Scientist Award from the Organization of Pharmaceutical Producers of India – 2009
- Fellow of Andhra Pradesh Academy of Sciences (FAPSc) – 2010
- Fellow of Royal Society of Chemistry (FRSC) – 2011
- Most Outstanding Researcher in the field of Chemistry by Careers 360 – 2018

He is a member of various Professional and Academic bodies, including

- Member, Editorial Advisory Board "*ChemMedChem*" (Wiley)
- Member, Editorial Advisory Board "*RSC Med. Chem.*" (RSC)
- Member, Editorial Advisory Board "*J. Saudi Chem. Soc.*" (Elsevier)
- Member, Editorial Advisory Board "*Letters in Drug Design & Discovery*" (Bentham)
- Chairman, Recruitment and Assessment Board (RAB), Defence Research and Development Organization (DRDO), New Delhi
- Member, Unani Pharmacopoeia Committee (UPC), Ministry of AYUSH, New Delhi

He was also a member of the following institutional bodies

- Executive Committee Member, Jawaharlal Nehru Technological University (JNTU), Hyderabad

- Member, Expert Appraisal Committee (Industry), Ministry of Environment, Forest and Climate Change, New Delhi
- Board Member, Recruitment and Assessment Board (RAB), Council of Scientific and Industrial Research (CSIR)
- Member, Research Council, Dr. Reddy's Institute of Life Sciences, Hyderabad
- Member, Scientific Advisory Committee of Central Council for Research in Unani Medicine, New Delhi
- Board Member, Life Sciences Sector Skill Development Council (LSSSDC), New Delhi
- Member, Pharma Advisory Committee of Andhra Pradesh
- Member, Task Force on Energy Biosciences, Department of Biotechnology (DBT), Ministry of Science & Technology
- Joint Secretary, Chemical Research Society of India (CRSI)
- Member, Project Monitoring Committee of Department of Biotechnology (DBT), SIBRI Programme
- Member, Institutional Bio-safety Committee (IBSC), Department of Biotechnology (DBT)
- Member, Andhra Pradesh State Council of the Confederation of Indian Industry (CII) AP Life Sciences Panel

He has published over 550 research papers in reputed international journals with more than 13,500 citations; h-index 53, and filed a number of 432 patents (Granted 306 and filed 126). He has guided over 110 PhD students with interest in multi-disciplinary research programmes including organic synthesis, medicinal chemistry, combinatorial chemistry, green chemistry, chemical biology and bio-catalysis. He has delivered over 150 invited lectures at different international/national seminars. He has also actively worked on the design and synthesis of gene-targeting compounds as novel anticancer agents, and their targeted delivery as prodrugs. He has been invited by various prestigious institutes around the globe to deliver talks on his research contributions. He has played a pivotal role in developing educational leadership at Jamia Hamdard, establishment of NIPER Hyderabad, National Centre for Research and Development in Bulk Drugs (NCRDBD), and Biotech Incubation Centre (BTIC) / Chemical Biology Facility while holding different positions at various organisations.

## Significant Research Contributions

### Development of Anticancer Therapeutics

The discovery of potent, selective and less toxic anticancer agents is considered to be one of the major challenges in medicinal chemistry. Dr. Kamal has contributed towards design and synthesis of large number of heterocyclic hybrids and their conjugates wherein at least two biologically well-established components were embedded into a single moiety that could interact or sometimes enhance the biological effect on the same target. In this pursuit, structural modifications of the pyrrolo[2,1-c]benzodiazepine (PBD) ring system were explored extensively. These results provided further understanding of the combination of certain non-covalent interacting groups with a PBD moiety that led to the design and synthesis of a variety of hybrids and conjugates. Moreover, a large number of DNA topoisomerase II and tubulin polymerization inhibitors as well as inducers of apoptosis based on podophyllotoxin, combretastatin A-4, phenstatin,  $\beta$ -carboline, curcumin and E7010 scaffolds were designed, synthesized and evaluated for their anticancer potential. Some of the lead compounds are currently undergoing further investigations.

### Development of New Antitubercular Agents

He has also shed light on various antitubercular agents wherein many heterocyclic scaffolds like phthalimido/naphthalimido linked phenazines, 1,2,4-benzothiadiazines, benzothiazole conjugates, arylsulfonamido oxazolidinones and thialactones were successfully designed and investigated for their antitubercular potential.

### Biocatalysis / Biotransformations and Biofuels

A large number of enantiomerically pure chiral intermediates were obtained by lipase catalysed transesterification processes. He has coordinated the US-India Consortium for the Development of Sustainable Advanced Lignocellulosic Biofuel Systems under the Second-Generation Biofuels for the Indo-US Clean Energy Research Initiative.

### Academic and Industrial Collaborations

The research and development activities during his career represent many conceptual and original ideas with experimental excellence that is in tune with the priorities and requirements. He has played an important role in the formulation and development of a large number of projects/programmes with academia and industrial collaborations/sponsorships that led to fruitful industry-institute links. The research work relating to new chemical entities focused on affordable healthcare (cancer therapeutics). A substantial number of process technologies were also investigated in collaboration/sponsorship with industry, particularly, in the development of environmentally benign processes by utilizing microbes/enzymes as biocatalysts with the objective being to bring organic synthetic processes closer to those practised by nature. This challenging area of research has considerable impact on the environment together with the development of cost-effective processes.

Research programmes in association with industry were conceptualised. Some of the industries that were associated with Dr. Kamal are: Yamanuchi Pharmaceuticals Limited (Japan), Mitsubishi (Japan), Marubeni (Japan), Sheratori Pharma (Japan), Dupont (USA), Spirogen Pharmaceuticals (UK), Evolva (Switzerland), Ranbaxy Laboratories (New Delhi), Lupin Laboratories (Pune), Acoris, (Pune) and Pedilite (Mumbai). Several academic collaborations were developed internationally and nationally including - Imperial College London, Kings College, London, University of Wuppertal, Germany, University of Greifswald, Germany, University of Cape Town, University of the Witwatersrand, Johannesburg, South Africa, Lomonosov Moscow State University, Russia, ACTREC, Mumbai, CCMB, Hyderabad and IISc, Bangalore.

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## Selected Publications &amp; Patents

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