CURRICULUM VITAE

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PRESENT PAY Basic pay: ***Rs. 77, 500/-*** (Pay band 4; Band pay: Rs. 67, 000; Academic Grade pay: Rs. 10, 500)

EDUCATION*

1976-1980 Ph. D.; Title: "Experimental Studies on Some Chemotherapeutic and Immunological Aspects of Primate Malaria (*Plasmodium knowlesi* infection)"; work done at Central Drug Research Institute, Lucknow.

1975-1976 Proficiency in French; University of Lucknow, Lucknow.

1973-1975 M. Sc.; Zoology (Physiology/Entomology); University of Lucknow. *(I division and II position in order of merit in the university).*

1971-1973 B. Sc.; Chemistry, Botany, Zoology and Gen. English; University of Lucknow, Lucknow.

1988 Indo-US Workshop on Cell Mediated Immunity in Relation to Tropical Diseases, Lucknow.

1989 IUIS -WHO-AIIMS Advanced Immunology Course, New Delhi.

1991 Indo-US Workshop on Current Approaches for Receptor Studies in Neurobiology, Lucknow.

1992 Course on Management of Research Programmes, Council of Scientific and Industrial Research, New Delhi.

2003 Induction Training Programme for Faculty of NIPER by Education and Educational Management Department, National Institute of Technical Teacher's Education and Research, Chandigarh.

* Process for the submission of **D. Sc.** degree thesis titled *"Studies on some Parasitic Protozoans of National Health and Pharmaceutical Importance"* to C. S. J. M. University, Kanpur has been started. Thesis synopsis submitted on Jan. 06, 2006.

Total pages 40

PROFESSIONAL POSITIONS (in reverse chronological order)*

2004–present **Professor**, Pharmacology and Toxicology, and ***In-charge,*** *Centre for Infectious Diseases*, National Institute of Pharmaceutical Education and Research, S.A.S. Nagar. Ex. **Associate Dean (academic affairs).** Ex. **Senator.**

1997–2004 Associate Professor, National Institute of Pharmaceutical Education and Research, S.A.S. Nagar.

1991–1996 Scientist-C (Group Leader), Division of Microbiology, Central Drug Research Institute, Lucknow.

1988–1991 Scientist-B, Division of Microbiology, Central Drug Research Institute, Lucknow.

1987–1988 Scientist (Pool Officer), Division of Microbiology, Central Drug Research Institute, Lucknow.

1986 Research Associate, Department of FCPM, Stanford University Medical Center, Stanford, CA, USA.

1984–1985 Research Associate, Department of Microbiology, The Ohio State University, Columbus, OH, USA.

1983–1984 Scientist-in-charge, Department of Protozoology, Hindustan Ciba-Giegy Research Centre, Mumbai.

1979–1982 Senior Scientific Asstt., Research Centre, Indian Drugs and Pharmaceuticals Ltd., Hyderabad.

1976–1979 Junior Research Fellow, Division of Microbiology, Central Drug Research Institute, Lucknow.

**I was invited to join on deputation as Professor in the Department of Pharmaceutical Sciences, Guru Jambheshwar University of Science and Technology, Hisar, vide their letter No. F-III/06/1061 dated April 22, 2006.*

PERSONAL DETAILS

Date of birth, July 05, 1954; Age, 61 years; height, 5 feet 5 ½ inches; weight, 65 kg; health, excellent; married; one daughter 29 years; religion, Hindu; hobby–intelligent discussions, long morning walks, chess, photography, music.

MEMBERSHIPS OF PROFESSIONAL SOCIETIES/ORGANIZATIONS

1. Member, The Neuro Network, USA.
2. Member, International Society for Infectious Diseases, USA.
3. Ex. Councilor-at-large (non-US), Society on NeuroImmune Pharmacology, USA.
4. Life Member, The National Academy of Sciences, India, Allahabad.
5. Life Member, Inflammation Research Association, U.S.A.
6. Member, International Brain Research Organization, France.
7. Life Member, Indian Immunology Society.
8. Life Member, Indian Academy of Neurosciences.
9. Life Member, Indian Science Congress Association.
10. Life Member, Indian Society for Parasitology.
11. Life Member, U. P. Association for the Advancement of Science.
12. Life Member, Association of Microbiologists of India.
13. Life Member, Indian Pharmacology Society.
14. Founder Member, Molecular Immunology Forum.
15. Ex. Vice-President, Indian Society of Chemists and Biologists.

AWARDS/HONOURS

- **Ex. Associate Dean** (Academic Affairs), National Institute of Pharmaceutical Education and Research, S. A. S. Nagar.
- **Member, Editorial Board,** Toxicology and Forensic Medicine-Open Journal, USA.
- Member, IBCs Leading Health Professional of the World – 2015.
- **Member, Advisory Committee, CSIR Young Scientist Award 2014** (Biological Sciences).
- Member, Scientific Board, Research Institute for Pharmacy and Biochemistry, Brno, Czech Republic, 2012.
- Member, Editorial Board, *International Bulletin of Pharmaceutical Sciences.*
- Member, Editorial Board, *Pharmaceutical Design and Current Perspective.*
- Reviewer, *Immunology and Infectious Diseases*.
- **Elected, At-Large Councilor** (non-US) 2010, Society on Neuroimmune Pharmacology, USA.
- **Awarded financial support** to participate in the 15th Society on Neuroimmune Pharmacology conference, April 21-24, 2009, Wuhan, China.
- **Elected, Fellow** of the **Association of Microbiologists of India** (2008).
- **The Bill and Melinda Gates Foundation Global Health Travel Award 2008** to attend the Keystone Symposia E3 Malaria: Immunology, Pathogenesis and Vaccine

Perspectives, Alpbach Congress Centrum, Alpbach, Austria, Austria, June 08-13, 2008.

- Selected as IBCs Leading Scientist of World 2008.
- Bioorganic & Medicinal Chemistry Most Cited Paper 2003–2006 Award. Bioorganic and Med. Chem. 2004 **12**: 2501-2508.
- **Member, Editorial Board**, *Journal of Neuroimmune Pharmacology*, USA**.**
- Editor/Reviewer, *Science Alert*.
- National Institute on Drug Abuse, USA, **Travel Grant Awardee** (2006) for participation in 12th Society on NeuroImmune Pharmacology Conference, Santa Fe, New Mexico, USA.
- **Editor-in-Chief**, *Journal of Parasitic Diseases* (2006-2008).
- Member, Executive Committee, Indian Society for Parasitology.
- Member, Editorial Advisory Board, "Recent Patent Reviews on Anti-Infective Drug Discovery", Bentham Science, USA.
- **Elected, Fellow of The National Academy of Sciences of India, Allahabad (2004)** for his contribution in the field of biotechnology, parasitology and *neuroimmunomodulation.*
- **Awarded, Indian Science Congress Association** best presentation award in Section: New Biology (including biochemistry, biophysics and molecular biology & biotechnology), 2003.
- **Selected** for biographical inclusion in the Ninth Edition of *International Directory of Distinguished Leadership*, 2000.
- **Awarded**, prestigious *Tulsabai Somani Educational Trust* 1992 award of the Indian Academy of Neurosciences.

RECOGNITIONS

- **Member, Site Visit Panel,** Biotechnology Industry Research Assistance Council **(BIRAC)**, Department of Biotechnology for IIIM, Jammu and Sphaera Pharma Research & Development Pvt. Ltd., Gurgaon (December, 2015).
- **Member, Site Visit Panel,** Biotechnology Industry Research Assistance Council **(BIRAC)**, Department of Biotechnology for JNCASR and Anthem Biosciences (June 22, 2015).
- **Expert reviewer**, Biotechnology Industry Research Assistance Council **(BIRAC)**, Department of Biotechnology (20 projects).
- **Member, State Level Co-ordination Committee, National Institute of Pharmaceutical Education and Research, *Rae Bareli*, Ministry of Chemicals and Fertilizers, Govt. of India.**
- **Nodal Officer, National Institute of Pharmaceutical Education and Research, *Rae Bareli*, Ministry of Chemicals and Fertilizers, Govt. of India.**
- Resource Person/Organizer, National Conference on Infectious Diseases: Challenges and Opportunities in Research and Practice, Institute of Pharmacy, Nirma University, Ahmedabad (Jan. 22-23, 2015).

- **Member, Selection Committee, Faculty Positions**, Institute of Pharmacy, Nirma University, Ahmedabad (May 10, 2014).
- **Member, Selection Committee, Faculty Positions** in Biology, Indian Institute of Technology, Rajasthan (IITJ), Jodhpur (Dec. 12, 2011).
- Nominated for Fellow, Indian National Science Academy (F.N.A.), New Delhi.
- Nominated for Fellow, Indian Science Academy (F. A. Sc.), Bangalore.
- Book Reviewer, "Conceptual Pharmacology" 2010 Edition, P. Jagadish Prasad, University Press (India) Pvt. Ltd. (2013).
- Expert Evaluator, Kerala State Council for Science, Technology and Environment research projects (2013-15).
- Expert Evaluator, Indo-Australia Biotechnology Fund (IABF) collaborative projects (between DBT and DIISR), Dec. 2011.
- **Chairman, Institutional Biosafety Committee, NIPER, S. A. S. Nagar.**
- **Chairman, Radiation Safety Committee, NIPER, S. A. S. Nagar.**
- **Member, Scientific Advisory Committee**, ICMR Desert Medicine Research Centre, Jodhpur (May 20-22, 2010).
- Chairman, Scientific Working Group on Nutrition, Biochemistry and NCDs (Feb. 18-19,2010)
- Expert, Doctoral Committee, Ph. D. student, SRM University, Kattankulathur, Tamil Nadu (2009).
- Expert, Research Grant Proposal Evaluation, Council of Scientific and Industrial Research, New Delhi (2009).
- Expert, Selection Committee, Pharmaceutical Sciences and Drug Research, Punjabi University, Patiala (2008).
- **Chairman, Selection Committee**, Scientist B, National Institute of Occupational Health (ICMR), Ahmedabad (2008).
- **Organizing Secretary**, "International Conference on Biotechnological Approaches to Neuroimmunomodulation and Infectious Diseases", Dec.11-13, 2008, NIPER, S. A. S. Nagar.
- **Expert**, Research Grant Proposal Evaluation, Department of Biotechnology, New Delhi (2008).
- Invitee, The Third Open Forum on Key Issues in Tuberculosis Drug Development, organized by TB Alliance, The Bill and Melinda Gates Foundation, The Stop TB Partnership Working Group and Treatment Action Group, New Delhi (May 5-6, 2008).
- **Member, Selection Committee**, Scientist C, National Institute of Occupational Health (ICMR), Ahmedabad (2008).
- **Member, Scientific Advisory Committee**, Desert Medicine Research Centre, (ICMR), Jodhpur (2008).
- Member (Special Invitee), Scientific Advisory Committee, National Institute of Occupational Health (ICMR), Ahmadabad (2008).
- Expert, Technology Information, Forecasting and Assessment Council (TIFAC), New Delhi (2007).
- Evaluator, Research Grant Proposal, Department of Science and Technology, New Delhi (2006).

- Expert Attendee, Expert Focus Group: MMV–Shin Poong Pyronaridine-Artesunate Project Development Team, September 15, 2005, La Salle Notre Dame de la Grande, Marseille, France.
- Research Grant Proposal Evaluator, Council of Science and Technology, U.P., Lucknow (2005).
- Referee, Mini-Reviews in Medicinal Chemistry.
- Referee, Proc. of the Nat. Acad. of Sciences, India (Sec. B–Biol. Sciences)
- Referee, National Academy Science Letters.
- Chairman, Scientific Session: Toxicological Problems in Occupational Health, International Conference on Health, Occupation and Environment, Nov. 1–3, 2004, Industrial Toxicology Research Center, Lucknow.
- Member, Senate, National Institute of Pharmaceutical Education and Research, S. A. S. Nagar (2000–2004).
- Faculty member, Refresher Course in Zoology, Academic Staff College, Shimla University, Shimla, 2004.
- Coordinator, NIPER Thrust Areas of Research: MALARIA and TUBERCULOSIS.
- Faculty member, Refresher Course in Zoology, Academic Staff College, Panjab University, Chandigarh, 2000.
- **Organizing Secretary**, The Millennium Symposium *Malaria 2000*, NIPER, S. A. S. Nagar, 2000.
- **Organizing Secretary**, Indo-US Symposium on Recombinant DNA Technology and its Application in Drug Discovery, NIPER, S. A. S. Nagar, 1999.
- Joint-Organizing Secretary, National Conference on Chemistry and Biology of Herbal Medicine, Lucknow, 1997.
- Treasurer, CSIR-SWA Silver Jubilee Symposium on Intellectual Property Rights and Industrial Development in India–Health, Agriculture and Environment, Lucknow, 1996.
- Member, Scientific and Publications Committee, First Annual Conference on Chemistry, Biology and Health-Care, Lucknow, 1996.
- **Faculty member**, NAM and Third World Academy Workshop on Antimalarial Evaluation and Biocide Assay for Control of Malaria, Lucknow, 1994.
- **Faculty member**, Refresher Course, Academic Staff College, University of Lucknow, Lucknow, 1993.
- **Faculty Member**, UNESCO-CDRI Workshop on the Use of Pharmacological Techniques for the Study of Natural Products, Lucknow, 1992.
- Member, R and D Highlights and Publications and, Finance Committees, CSIR Golden Jubilee Symposium on Tropical Diseases: Molecular Biology and Control Strategies, Lucknow, 1992.
- Member, Organizing Committee, CSIR Exposition on Medicinal Plants, CDRI, Lucknow, 1989.
- **Secretary**, Scientific and Publications Committee, Symposium on Recent Advances in Protozoan Diseases, Hind. Ciba-Geigy Ltd., Bombay, 1983.
- Referee, Indian Journal of Medical Research, 1983-84.
- **Vice-President**, Zoological Society, University of Lucknow, Lucknow, 1975.

BOOKS EDITED

- Co-editor, **Prati Pal Singh** and R M Donahoe (Eds.). 2009. ***"****Proceedings of International Conference on Biotechnological Approaches to Neuroimmunomodulation and Infectious Diseases"*. pp i-xii + 508, ISBN 978-81-8465-013-6.

- Co-editor, **Prof. Prati Pal Singh** and Prof. V. P. Sharma, (Eds.). 2009. Proceedings of the National Academy of Sciences, India. Section B – Biological Sciences. Special Issue titled *"Human Parasitic Infections of Pharmaceutical and National Health Importance"*. pp 220, ISSN 0369-8211 *(released Dec. 2009).*

- Co-editor, **Prof. Prati Pal Singh** and Prof. V. P. Sharma, (Eds.). 2014. "*Water and Health"* pp i-xxiii + 404, Springer India. ISBN: 978-81-322-1028-3 (Print) 978-81-322-1029-0 (Online); DOI 10.1007/978-81-322-1029-0.

VISITS ABROAD

- June 28, 2013: European Molecular Biology Laboratory, Hamburg, **Germany**. *(Invited Lecture)*
- June 27, 2013: Institute of Medical Microbiology, Otto-van-Guericke University Magdeburg, **Germany**. *(Invited Lecture)*
- June 22-26, 2013: Institute of Medical Microbiology, the Justus-Liebig University, Giessen, **Germany**. *(discussions for possible collaborative research projects funded by some international funding agency)*
- June 19-22, 2013: CNRS and University of Orleans, Orleans, **France**. *(Invited Lecture)*
- October 25-30, 2010: Institute of Medical Microbiology, Justus Liebig University, Giessen, **Germany**. *(Invited Lecture)*
- October 17-19, 2010: Annual General Assembly Meeting of the Indo-EU project (FP7) titled "New Approaches to Target Tuberculosis", London, **UK**.
- September 30, 2009: TSE System GmbH, Siemensstr., Bad Homburg, **Germany**. *(Invited Lecture)*
- September 29, 2009: Klinik für Anaesthesiologie und operative Intensivmedizin, Freie Universitüt Berlin, Charité-Campus Benjamin Franklin, 12200 Berlin, **Germany**. *(Invited Lecture)*
- September 27-29, 2009: Annual General Assembly meeting of the Indo-EU project (FP7) titled "New Approaches to Target Tuberculosis", Berlin, **Germany**.
- September 25-27, 2009: Institute of Medical Microbiology, the Justus-Liebig University, Giessen, **Germany**. *(Invited Lecture and discussions for initiating collaborative research projects funded by some international funding agency)*
- April 21-25, 2009: 15th Annual Conference of Society on Neuroimmune Pharmacology, Wuhan, **China**. *(Invited Lecture)*
- November 14-15, 2008: Institute of Medical Microbiology, Otto-van-Guericke University Magdeburg, **Germany**. *(Invited Lecture)*
- November 10-13, 2008: Start-up meeting of the recently funded FP7 Indo-EU project titled ""New Approaches to Target Tuberculosis"", Leuven, **Belgium**.

- June 15-17, 2008: Institute of Medical Microbiology, Otto-van-Guericke University Magdeburg, **Germany**. *(Invited Lecture)*
- June 12-15, 2008: Department of Public Health-Microbiology-Virology, University of Milan, **Italy**. *(Invited Seminar)*
- June 07-12, 2008: Keystone Symposia Conference, E3 "Malaria: Immunology, Pathogenesis and Vaccine Perspectives", Alpabach Congress Centrum, Alpabach, Austria, **Austria**. *(Bill and Melinda Gates Foundation Awardee)*
- April 04-10, 2006: 12th Society on NeuroImmune Pharmacology Conference, Santa Fe, New Mexico, **USA**. *(Delegate)*
- Sept. 16, 2005: Departement de Medecine Moleculaire, Institut Pasteur, Paris, **France**. *(Invited Lecture)*
- Sept. 15, 2005: Genetique Experimentale et Moleculaire Institut de Transgenose, Orleans, **France**. *(Invited Lecture)*
- Sept. 11-14, 2005: World Congress on "Medicine and Health in the Tropics", Marseille, **France**. *(Delegate)*
- Sept. 29-Oct. 02, 1999: The 4th International Congress of the International Society for Neuroimmunomodulation, Lugano, **Switzerland**. *(Delegate)*
- Jan.–Aug. 1986: FCPM department, Stanford University Medical Center, Stanford, CA, **USA**. *(Research Associate)*
- May, 1985: Division of Clinical Immunology and Allergy, Montreal General Hospital, Montreal, **Canada**. *(Visiting Fellow)*
- Jul. 1984–Dec. 1985: Microbiology Department, The Ohio State University, Columbus, OH, **USA**. *(Post-Doctoral Research Associate)*

RESEARCH EXPERIENCE *(Thirty nine years)*

Broad area of specialization: *Pharmaceutical Education and Research*

Specific areas of specialization: ***Parasitic and microbial infections*** (mainly tuberculosis, malaria, leishmaniasis, amoebiasis and trichmoniasis)***:*** new drug discovery, bioimmunotherapy, vaccination and pathogenesis; ***neuroimmunomodulation,*** *biotechnology, inflammation, drug- and immune-toxicology, and science administration, and communication/editing.*

Summary of major scientific contributions

Malaria

1. Discovered four new 8-aminoquinoline molecules synthesized at NIPER as broad-spectrum antimalarials which showed activity better than chloroquine and primaquine in blood-schizontocidal and met-hemoglobulin toxicity evaluations. Two international (1 US and 1 European) patents have been granted on this work.
2. Reported that recombinant human interleukin-12 sterile-protected rhesus monkeys (*Macaca mulatta)* from *Plasmodium cynomolgi* B sporozoite-induced malaria.
3. Discovered that purified human C-reactive protein (CRP) sterile-protected rhesus monkeys (*M. mulatta*) against *P. cynomolgi* B sporozoite-induced malaria.
4. Discovered that recombinant mouse granulocyte-macrophage colony-stimulating factor (GM-CSF) and methionine-enkephalin (M-ENK) or its fragment peptide Tyr-Tyr-Gly protected mice against both sporozoite- and trophozoite-induced rodent malarias,

apparently *via* macrophage-mediated mechanisms which are, at least partly, nitric oxide-dependent.

5. Developed a new rigorous rodent malaria vaccination model (*P. yoelii nigeriensis*/mouse) to study mechanisms of protective immunity and to evaluate potential immunoadjuvants; IL-1 fragment peptide 163-171 showed strong co-adjuvant activity with saponin.
6. Discovered *M. assamensis* and *Presbytis entellus* as the two new hosts of *P. knowlesi.*
7. Reported that an antigenic variant (W3) of *P. knowlesi* was relatively resistant to chloroquine as compared to its parent strain (W1) in rhesus monkeys (*M. mulatta*); *P. falciparum* antigenic variants also showed differences in their susceptibility to chloroquine, *in vitro*.
8. Discovered a distinct dichotomy in the monoclonal antibodies (MAbs) generated from the splenocytes of mice vaccinated with *P. yoelii nigeriensis* total parasite antigens soluble in culture medium and saponin, based on their merozoite invasion inhibition and passive transfer of protection activity.
9. Demonstrated that (1) probenecid (PB) is a blood-schizonticidal agent and (2) it synergizes with both dapsone (DS) and proguanil (PG). A combination of all the three agents also resulted in synergism, and reduced the required dose of DS, as compared to DS stand-alone by 10.17-fold. This first report of the *in vivo* antimalarial activity of PB suggests that it can be used as a new therapeutic agent to reduce dose-related toxicity of DS.

Tuberculosis

1. **Indo-European Union FP7 project**: identified 34 new anti-tuberculosis (TB) compounds as potential new drugs (IC_{99}: 6.25 µg/ml) against *Mycobacterium tuberculosis*. Further, 12 compounds have been found active against an Indian *M. tuberculosis* clinical isolates (resistant to isoniazid) at 6.25 µg/ml (IC_{99}); apparently, two of them have the potential for clinical testing.
2. Contributed extensively to the roles of innate immunity in TB, and discovered that **(i)** purified mouse serum amyloid P-component (SAP, a pentraxin) significantly inhibited the uptake of *M. tuberculosis* by mouse alveolar macrophages, *in vitro*, apparently through mannose 6-phosphate (M6-P) receptors, and thus demonstrated M6-P receptors to be the new type of receptors involved in the uptake of *M. tuberculosis* by macrophages, *in vitro*. Further, discovered that purified mouse SAP activated alveolar macrophages to greatly inhibit the intra-macrophage growth of *M. tuberculosis*, *in vitro*, apparently *via* nitric oxide (NO)-dependent mechanism(s). All these original researches have greatly contributed to our existing fundamental knowledge of TB, which are expected to help in the discovery of new therapies for TB.
3. Discovered a new 5-nitroimidazole drug, satranidazole, to be active in an *in vitro* model (Wayne model) of hypoxia-induced non-replicating persistent *M. tuberculosis* (latent forms).
4. Developed a new short-term rodent model for the screening of potential anti-TB compounds against *M. smegmatis*.
5. Demonstrated IL-6 as a potent biomarker of mycobacterial viability, virulence and pathogenesis using cytokine multiplex systems and confocal microscopy. *(In just last 18 months, our research paper on this work has 376 citations)*

Acute-phase reactant biology

1. Reported that purified human CRP activated monkey macrophages for enhanced phagocytosis of *P. fragile*-infected monkey erythrocytes, *in vitro*.
2. Discovered that purified human CRP induced increase in serum CSFs in monkeys (*M. mulatta*) and stimulated monkey macrophages to elaborate CSFs, *in vitro*, and that purified mouse SAP induced increase in serum CSFs in mice and stimulated mouse macrophages to elaborate CSFs, *in vitro*.
3. Reported that spororzoite- and trophozoite-induced *P. cynomolgi*-infection in monkeys induced increased production of serum CSFs. *In vitro* both intact *P. cynomolgi*-infected monkey erythrocytes and their soluble components stimulated monkey macrophages to produce CSFs, *de novo*. Similar results were obtained using *P. berghei* and mice.
4. Studied the induction kinetics of SAP in various inbred and recombinant inbred *Lr* and *Ls* mouse strains during *Listeria monocytogenes* infection. A strong correlation between SAP levels and genetic control of host resistance to *L. monocytogenes* infection was observed. *In vitro*, purified mouse SAP activated mouse macrophages (peritoneal, BM-derived and subcutaneous) for the intracellular killing of *L. monocytogenes*. Prof. Singh also reported several other immunoregulatory properties of purified mouse SAP.

Neuroimmunomodulation

1. Discovered opiates as a new class of drugs which protected against malaria, leishmaniasis and tuberculosis in rodents. Morphine in a dose-dependent manner, biphasically modulated the course of *P. berghei* infection in mice; low doses provided complete protection. Similarly, morphine protected both hamsters and mice infected with *Leishmaniasis donovani*, in a macrophage-mediated and NO-dependent manner. Further, morphine protected mice against *M. tuberculosis* H37Rv infection though macrophage-mediated and NO-dependent mechanisms.
2. Reported that morphine, in a dose-dependent biphasic manner, modulated the production of plasmodial antigens-induced production of CSFs by macrohpahes, *in vitro*.
3. Reported that M-ENK and C.D.R.I. compound 82/205, modulated the elaboration of CSFs by malarial antigens-stimulated macrophages, and of lymphokines (IFN-γ and IL-4) by Con A-stimulated splenocytes; compound 82/205 was more potent.
4. Demonstrated that morphine, M-ENK, dermorphin and compounds 82/205 showed high immunoadjuvant activity in a new rodent malaria (*P. yoelii nigeriensis*/mouse) vaccination model.

Amoebiasis and trichomoniasis

1. Contributed extensively to the pre-clinical discovery/development of a new anti-amoebic drug, satranidazole.
2. Developed a new model (*Entamoeba muris*/rat) for screening potential luminal amoebcides.
3. Reported the anti-trichomonal activity of triclosan and nitazoxanide, separately, *in vitro*.

TEACHING EXPERIENCE: (***Eighteen years*;** Jan. 1997 onwards)

Special attainments in education

For last nearly 16 years, I am involved in the teaching of biotechnology, microbiology, parasitology, neuroimmunology and new drug discovery research to the students of Pharmaceutical Sciences. For this, special courses addressing to our National and International Health problems (*Pharmaceutical Biotechnology* and *Pharmaceutical Parasitology and Microbiology*) have been developed for both Master's and Ph. D. students. The courses were well taken by the students and industries.

(a). Supervised/supervising the **Ph. D.** thesis work of the following students**,** and the titles of their thesis are:

1. "Vaccination of mice against *Plasmodium yoelii nigeriensis* and characterization of the protective monoclonal antibodies". **(Degree awarded**, 2002; SRF: CSIR).
2. "Experimental studies on neuroimmunomodulation in visceral leishmaniasis". (**Degree awarded**, 2004; JRF/SRF: CSIR, NET).
3. "Acute-phase reactants in murine tuberculosis: cellular and molecular studies". (**Degree awarded**, 2005; JRF/SRF: CSIR, NET).
4. "Bioimmunotherapy of rodent malarias: elucidation of cellular and molecular mechanisms" (**Degree awarded**, 2007; JFR: CSIR, NET).
5. "Experimental immunological approaches to target tuberculosis" (**Degree awarded;** JRF/SRF: CSIR, NET).
6. "Cellular and molecular studies in cerebral malaria: a rodent model" (continuing; NIPER Fellowship).
7. "Studies on the protective effect(s) of vitamins on rodent malaria" (continuing; NIPER Fellowship).
8. "Immunomodulatory effects of lithium chloride during rodent malaria" (continuing; NIPER Fellowship).
9. "Chemotherapeutic and immunological studies on experimental visceral leishmaniasis" (continuing; DoP-funded NIPER Fellowship).
10. "Studies on the chemotherapy of experimental tuberculosis, *in vitro*" (continuing; DoP-funded NIPER Fellowship).

Serial No. 1 student was registered under Biotechnology programme, the remaining nine students were/are under Pharmacology and Toxicology programme.

(b). Total **M. S.** (Pharm.) students 52. **Thirty,** Master's degree students have been awarded their **M. S. (Pharm.)** *Biotechnology* (Sr. No. 1-4*)* and *Pharmacology and Toxicology* (Sr. No. 5 and 52*)* degrees. The titles of their theses are:

1. "Molecular mechanisms in pathogenesis in malaria: role of colony-stimulating factors".
2. "Vaccination of mice against *Plasmodium yoelii nigeriensis*".
3. "*Plasmodium berghei* infection in mice: serum amyloid P-component response and its role in enhanced erythrophagocytosis".

4. "Morphine-induced immunomodulation in *Plasmodium yoelii nigeriensis*-infected mice".
5. "Selection and cloning of artemisinin and artenilic acid resistant strains of rodent malaria parasites".
6. "Neuroimmunomodulatory effects of morphine in murine tuberculosis".
7. "Determination of blood-schizontocidal activity of macrolide antibiotics against rodent malarias: stand alone and adjunct".
8. "*Leishmania donovami* infection in hamsters: chemotherapy and selection of a miltefosine-resistant strain".
9. "Experimental studies on the efficacy of nitazoxanide against *Trichomonas vaginalis*".
10. "Possible reduction of miltefosine curative doses by co-administration of recombinant human granulocyte-macrophage colony-stimulating factor and methionine-enkephalin: a rodent visceral leishmaniasis study".
11. "Allicin treatment of rodent malaria: stand alone and in combination with curcumin and artemisinin".
12. "Evaluation of *in vitro* efficacy of satranidazole against *Mycobacterium tuberculosis* in latent state under oxygen depletion conditions".
13. "Determination of the immunomodulatory effects of morphine on experimental immunization using a rodent malaria vaccination model".
14. *Trichomonas vaginalis*: *in vitro* cloning and drug susceptibility testing".
15. "Evaluation and comparison of *in vitro* antimycobacterial activity of satranidazole against nutrient starvation and hypoxia-induced latent *Mycobacterium tuberculosis*".
16. "Evaluation of *in vitro* susceptibility of *Trichomonas vaginalis* to triclosan".
17. "Investigation of the effect of probenecid, proguanil and dapsone combination against *Plasmodium berghei* infection in mice".
18. "Assessment of nelfinavir in *Leishmania donovani*-infected golden hamsters".
19. "To investigate the antileishmanial effect of amiodarone against *Leishmania donovani* infection in golden hamsters".
20. "To investigate the combination effect of miltefosine and 3,3'-di indolyl methane against *Leishmania donovani* infection in hamsters".
21. To study the effect of atorvastatin on the antimalarial activity of artesunate against *Plasmodium yoelli nigeriensis* infection in mice".
22. "Antimalarial activity assessment of farnesol in *Plasmodium yoelli nigeriensis* infected in mice".
23. "Study of the effect of the combination of risedronate and azithromycin in a rodent malaria model".
24. "To determine the antimalarial activity of the combination of azithromycin and quinine in *Plasmodium yoelii nigeriensis*-infected mice".
25. "Experimental immunization of mice using *Plasmodium yoelii nigeriensis* antigens".
26. "To determine the antimalarial effect of ibandronate against *Plasmodium berghei* infection in mice".
27. "To determine the antimalarial activity of the combination of limonene and farnesol in *Plasmodium berghei*-infected mice".
28. "To investigate the combined effect of omeprazole and amodiaquine in *Plasmodium berghei*-infected mice".

29. "To investigate the therapeutic potential of LL-37 cationic antimicrobial peptide in *Plasmodium berghei*-infected mice".
30. "To investigate the effect of deltrophin II in *Plasmodium berghei*-infected mice".
31. "To determine the antimalarial effect of gramicidin in *Plasmodium berghei*-infected mice".
32. "To determine the combined effect of chloroquine and [D-Ala2, D-Leu5] enkephalin in *Plasmodium berghei*-infected mice".
33. "To determine the blood-schizonticidal activity of fenofibrate against *Plasmodium berghei* infection in mice".
34. "To determine the blood-schizonticidal activity of thioridazine against *Plasmodium berghei* infection in mice".
35. "To determine the blood-schizonticidal activity of fusidic acid against *Plasmodium berghei* infection in mice".
36. "To determine the blood-schizonticidal activity of telithromycin against *Plasmodium berghei* infection in Swiss mice".
37. "To determine the blood-schizonticidal activity of linolenic acid against *Plasmodium yoelii nigeriensis* infection in Swiss mice".
38. "To determine the blood-schizonticidal activity of ellagic acid against *Plasmodium yoelii nigeriensis* infection in Swiss mice".
39. "To determine the blood-schizonticidal activity of clotrimazole in *Plasmodium yoelii nigeriensis*-infected Swiss mice".
40. "To determine the blood-schizonticidal activity of fluconazole in *Plasmodium yoelii nigeriensis*-infected Swiss mice".
41. "To determine the blood-schizonticidal activity of quinacrine against *Plasmodium yoelii nigeriensis* infection in Swiss mice".
42. "To determine the effect of artesunate on the phagocytosis *P. berghei*-infected erythrocytes by mouse peritoneal macrophases, *in vitro"*.
43. "Determination of the role of IL-18 in the pathogenesis of rodent malaria".
44. "To determine the blood-schizonticidal activity of bafilomycin against *P.berghei* infection in Swiss mice".
45. "To determine the dapsone dose reduction potential of probenecid in a combination of dapsone and proguanil: a rodent malaria study".
46. "To determine the blood-schizonticidal activity of a combination of linolenic acid and linoleic acid in *P. berghei*-infected Swiss mice".
47. "To determine the blood-schizonticidal activity of a combination of 5-fluoroorotate and pyrimethamine against *P. yoelii nigeriensis*-infection in Swiss mice".
48. "To determine the effect of chloroquine on the *P.berghei* antigen-induced elaboration of colony-stimulating factors by macrophages, *in vitro*".
49. "To determine the effect of curcumin on the *P. berghei* antigen-induced elaboration of colony-stimulating factors by macrophages, *in vitro"*.
50. "To determine the blood-schizonticidal activity of thiostrepton against *P. yoelii nigeriensis* infection in Swiss mice".
51. "NIPER compounds NP-3524, NP-3525, NP-3526 and NP-3527 belonging to artemisinin class: determination of their blood-schizonticidal activity in *Plasmodium berghei*-infected mice".
52. "Protection of mice from malaria: co-treatment with rmGM-CSF and [D-Ala^2, D-Leu^5] encephalin".

53. "Study of blood schizonticidal activity of NIPER compounds: NP 2818, NP 2819, NP 2825, NP 2830 and NP 2832 against *P. berhei* infection in Swiss mice".
54. "To determine the combined effect of clarithromycin and [D-Ala^2, D-Leu^5] enkephalin against malaria caused by *Plasmodium berghei* in mice".
55. "To determine the effect of [D-Ala^2, D-Leu^5] encephalin on the phagocytosis of *Plasmodium berghei*-infected erythrocytes, *in vitro*".

(c). Supervised the Summer Training Programme work of M. Sc. (Microbiology and Biotechnology) students from Panjab University, Chandigarh; Kurukshetra University, Kurukshetra and Banasthali Viday Peeth, Banasthali. The titles of their projects are:

1. Hybridoma technology: maintenance of myeloma cell line and a hybrid.
2. Cultivation of mouse bone-marrow cells and the determination of colony-stimulating factors.
3. Vaccination against rodent malaria.
4. Mouse splenic macrophages: cultivation and determination of phagocytic activity.
5. Production of phagocytosis promoting lymphokines.
6. Hybridoma technology: maintenance of myeloma cell lines and production of a hybrid.
7. Determination of rosette formation during *Plasmodium yoelii nigeriensis* infection in mice.
8. Detection of antimalarial antibody by enzyme-linked immunosorbant assay.
9. Fluorescence microscopy of malaria parasites.
10. Mycobacteria-macrophage interaction.
11. Vaccination against *P. yoelii nigeriensis:* antigen preparation, protein estimation, immunization and assessment of protection.
12. Chemotherapy and drug resistance in malaria: a rodent model.

(d). Taught the following Courses to M. S. (Pharm.) and Ph. D. students:

1. BT-510 (Biotechnology in Pharmaceutical Sciences)
2. BT-511 (Immunochemical/Radiochemical Methods of Analysis)
3. BT-630 (Immunology and Immunotechnology)
4. BT-640 (Applied Microbiology and Fermentation Technology)
5. BT-650 (Diagnostics)
6. PC-540 (Chemotherapy of Parasitic and Microbial Infections)
7. PC-611 (Pharmacological Screening)
8. PC-660 (Chemotherapy and Immunopharmacology)
9. BT/PC-720 (Ph. D. course: Application of Biotechnology in Parasitic Disease Research).
10. BT/ PC-740 (Ph. D. course: Cellular and Molecular Parasitology)
11. PC-830 (Ph.D. course: Parasitology/Microbiology, community and Pharmacy.
12. Laboratory practical.
13. Seminars

Course coordinator: BT-510, BT-511, BT-630, BT-640, BT-650, GE-511, PC-540, BT/PC-720, PC-740 and PC-830.

Examiner of Ph. D. theses:

1. "Modulation of Host Cell Interactomics by Intracellular Pathogen *Leishmania donovani*". (2015). Dept**.** of Life Sciences, Jawaharlal Nehru University, New Delhi.
2. "Investigation of the role of zinc in hypobaric hypoxia induced memory impairment and neuronal damage". (2011). ACBR, University of Delhi, Delhi.
3. "Modes of action and mechanisms of resistance to promomycin in visceral leishmaniasis". (2009). Dept**.** of Life Sciences, Jawaharlal Nehru University, New Delhi.
4. "Studies on phytochemical and pharmacological activity *Scoparia dulcis* Linn". (2008). Institute of Pharmacy, Bundelkhand University, Jhansi.
5. "Characterization and conformational studies of high mobility group box (HMGB) proteins of *Plasmodium falciparum*". (2008). Dept**.** of Biosciences, Jamia Millia Islamia, New Delhi.
6. "Studies on glutathione reductase and thioredoxine reductase of *Plasmodium berghei*". (2007), Dept. of Biosciences, Himachal Pradesh University, Shimla.
7. "Cloning, expression, purification and immunization studies of MSP-1 19 and MSP-1 42 (vaccine candidate antigens) of *Plasmodium falciparum* and *P. vivax*", (2006). Dept. of Zoology, University of Delhi, Delhi. Also, the examiner to conduct the *viva voce* of this student.
8. "Isolation and characterization of some antigens of *Plasmodium berghei*". (2006). Dept. of Biosciences, Himachal Pradesh University, Shimla. Also, the examiner to conduct the *viva voce* of this student.
9. "Detoxification of heme by *Plasmodium falciparum* histdine-rich proteins and its inhibition by quinoline antimalarial drugs". (2003). Dept. of Zoology, University of Delhi, Delhi.
10. "Selection of antimalarial resistant lines of *Plasmodium yoelii* and sporogonic studies in *Anopheles stephensi*". (2003). Dept. of Zoology, University of Delhi, Delhi.

Examiner of M. Sc. thesis:

1. "Effect of cigarette smoke inhalation and/or α-tocopherol on pulmonary lipid peroxidation and DNA freagmentation in male BALB/c mice", 2001, Dept. of Biophysics, Panjab University, Chandigarh.

Human resource development activities (recognition/honor/award received by P.G./Ph. D. scholars):

A. One Ph. D. student was selected for "First Winter School in Immunology in India", organized by Dr. V. S. Kanury Rao, International Center for Genetic Engineering and Biotechnology at Kovalam, Kerala from Feb. 8-13, 2001.
B. One Ph. D. student was awarded a Travel Grant by CSIR, New Delhi, to present an oral paper at UK. The Organizers waived the Registration fee.

C. One Ph. D. student has been awarded a Post-doctoral Fellowship in USA.
D. Three Ph. D. students were selected (and participated) in two different International Training programmes in India. They were provided full financial support.
E. One Ph. D. student has joined as Lecturer at the Dept. of Microbiology, Guru Nanak Dev University, Amritsar, Punjab.
F. Two Ph. D. students have been appointed Scientists in two different National Pharmaceutical Industries.
G. Seven P.G. students have joined scientific positions in National Pharmaceutical Industries.
H. One foreign P.G. student has done master's degree work on malaria and is working as a lecturer in Ethiopia.
I. One Ph. D. student has been awarded DBT fellowship to work on tuberculosis in Seattle, Washington, USA.

PRODUCTS DEVELOPED:

1. Anti-*Plasmodium yoelli nigeriensis* monoclonal antibodies. *(For details please see* product section *"*Monoclonal Antibodies" *in Hybridoma and Hybridomics, 2003, Vol. 22 (3), 61)*
2. Was involved in the pre-clinical development of anti-amoebic drug **satranidazole**.
3. Identified **four** novel 8-aminoquinolines as broad spectrum antimalarias in rodent malaria models and *P. falciparum, in vitro*. These compounds have been synthesized at NIPER and have been patented. Their evaluation in non-human primate malarias is being persued.
4. As part of the ongoing Indo-European Union FP7 funded project titled "New Approaches to Target Tuberculosis", identified 34 compounds to be active against *Mycobacterium tuberculosis* H37Rv (by BACTEC 460 method) at 6.25 µg/mL(IC99). Six of these compounds have shown MIC values of $\leq$ 0.39 µg/ml.

5. Dapsone (DS)-chlorproguanil combination (Lapdap™), though effective against human malaria parasite *Plasmodium falciparum*, has been reported to reduce hemoglobin concentration in patients with glucose-6-phosphate dehydrogenase deficiency due to dose-related toxicity of DS component. We have observed that (1) probenecid (PB) is a blood-schizonticidal agent and (2) it synergizes with both DS and proguanil (PG). A combination of all the three agents also resulted in synergism, and reduced the required dose of DS, as compared to DS stand-alone, by 10.17-fold. This first report of the *in vivo* antimalarial activity of PB suggests that it can be used as a new therapeutic agent to reduce dose-related toxicity of DS.

6. Triclosan, at 50 µg/ml (minimal inhibitory concentration; MIC), was observed to be active against both the metronidazole-sensitive and -resistant strains of *T. vaginalis*, *in vitro*; the MICs of metronidazole against both these strains was 1.6 µg/ml and 4.8 µg/ml, respectively. The results of this first study demonstrate that triclosan may be a promising potential agent for the treatment and management of human trichomoniasis.

CONCEPTS CREATED

1. Bioimmunotherapy of malaria using rmGM CSF and met-enkephalin co-treatment.
2. Opioids as potential drugs for the treatment of microbial and parasitic diseases.
3. Generation of a qualitatively distinct dichotomous immune response to malaria in vaccinated/protected mice, which probably ensued in the generation of MAbs with functional heterogeneity.
4. Involvement of macrophage mannose 6-phosphate receptors in the uptake of *Mycobecterium tuberculosis*.
5. Role of pentraxins in host defense from tuberculosis.
6. IL-6 has been identified as a potent biomarker of mycobacterial infections.

PROCESSES/MODELS/METHODOLGY/TECHNOLGY DEVELOPED

1. Developed a new rodent model for the screening of potential luminal amoebicides.
2. Developed a new rodent malaria (*P. yoelli nigeriensis* /mouse) vaccination model. *As this parasite causes a fulminating 100% lethal infection in mouse, vaccination-induced protective immunity can be very clearly distinguished from slow-grade infection- induced immunity.*
3. Antigen-induced production of CSFs by macrophages *in vitro*, as a model for the biological evaluation of potential immunomodulators. *Extensive publication in high-impact journals have been made on this new model.*

NATIONAL RESEARCH PROJECTS

1. Determination of possible linkage between antigenic variation and drug-resistance in *Plasmodium falciparum, in vitro*. CSIR, New Delhi. (PI; Mar. 2000 – Feb. 2003; **Rs. 10.53 lakh**)
2. Bioimmunotherapy of rodent malaria: evaluation of recombinant granulocyte-macrophage colony-stimulating factor and methionine-enkephalin co-treatment. DBT, New Delhi. (P I; Mar. 2003 – Feb. 2006; Rs. **20.12 lakh**)
3. Acute-phase reactants during *Mycobacterium tuberculosis* H37Rv infection in mice: induction kinetics, and their role(s) in immunoregulation and host-defense. ICMR, New Delhi. (P I; Jan. 2004 – Dec. 2006; Rs. **10.77 lakh**)
4. Hybridomic elucidation and molecular characterization of antimalarial immune response: a rodent model. CSIR, New Delhi. (PI; Apr. 2009 – Mar. 2012; **Rs. 21.65 lakh**).
5. Got **Rs. 903 lakh** (**Rs. 90.3 million**) for a five year proposal submitted (Rs. 12. 44 crore; Rs. 124.4 million) to the Ministry of Chemicals and Fertilizers, Government of India, for XI Five Year Plan (2007-2012) to start a new Department of Pharmaceutical Parasitology and to expand and modernize the existing small base of pharmaceutical parasitology research and education at NIPER.
6. Got **Rs. 100 lakh** (**Rs. 10 million**) for a three year (2013-2016) research scheme titled "Studies on molecular approaches to TB: determination of prevalence of MDR and XDR strains, drug susceptibility testing and development of new diagnostic tools" from the Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India.

7. I am one of the six PIs of "A Program project For Target Specific New Drug Discovery of Anti-tubercular Agents" at NIPER, S. A. S. Nagar has been funded for three years (2013-2015) by the Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India. (**Rs**. **4, 88 lakh)**
8. I am one of the PIs of "A Program project For Target Specific New Drug Discovery Research Against Kala-azar" at NIPER, S. A. S. Nagar has been funded for three years (2013-2015) by the Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India. (**Rs**. **4, 88 lakh)**
9. I am one of the two PIs of a "New Biotherapeutic Approached to the Treatment of Tuberculosis" a collaborative project with AIIMS, New Delhi has been approved for funding by the Department of Pharmaceuticals and Medical Devices, Ministry of Chemicals and Fertilizers, Government of India. (**Rs**. **243 lakh)**

INTERNATIONAL RESEARCH PROJECT

1. **Indo-European Union Seventh Framework Programme (FP7).** Project titled *"New Approaches to Target Tuberculosis" has been <u>funded</u>* in collaboration with Dr. Piet Herdewijn (Coordinator; K. U. Leuven, Belgium), Dr. S. H. E. Kaufmann (Max-Planck Institute for Infection Biology, Germany; Dr. Marino Zeria**l** (Max-Planck Institute of Cell Biology and Genetics, Germany), Dr. Elaine Da**vis** (Div. of Mycobacterial Research, National Institute for Medical Research, UK), Dr. Matthias Wilmanns (EMBL, Germany), Prof. Jyoti Chattopadhayay (Bioorganic Chemisitry Dept., Uppsala University, Sweden), **<u>Prof. Prati Pal Singh</u>** (National Institute of Pharmaceutical Education and Research, Mohali; **Rs. 84 lakh**), Dr. Rajesh Gokhale (National Institute of Immunology, India) and Dr. Ram Upadhayaya (Institute of Molecular Medicine, Pune). *The project was operational Oct. 01, 2008-Sept. 30, 2011.*

2. A no cost project (with Prof. Branka Zorc, Zagreb, Croatia) on the screening of potential antimalarial compounds is operational for last 02 years. Nearly 50 compounds have been tested. Out of this work, one paper has been communicated for publication and the other shall be sent soon.

3. A collaborative research programme with Prof. Drik Schluter, Otto-van Guericke Univ., Magdeburg, Germany, has been initiated for the development of a new rodent cerebral malaria model using KO mice. The agreement is expected to be signed shortly.

INVITED LECTURES: Sixty three

SCIENTIFC SESSIONS CHAIERD: Thirty one

KEYNOTE ADDRESS: Three

BOOK REVIEWED: Three

INDUSTRY ASSOCIATIONS: Presently, **Technical Services Agreements** with two pharmaceutical companies *viz.* M/s. Institute of Molecular Medicine, Kolkata and M/s. Advanced Enzyme Technologies Limited, Thane, are operational. Agreements with two more industries are being negotiated and will be signed, soon.

PATENTS (*granted*; *including US,* one, *Europe,* one)

1. Jain, R.; Jain, M.; **Singh, P. P**.; Singh, S.; Sachdeva, S.; Misra, V.; Ramarao, P.; Kaul, C. L.; Tikoo, K. Ring-substituted 8-aminoquinoline analogs as antimalarial agents and process for their preparation. *European Patent No.* EP1606263, WO 2004085402, dated 21/12/2005, *Appl. No.* PCT/IB03/06362, filed 15/12/2003, 62 pp.
2. Jain, R.; Jain, M.; **Singh, P. P**.; Singh, S.; Sachdeva, S.; Misra, V.; Ramarao, P.; Kaul, C. L.; Tikoo, K. Ring-substituted 8-aminoquinoline analogs as antimalarial agents and process for their preparation. *US Patent No.* 6,979,740, Dec 27, **2005**, 18 pp.
3. Jain, R.; Jain, M.; **Singh, P. P**.; Singh, S.; Sachdeva, S.; Misra, V.; Ramarao, P.; Kaul, C. L.; Tikoo, K. Ring-substituted 8-aminoquinoline analogs as antimalarial agents and process for their preparation. *Australian Patent No.* AU2003292489A1, dated 18/10/2004, Appl. No. AU2003-292489, dated 22/12/2003.
4. Jain, R.; Jain, M.; **Singh, P. P**.; Singh, S.; Sachdeva, S.; Misra, V.; Ramarao, P.; Kaul, C. L.; Tikoo, K. Ring-substituted 8-aminoquinoline analogs as antimalarial agents and process for their preparation. *Brazilian Patent No.* BR2003018214A, dated 21/3/2006, Appl. No. BR0318214-2, dated 22/12/2003.
5. Jain, R.; Jain, M.; **Singh, P. P**.; Singh, S.; Sachdeva, S.; Misra, V.; Ramarao, P.; Kaul, C. L.; Tikoo, K. Ring-substituted 8-aminoquinoline analogs as antimalarial agents and process for their preparation. *Japanese Patent No.* JP2006521284T, dated 21/9/2006, Appl. No. JP2004-569883, dated 22/12/2003.
6. Jain, R.; Jain, M.; **Singh, P. P**.; Singh, S.; Sachdeva, S.; Misra, V.; RamaRao, P.; Kaul, C. L. Ring-substituted 8-aminoquinoline analogues as antimalarial agents. **2003**, *Indian Patent No.* IN2003DE00459, dated 9/3/2007, Appl. No. 459/DEL/2003, dated 27/3/2003.
7. Jain, R.; Jain, M.; **Singh, P. P**.; Singh, S.; Sachdeva, S.; Misra, V.; RamaRao, P.; Kaul, C. L. A process for preparation of ring-substituted 8-aminoquinoline analogues as antimalarial agents. **2003**, *Indian Patent No.* IN 234308, dated 19/6/2009, *Appl. No.* IN2003DE00473, dated 27/3/2003.
8. Jain, R.; Suryanarayana V.; **Singh, P. P**.; Kinhikar, A. G.; Singh, S.; Jain, M.; Sachdeva, S.; Misra, V.; Ramarao, P.; Kaul, C. L. Quinoline analogues with broad-spectrum of antimalarial activities (Novel 4-ethyl-5-alkoxyprimaquine compounds). **2011**, Indian Patent no. IN 248025 dated 9/6/2011, *Appl. No.* IN2002DE01112 A2005031.

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9. Jain, R.; Balasubramanian V.; Nayyar, A.; Palde, P. B.; Jain, M.; Sachdeva, S.; Kaur, S.; Misra, V.; **Singh, P. P**.; Kaul, C. L. Ring-substituted quinolines as anti-tuberculosis agents. Indian Pat. Appl. **2005**, CODEN: INXXBQ IN 2002DE00628 A 20050311 AN 2007:299982.

List of publications (total **221**; research papers, **92**; abstracts, **125**; editorials, **04**; in reverse chronological order).

- This research paper featured on ***World Biomedical Frontiers***, because of its innovation and potential for significant impact; Ref. No. 2.
- This research paper published in ***NatureIndia*** as a research highlight titled *"A shot of morphine to treat TB"*; doi:10.1038/nindia.2008.110; published online 31 January 2008; Ref. No. 23.
- This research paper has 384 citations since Dec. 21, 2013; Ref. No. 5.
- This research paper published in **Nature Medicine**; Ref. No. 60.

1. Tesfaye, Solomon; Prakash, Bhanu and **Singh, Prati Pal** (2015) Apicoplast Biosynthetic Pathways as Possible Targets for Combination Therapy of Malaria. *J. Pharm. Pharmacol.* **3**, 101-115. **(IF 2014: 2.264)**

2. **Singh, Prati Pal** and Prakash, Bhanu (2014). The dichotomy (generation of MAbs with functional heterogeneity) in antimalarial immune response in vaccinated/protected mice; a new concept in our understanding of protective immune mechanisms in malaria. *Human Vaccines & Immunotherapeutics*, **10**, 1-5. (**IF 2012: 3.136)**

3. Jhamb, S. S., Goyal, Amit and **Singh, Prati Pal** (2014). Determination of the activity of standard anti-TB drugs against intramacrophage *Mycobacterium tuberculosis*, *in vitro*: MGIT 960 as a viable alternative for BACTEC 460. *Brazilian J. Infect. Dis.* **18,** 336-340.

4. **Singh, Prati Pal** and Galhotra, Abhiruchi (2014). Water, amoebiasis and public health. In "Water and Health". (Eds.) Prati Pal Singh and V. P. Sharma. Springer India. pp 169-177.

5. **Singh, Prati Pal** and Goyal, Amit (2013). Interleukin-6: a potent biomarker of mycobacterial infection. *Springer Plus.* **2**, 686-693. ***(Cited by 383 since Dec. 2013)***

6. Patel, Kamlesh, Jhamb, S. S. and **Singh, Prati Pal** (2013). Metabolic changes in *Mycobacterium tuberculosis* during nutrient starvation conditions. *Int. J. Pharm. Bio. Sci.* **4**, 229-239.

7. Kaur, Kirandeep., Jain, Meenakshi., Khan, S. I., Jacob, M. R., Tekwani, B. L., Singh, Savita., **Singh, Prati Pal** and Jain Rahul (2012). Amino acid, dipeptide and pseudodipeptide conjugates of ring substituted 8-aminoquinolines: Synthesis and evaluation of anti-infective, β-haematin inhibition and cytotoxic activities. *European J. Med. Chem.* **52**, 230-241. (**IF 2011: 3.509**)

8. Kaur, Kirandeep., Jain, Meenakshi., Khan, S. I., Jacob, M. R., Tekwani, B. L., Singh, Savita., **Singh, Prati Pal** and Jain Rahul (2011). Extended side chain analogues of 8-aminoquinolines: snthesis and evaluation of antiprotozoal, antimicrobial, bhematin inhibition, and cytotoxic activities. *Med. Chem. Commun.* **2**, 300-307. (**IF 2011: 1.271**)

9. Kaur, Kirandeep., Jain, Meenakshi., Khan, S.I., Jacob, M.R., Tekwani, B. L., Singh, Savita., **Singh, Prati Pal** and Jain Rahul (2011). Synthesis, antiprotozoal, antimicrobial, b-hematian inhibition, cytotoxicity and methemobglobin (metHb) formation activities of bis (8-aminoquinolines). *Bioorg. Med. Chem.* **19**, 197-210. (**IF 2011: 3.157**)
10. S, Kharatmal., Jhamb, Sarbjit Singh and **Singh, Prati Pal** (2011). New insights into latent tuberculosis: a persisting global health challenge. *Int. J. Pharm. Sci. Res.* 2, 1875-1887.
11. Patel Kamlesh, Sarbjit Singh, **Singh, Prati Pal** (2011). Models of latent tuberculosis: their salient features, limitations and development. J. Lab. Physicians **3,** 75-79.

12. Singh, Raman Preet., Jhamb, Sarbjit Singh, **Singh, Prati Pal** (2011). Evaluation of antibiotic supplements for culturing *Mycobacterium tuberculosis* from mouse macrophages and organs. *Res. J. Pharma. Biol. Chem. Sci*. **2**, 370-377.

13. Chaudhari, Hemantkumar Somabhai and **Singh, Prati Pal** (2010). Comparative drug susceptibility study of five clonal strains of *Trichomonas vaginalis in vitro*. *Asian Pacific J. Trop. Med*.**4**, 50-53.

14. Jhamb, Sarbjit Sing**h** and **Singh, Prati Pal** (2009). A short-term model for preliminary screening of potential antituberculous compounds. *Scand. J. Infect. Dis.***41**, 886-889. (IF 2008: **1.678**)

15. Singh, Ramanpreet; Jhamb, Sarbjit Singh and **Singh, Prati Pal** (2009). Effect of morphine in *Mycobaterium smegmatis* infection in mice and macrophages. *Ind. J. Microbiol.* **49**, 276-282.
16. S, Kharatmal., Jhamb, Sarbjit Singh and **Singh, Prati Pal** (2009). Evaluation of BACTEC 460 TB system for rapid in vitro screening of drugs against latent state *Mycobacterium tuberculosis* H37Rv under hypoxia conditions. *J. Microbiol. Methods* **78**, 161-164. (IF 2008: **2.000**)

17. Rajic, Z., Kos, G., Zorc, B., **Singh, Prati Pal** and Singh, Savita (2009). Macromolecular pro-drugs. XII. Primaquine conjugates: Synthesis and preliminary antimalarial evaluation. *Acta Pharmaceutica* **59**, 107-115.

18. **Singh, Prati Pal** and Nagpal, Trinity (2009). Colony-stimulating factors and malaria. In "Proceedings of National Academy of Sciences, India. Section-B, Volume 79 (Spl. Issue) "Human Parasitic Infections of Pharmaceutical and National Health Importance". (Eds.) Prati Pal Singh and V. P. Sharma. NASI, Allahabad, pp. 99-110.

19. **Singh, Prati Pal** and Nagpal, Trinity (2009). Neuroimmunomodulation and infectious diseases. In "Proceedings of International Conference on Neuroimmunomodulation and Infectious Diseases", (Eds.) Prati Pal Singh and Robert M. Donahoe, NIPER, S. A. S. Nagar, pp. 321-342.

20. Butani, Manoj and **Singh, Prati Pal** (2008). *In vitro* activity of triclosan against metronidazole-sensitive and -resistant strains of *Trichomonas vaginalis*. *J. Parasit. Dis.* **32**, 111-117.

21. Jhamb, Sarbjit Singh; Singh, Raman Preet and **Singh, Prati Pal** (2008). A comparision of conventional and radiometric methods for the assessment of anti-tubercular activity of drugs against *Mycobacterium tuberculosis* in mouse and macrophage models. *Ind. J. Tuberculosis* **55**, 70-76.

22. Singh, Ramanpreet; Jhamb, Sarbjit Singh and **Singh, Prati Pal** (2008). Iummnoenhancing effects of morphine during murine tuberculosis. In "Proceedings of International Conference on Opportunistic Pathogens in AIDS", pp 110-115.

23. Singh, Raman Preet**;** Jhamb, Sarbjit Singh and **Singh, Prati Pal** (2008). Effects of morphine during *Mycobacterium tuberculosis* H37Rv infection in mice. *Life Sci.* **82**, 308-314. (IF 2007: **2.348**)

24. **Singh, Prati Pal** and H. Jain (2007). Trichomoniasis: chemotherapy, drug resistance and new targets. *J. Parasit. Dis.* **31**, 79-91.

25. **Singh, Prati Pal** and Singal, Priya (2007). Morphine-induced neuroimmunomodulation in murine visceral leishmaniasis: the role(s) of cytokines and nitric oxide. *J. Neuroimmune. Pharmacol.* **2**, 338-351. (IF 2004: **3.319**)

26. **Singh, Prati Pal** and Kaur, Sukhraj (2006). Serum amyloid P-component in murine tuberculosis: induction kinetics and intramacrophage *Mycobacterium tuberculosis* growth inhibition, *in vitro*. *Microb. Infect.* **8**, 541-551. (IF 2004: **3.753**)

27. **Singh, Prati Pal** (2006). Malaria and macrophages: cellular and molecular basis of pathogenesis and immune protection. *J. Parasit. Dis.* **30**, 116-124.

28. Kaur, Amanpreet and **Singh, Prati Pal** (2005). *Plasmodium chabaudi chabaudi* AS infection in mice: role(s) of erythrophagocytosis and nitric oxide in parasite clearance. *J. Parasit. Dis.* **29**, 112-118.

29. **Singh, Prati Pal** and Kaur, Sukhraj (2005). Acute-phase reactants during murine tuberculosis: unknown dimensions and new frontiers. *Tuberculosis*, **85**, 303-315. (IF 2004: **1.935**)

30. Jain, Meenakshi; Khan, Shabana I; Tekwani, Babu L; Jacob, Melissa R; Singh, Savita; **Singh, Prati Pal** and Jain, Rahul (2005). Synthesis, antimalarial, antileishmainal and antimicrobial activities of some 8-quinolinamine analogues. *Bioorg. Med. Chem.* **13**, 4458-4466. (IF 2003: **2.185**)

31. Singal, Priya and **Singh, Prati Pal** (2005). *Leishmania donovani* amastigote component-induced colony-stimulating factors production by macrophages: modulation by morphine. *Microb. Infect.* **7**, 148-156. (IF 2004: **3.753**)

32. P. Singal and **Singh, P. P.** (2005). *Leishmania donovani* amastigote components-induced colony-stimulating factors production. *Parasitol. Int.* **54**, 9-20. (IF 2003: **1.205**)

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