The Medicinal Chemistry Research Group

Prof. Amir Azam
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Teaching Area: Spectroscopy and Organic Chemistry

Qualifications: M.Phil, PhD

Research Interests:

We focus to utilize different strategies to synthesize novel compounds targeting amoebasis. Each drug has a considerable toxicity profile. Metronidazole is reported to be carcinogenic. The strain has also developed resistance towards available drugs to some extent. Our research mainly directed to develop a novel drug for the disease with less toxicity.

- Design, synthesis and evaluation of novel heterocyclic compounds against Amoebasis.
- Metal complexes of Novel structures
- Extraction, Isolation and characterization of compounds from folklore medicinal plants.

- **Ph.D. awarded** : 14
- **Ph.D Thesis Submitted** : 2
- **Ph.D Students Supervising** : 5
- **Research Associates** : 3
- **Young Scientist** : 1

***On Going Research Project*:**

1. Council of Scientific and Industrial Research, (CSIR) Rs. 12. 11 Lacs (Nov.1, 2008-Oct.30, 2011)

***Research Projects Completed*:**

1. Department of Science & Technology (DST), Rs. 94.69 Lacs **(**April 1, 2005 – March 31, 2008)
2. Council of Scientific and Industrial Research (CSIR), Rs. 15.5 Lacs, (Sept. 1, 2002 –Aug. 30, 2005)
3. CCRUM, Ministry of Health, Govt. of India. Rs. 7.55 Lacs **(**April 1, 2005 – March 31, 2008)

List of Publications (since 2000):

1. Indrani Som, **Amir Azam**, Alok Bhattacharya and Sudha Bhattacharya**,** "Intra and Inter strain variation in Entamoeba histolytica and Entamoeba Spp.", **Int. J. Parasitol.**, 2000, 30, 723-728.

2. Bharti Neelam, Maurya Mannar R, Naqvi Fehmida, Sudha Bhattacharya, Alok, Bhattacharya Sudha, **Azam Amir**, "Palladium (II) complexes of NS donor ligands derived from S-methyldithiocarbazate, S-benzyl dithiocarbazate and thiosemicarbazide of antiamoebic agents", **Eur. J. Med. Chem.**, 2000, 35, 481-486.

3. Neelam Bharti, Mannar R. Maurya, Fehmida Naqvi, **A. Azam,** "Synthesis and antiamoebic activity of new cyclooctadiene ruthenium(II) complexes with 2-acetylpyridine and benzimidazole derivatives", **Bioorg. & Med. Chem. Lett.**, 2000, 10, 2243-2245**.**

4. Shailendra; Bharti, N.; Gonzalez Garza, M. T.; Cruz-Vega, D. E.; Garza, J. C.; Saleem, K.; Naqvi, F.; **Azam, A.**, "Synthesis, Characterization and Antiamoebic Activity of New Thiophene-2-carboxaldehyde Thiosemicarbazone derivatives and their Cyclooctadiene Ru (II) Complexes", **Bioorg. & Med. Chem. Lett.**, 2001,11, 2675-2678.

5. Sham M. Sondhi, Monika Johar, Rakesh Shukla, Ram Raghubir, Neelam Bharti, **Amir Azam,** "Synthesis, anti-inflammatory, analgaesic and anti-amoebic activity evaluation of some pyrimidobenzimidazole and pyrimidoimidazole derivatives", **Aust. J. Chem**., 2001, 54, 461-467.

6. Neelam Bharti, Shailendra, M. T. Gonzalez Garza, Delia E. Cruz-Vega, J. Castro Garza, Kishwar Saleem, Fehmida Naqvi, Mannar R. Maurya, **Amir Azam**, "Synthesis, characterization and antiamoebic activity of benzimidazole derivatives and their vanadium and molybdenum complexes", **Bioorg. Med. Chem. Lett.**, 2002, 12, 869-871.

7. Neelam Bharti, Shailendra, Simon J. Coles, Micheal B. Hursthouse, Thomas A. Mayer, Mata T. Gonzalez Garza, Delia E. Cruz-Vega, Benito D. Mata-Cardenas, Fehmida Naqvi, Mannar R. Maurya, **Amir Azam**, Synthesis, Crystal Structure and Enhancement of the Efficacy of Metronidazole Against Entamoeba histolytica by complexation with Palladium, Platinum and Copper, **Helv. Chim. Acta**, 2002, 85(9), 2704-2712.

8. Shailendra, Neelam Bharti, Fehmida Naqvi, **Amir Azam**, Synthesis, Characterization and Screening for Antiamoebic Activity of Palladium (II), Platinum (II) and Ruthenium (II) Complexes of NS donor Ligands, **Helv. Chim. Acta,** 2002, 85(9), 2713-2720.

9. Neelam Bharti, Kakul Husain, M.T. Gonzalez Garza, Delia E. Cruz-Vega, J. Castro-Garza, Benito D. Mata-Cardenas, Fehmida Naqvi and **Amir Azam,** Synthesis and *in vitro* Antiprotozoal Activity of 5-nitrothiophene-2- Carboxaldehyde Thiosemicarbazone Derivatives, **Bioorg. Med. Chem. Lett.,** 2002, 12(23), 3475-3478.

10. Sham M. Sondhi, Shefali Rajvanshi, Monika Johar, Neelam Bharti**, Amir Azam,** Ashok Kumar Singh, Anti-inflammatory, analgesics and antiamoebic activity evaluation of pyrimido[1,6-]benzimidazole derivatives synthesized by the reaction of ketoisothiocyanates with mono and Diamines, **Eur. J. Med. Chem.,** 2002, 37, 835-843.

11. Shailendra, Neelam Bharti, Fehmida Naqvi and **Amir Azam**, Synthesis, Spectral Studies and Screening for Amoebicidal Activity of New Palladium (II) Complexes derived from Thiophene-2-carboxaldehyde Thiosemicarbazones, **Bioorg. Med. Chem. Lett.,** 2003, 13, 689-692.

12. Neelam Bharti, Shailendra, Sangita Sharma Fehmida Naqvi and **Amir Azam** New Palladium (II) Complexes of 5-Nitrothiophene-2-carboxaldehyde Thiosemicarbazones: Synthesis, Spectral Studies and In vitro Antiamoebic activity, **Bioorg. Med. Chem.** 2003, 13, 2923-2929.

13. Mannar R. Maurya, Shilpa Khurana, Shailendra, **Amir Azam**,Wenjian Zhang and Dieter Rehder, Synthesis, Characterisation and Antiamoebic Studies of Dioxovanadium(v) Complexes Containing ONS Donor Ligands Derived From S-Benzyldithiocarbazate, **Eur. J. Inorg. Chem**. 2003, 1966-1973.

14. Shailendra Singh, Neelam Bharti, Fehmida Naqvi, **Amir Azam,** Synthesis, Characterization and in vitro antiamoebic activity of 5-nitrothiophene-2-carboxaldehyde thiosemicarbazones and their Palladium (ll) and Ruthenium (ll) complexes, **Eur. J. Med. Chem.,** 2004, 39, 459-465.

15. Neelam Bharti, Fareeda Athar, Mannar R. Maurya and **Amir Azam,** Synthesis, characterization and in vitro anti-amoebic activity of new palladium(II) complexes with 5-nitrothiophene-2-carboxaldehyde N(4)-substituted thiosemicarbazones, **Bioorg. Med. Chem.** 2004, 12, 4679-4684.

16. Mohammad Abid, **Amir Azam,** Synthesis and Antiamoebic activities of 1-N-Substituted Cyclised Pyrazoline Analogues of Thiosemicarbazones, **Bioorg. & Med. Chem.** 2005, 13, 2213 - 2220.

17. Sharma S, Athar F, Mannar RM, Naqvi F, **Azam A.** Novel bidentate complexes of Cu(II) derived from 5-nitrofuran-2-carboxaldehyde thiosemicarbazones with antiamoebic activity against *E. histolytica.* **Eur. J. Med. Chem.** 2005, 40, 6, 557-562

18. Singh S, Husain K, Athar F, **Azam A**. Synthesis and antiamoebic activity of 3,7-dimethyl-pyrazolo[3,4-e][1,2,4]triazin-4-yl thiosemicarbazide derivatives. **Eur. J. Pharm. Sci**.,(2005) 25, 2-3, 255 – 262.

19. Mohammad Abid, **Amir Azam**, 1-*N*-Substituted Thiocarbamoyl-3-Phenyl-2-Pyrazolines: Synthesis and In Vitro Antiamoebic Activities, **Eur. J. Med. Chem.,** 2005, 40, 9, 935-942.

20. Mohammad Abid, Kakul Hussain and **Amir Azam,** Synthesis and antiamoebic activity of new oxime ether derivatives containing 2-acetyl pyridine/2-acetyl furan, **Bioorg. Med. Chem. Letters,** 2005, 15,19, 4375-4329.

21. Fareeda Athar, Kakul. Husain, Mohammad. Abid, Subhash. M. Agarwal, Simon J. Coles, Micheal B. Hursthouse, Mannar R. Maurya, **Amir Azam** Synthesis, characterization and *In vitro* antiamoebic activity of Copper(II), Gold(I) and Ruthenium(II) complexes of metronidazole , **Chem. Biodiv**. 2005, 2, 1320-1330

22. Sharma S, Athar, Mannar R. Maurya, **Amir Azam,** Copper (II) complexes with substituted thiosemicarbazones of thiophene-2-carboxaldehyde: Synthesis, characterization and antiamoebic activity against *E. histolytica* **Eur. J. Med. Chem**., 2005, 40(12), 1414-1419.

23. Singh S, Athar F, **Azam A,** Synthesis, Spectral studies and In vitro Assessment for Antiamoebic Activity of New Cyclooctadiene Ruthenium(II) Complexes with 5-nitrothiophene-2-carboxaldehyde Thiosemicarbazones, **Bioorg. Med. Chem. Letters,** 2005, 15(24), 5424-8.

24. Asha Budakoti, Mohammed Abid, **Amir Azam;** Synthesis and antiamoebic activity of New 1-*N*- substituted thiocarbamoyl-3,5-diphenyl—pyrazoline derivatives and their Pd(ll) complexes, **Eur. J. Med. Chem**., 2006, 41(1), 63-70**.**

25. Mannar R. Maurya, Shalu Agarwal, Mohammad Abid, **Amir Azam**, Cerstin Bader, Martin Ebel and Dieter Rehder, Synthesis, characterisation, reactivity and in vitro antiamoebic activity of hydrazone based oxovanadium(IV), oxovanadium(V) and μ-bis(oxo)bis{oxovanadium(V)} complexes **Dalton Trans**., 2006, 21(7), 937-47.

26. Mohammad Abid and **Amir Azam** Synthesis, characterization and antiamoebic activity of 1-(thiazolo[4,5-b]quinoxaline-2-yl)-3-phenyl-2-pyrazoline derivatives, **Bioorg. Med. Chem. Letters,** 2006, 16(10), 2812-16

27. Maurya MR, Kumar A, Bhat AR, **Azam A**, Bader C, Rehder D, Dioxo-and Oxovanadium(V) complexes of thiohydrazones ONS donor ligands: synthesis, characterization, reactivity and antiamoebic activity. **Inorg. Chem**., 2006, 45(3) 1260-9.

28. Singh S, Athar F, Maurya MR, **Azam A˙,** Cyclooctadiene Ru(II) Complexes of Thiophene-2-carboxaldehyde derived thiosemicarbazones: synthesis, characterzation and antiamoebic activity, **Eur. J. Med. Chem**., 2006. 41,5, 592-598.

29. Pavar MC, Hanif K, **Azam A**, Lata S, Qadar Pasha MA, Pasha S. Structure activity relationship study between Ornithyl-Proline and Lysyl-Proline based tripeptidomimics as angiotensin-converting enzyme, **Bioorg. Med. Chem. Letters,** 2006, 15;16(8): 2117-21.

30. Neelam Bharti, Shailendra Singh, Fehmida Naqvi, and **Amir Azam**, Isolation and *in vitro* antiamoebic activity of iridoids isolated from *Kigelia pinnata*, **ARKIVOC** Journal, 2006, X, 69.

31. Mannar R. Maurya, Amit Kumar, Mohammad Abid, **Amir Azam**, Dioxovanadium(V) and μ-oxo bis[oxovanadium(V)] complexes containing thiosemicarbazone based ONS donor set and their antiamoebic activity **Inorganica Chimica Acta,** 2006, 359(8), 2439-47.

32. Asha Budakoti, Mohammad Abid and **Amir Azam** Syntheses, characterization and in vitro antiamoebic activity of new Pd(II) complexes with 1-N-substituted thiocarbamoyl-3,5-diphenyl-2-pyrazoline derivatives, **Eur. J. Med. Chem**., 2007, 42, 544-551.

33. Husain K, Abid M, **Azam A.,** Synthesis, Characterization and Antiamoebic Activity of New Indole-3-Carboxyldehyde Thiosemicarbazones and their Pd(II) Complexes. **Eur. J. Med. Chem**. 2007, 42(10):1300-8.

34**.** **A. Azam** and S.M.Agarwal, Targeting Amoebiasis: Status and New Developments. **Current Bioactive Compounds**, *(Review)* 2007, 3(2), 121-133.

35. Asha Budakoti, Abdul R. Bhat, Fareeda Athar, **Amir Azam,** Syntheses and Evaluation of 3-(3-bromo phenyl)-5-phenyl-1-(thiazolo [4,5-b] quinoxaline-2-yl)-2-pyrazoline Derivatives, **Eur. J. Med. Chem**. 2008, 43(8):1749-57.

36. Mohammad Abid, Subhash M Agarwal and **Amir Azam** Synthesis and antiamoebic activity of metronidazole thiosemicarbazone analogues, **Eur. J. Med. Chem**. 2008, 43(9):2035-9.

37. Husain K, Abdul Roouf Bhat, Fareeda Athar, **Azam A** New Pd(II)-complexes of the synthesized 1-N-substituted thiosemicarbazones of 3-indole carboxaldehyde: Characterization and antiamoebic assessment against E. histolytica, **Eur. J. Med. Chem**. 2008, 43(9):2016-28.

38. Abdul R. Bhat, Fareeda Athar, Robyn L. Van Zyl, Chien-Teng Chen, **Amir Azam**, Synthesis and biological evaluation of novel (N^4-substituted-amino)-{N^1[1-[4-(10,15,20-triphenyl-porphyrin-5-yl)-phenyl]-methylidene]}-thiosemicarbazone derivatives as new class of potential antiprotozoal agents, **Chem Biodivers**. 2008 5, 764-76.

39. Pandey S, Ali M, Bishnoi A, **Azam A**, Pandey S, Chawla HM., Quenching of Pyrene Flourescence by Calix[4]arene and Calix[4]resorcinarenes. **J. Flouresc.** 2008, 18(2) 533-9.

40. Husain K, Abid M, **Azam A**., Novel Pd(II) complexes of 1-N-substituted 3-phenyl-2-pyrazoline derivatives and evaluation of antiamoebic activity. **Eur. J. Med. Chem.** 2008, 43 (2): 393-403.

41. Agarwal SM, Jain R, Bhattacharya A, **Azam A**., Inhibitors of Escherichia coli serine acetyltransferase block proliferation of Entamoeba histolytica trophozoites. **Int. J. Parasitol**. 2008; 38(2): 137-41.

42. Humaira Parveen, Prince Firdoos Iqbal, **Amir Azam**, Synthesis and Characterization of a New Series of Hydroxy Pyrazolines, **Synthetic Communication**, 2008, 38(22), 3973-3983.

43. Prince Firdoos Iqbal, Abdul Roouf Bhat, **Amir Azam**, Antiamoebic coumarins from the root bark of *Adina cordifolia* and their new thiosemicarbazone derivatives. **Eur. J. Med. Chem.** 44 (2009) 2252-2259

44. Pandey S, **Azam A,** Pandey S, Chawla HM. Novel dansyl-appended calix[4]arene frameworks: fluorescence properties and mercury sensing. **Org Biomol Chem.** 2009 21; 7(2):269-279.

45. Asha Budakoti, Abdul R. Bhat, , **Amir Azam** Synthesis of New 2-(5-Substituted-3-Phenyl-2-Pyrazolinyl)-1,3-Thiazolino[5,4-b]Quinoxaline Derivatives and Evaluation of their Antiamoebic Activity, **Eur. J. Med. Chem**. 2009; 44,1317-1325.

46. Abdul R. Bhat, Asif I. Bhat, Fareeda Athar, **Amir Azam**, Synthesis, Characterization, and Anti-amoebic Screening of Core-Modified 5,20-Bis{2-{[(alkyl)(alkyl′) amino]methyl}ferrocen-1-yl}-10,15-diphenyl-21,23-dithiaporphyrin (=1,1′′-(10,15-Diphenyl-21,23-dithiaporphine-5,20-diyl)bis[2-{[(alkyl)(alkyl′)amino]methyl} ferrocene]) Derivatives, **Helvetica Chimica Acta**, 2009; 92,(8), 1644-1656.

47. Bhat AR, Athar F, **Azam A**., New derivatives of 3,5-substituted-1,4,2-dioxazoles: Synthesis and activity against *Entamoeba histolytica.* **Eur. J. Med. Chem**. 2009, 44(2):926-36.

48. Abdul R. Bhat, Fareeda Athar, **Amir Azam,** Bispyrazolines: Synthesis, Characterization and Antiamoebic Activity as Inhibitors of growth of *Entamoeba histolytica***, Eur. J. Med. Chem**. 2009; 44(1):426-31.

49. Mohammad Abid, Abdul Roouf Bhat, Fareeda Athar and **Amir Azam**, Synthesis, spectral studies and antiamoebic activity of new 1-*N*-substituted thiocarbamoyl-3-phenyl-2-pyrazolines, **Eur. J. Med. Chem**. 2009; 44(1):417-25.

50. Prince Firdoos Iqbal, Humaira Parveen, Abdul Roouf Bhat, Faisal Hayat, **Amir Azam,** Synthesis, characterization, antiamoebic activity and toxicity of novel bisdioxazole derivatives, 2009, 44, 4747-4751.

51. Mannar R. Maurya, Aftab Alam Khan, **Amir Azam**, Amit Kumar, Fernando Avecilla and J. Costa Pessoa, Vanadium complexes having $[VO]^{2+}$, $[VO_2]^{+}$and $[[(VO)_2O]^{2+}$ cores with binucleating dibasic tetradentate ligands: Synthesis, characterization, catalytic and antiamoebic activities, **Eur. J. Ing. Chem., 2009,** 35, 5377-5390.

52 Mannar R. Maurya, Aftab Alam Khan, Sameer Ranjan, **Amir Azam**, Neelima Mondal, Amit Kumar and J. Costa Pessoa, Binuclear oxidovanadium(IV) and dioxidovanadium(V) complexes of methylenebis(dibasic tridentate) ligands: synthesis, spectral characterisation, reactivity, catalytic and antiamoebic activities, **Dalton Trans,** 2010, 7;39(5):1345-60.

53 Shubha Pandey, Jyotsna R. Kar, **Amir Azam**, Siddharth Pandey and H. M. Chawla, Competitive Self and Induced Aggregation of Calix[4]arene Ethers and Their Interaction with Pinacyanol Chloride and Methylene Blue in Nonaqueous Media, **J. Solu.Chem.** 2010, 39: 107–120.

54. Iram Irfan, Nongyao Sawangjaroen, Abdul R. Bhat, **Amir Azam**, New Dioxazole Derivatives: Synthesis and Effects on the Growth of *Entamoeba histolytica* and *Giardia intestinalis*, Eur. J. Med. Chem. 2010 (In press)