




## University Faculty Details Page on DU Web-site

Title	<b>Dr.</b>	First Name	<b>Garima</b>	Last Name	<b>Khare</b>	Photograph 
Designation	<b>Assistant Professor</b>					
Department	<b>Biochemistry</b>					
Address (Campus)	<b>B.K. Bachhawat Block, University of Delhi South Campus, Benito Juarez Road, New Delhi-110021</b>					
(Residence)	<b>2054, Overseas Apartments, Sector-50, Noida - 201301</b>					
Phone No (Campus)	<b>011-24115209</b>					
(Residence)	-					
Mobile	<b>9810578184</b>					
Fax	<b>011-24115270</b>					
Email	<b>garima1822@yahoo.co.in</b>					
Web-Page	-					
<b>Education</b>						
	<b>Degree</b>	<b>Institution</b>		<b>Year</b>	<b>Details</b>	
	<b>Ph.D.</b>	<b>Department of Biochemistry, University of Delhi South Campus</b>		<b>2012</b>	<b>Subject: Biochemistry</b>  <b>Title: Characterization of important drug targets for the identification of novel inhibitors against <i>Mycobacterium tuberculosis</i></b>	
	<b>M.Sc.</b>	<b>Department of Biochemistry, University of Delhi South Campus</b>		<b>2006</b>	<b>First Division/71%</b>	
	<b>B.SC.</b>	<b>Daulat Ram College, University of Delhi</b>		<b>2004</b>	<b>First Division/74.7%</b>	
<b>Career Profile</b>						
	<b>Organization / Institution</b>	<b>Designation</b>		<b>Duration</b>	<b>Role</b>	
	<b>Department of Biochemistry, University of Delhi South Campus</b>	<b>Assistant Professor</b>		<b>November 2014 – till date</b>	<b>Teaching as well as Research</b>	
	<b>Department of Biochemistry, University of Delhi South Campus</b>	<b>IYBA Awardee</b>		<b>August 2014 – July 2017</b>	<b>Working on a research project funded under the “Innovative Young Biotechnologists Award” of Department of Biotechnology, Govt. of India for the year 2013</b>	
	<b>Department of Biochemistry, University of Delhi South Campus</b>	<b>Research Scientist</b>		<b>February 2012- July 2014</b>	<b>Working in the “Virtual Centre of Excellence for Co-ordinated research on Tuberculosis: Development of alternate strategies” funded by DBT, Govt.</b>	

			of India
Research Interests / Specialization			
<p>My research interests primarily pertain to the identification of novel inhibitors against <i>Mycobacterium tuberculosis</i>, the causative agent of tuberculosis, which can be developed into potent drugs against TB. Also, the research efforts are dedicated towards the understanding of host-pathogen interactions involved in TB pathogenesis.</p> <p>The work specifically is focused on the high throughput screening of various small molecule libraries against the growth of <i>Mycobacterium tuberculosis</i> by employing a rapid and robust strategy resazurin dye based cell screening assay. Subsequently, various assays are performed to check the drug likeness and selectivity index of the shortlisted compounds. Following this, all the hits are then evaluated for their ability to inhibit the intracellular survival of the pathogen which is performed by a fluorescence based method for screening of intraphagosomal growth of <i>M.tuberculosis</i>. Moreover, promising inhibitors are then evaluated in mice model of tuberculosis to check the efficacy of the compounds towards the treatment of the disease.</p> <p>Besides, my efforts are also invested into understanding of host-pathogen relationship and role of important mycobacterial genes in the pathogenesis and growth of the pathogen in the host by developing gene knockout mutants and correlating the loss of gene function with the establishment and progression of the disease and ability of the mutant pathogen to survive in the host.</p> <p>Another part of the work is focused on understanding the functional role of a very important acid induced transcriptional regulator of <i>M. tuberculosis</i> namely VirS. The bacterial responses to the host assault especially the acidic stress plays a crucial role in an early escape of the pathogen from the stressful conditions, however, these responses are poorly understood in the case of <i>M.tuberculosis</i>. VirS has been shown to be upregulated under acidic conditions suggesting that it might be involved in the acid induced responses and hence, the understanding of its function would provide useful insights into the host-pathogen interactions during such stressful conditions. We have carried out transcriptomics studies which has led to the identification of a number of genes regulated by VirS under acidic conditions. These genes are useful for delineating the mechanisms how the pathogen is able to counteract the acidic stress of the host.</p> <p>Apart from this, I am keenly interested in the iron metabolism of <i>M.tuberculosis</i> and had earlier extensively characterized the iron storage proteins (BfrA and BfrB) biochemically and biophysically. Recently, by employing the gene knockouts of these bacterioferritins, I have studied the role of these proteins in the maintenance of iron homeostasis and delineated differential roles of these two proteins under different iron conditions.</p> <p>Moreover, research efforts are focused on combating the growth of latent mycobacteria residing inside the bone marrow derived mesenchymal stem cells by using a combination of ABCG2 efflux pump inhibitors and the standard chemotherapy.</p>			
Teaching Experience (Subjects/Courses Taught)			
Recombinant DNA Technology, Cellular Signaling, Proteomics and Metabolomics, Practicals for Semester 1 and 2 students of M.Sc. Biochemistry, Course work for Ph.D. students (concepts of drug discovery)			

## Honors & Awards

- Received “Innovative Young Biotechnologist Award” for the year 2013 of the Department of Biotechnology, Government of India, with independent Grant-in-aid of Rs. 50.00 lakhs for research on drug discovery for the project entitled “Understanding the VirS mediated acid induced responses of *Mycobacterium tuberculosis* in maintaining the pH homeostasis *in vitro* and in host”, August 2014 – July 2017.
- Received first prize in Young Scientist Oral presentation (Symposium on “Microbes in Health and Agriculture”, 2012, held at Jawaharlal Nehru University, Delhi).
- Received second prize in Oral presentation (National Science Day Symposium, 2012, held at University of Delhi South Campus).
- Received best poster award (UGC-SAP symposium, 2011, held at Department of Biochemistry, University of Delhi South Campus).
- Received second prize in poster presentation (Symposium on “Understanding and Managing Pathogenic Microbes”, 2010, held at Institute of Microbial Technology, Chandigarh).
- Senior Research Fellowship (2008 – 2012). Senior Research Fellowship was availed from CSIR (2008 – 2011) and from DBT project (2011 – 2012).
- Qualified CSIR NET-JRF examination - Junior Research Fellowship (2006 - 2008).

## Publications (LAST FIVE YEARS)

### In Indexed/ Peer Reviewed Journals

<u>Year of Publication</u>	<u>Title</u>	<u>Journal</u>	<u>Co-Author</u>
2018	Necrosis driven triglyceride synthesis primes macrophages for inflammation during <i>Mycobacterium tuberculosis</i> infection	Frontiers in Immunology	Neetika Jaishingania, Stanzin Dawa, Kaurab Singh, Ananya Nandy, Dilip Menon, Purva D. Bhandari, Garima Khare, Anil Tyagi and Sheetal Gandotra
2018	Identification of <i>Mycobacterium tuberculosis</i> BioA inhibitors by using structure based virtual screening.	Drug Design, Development and Therapy	Swati Singh, Ritika Kar Bahal, Prahlad C. Ghosh and Anil K. Tyagi
2018	A combination of docking and cheminformatics approaches for the identification of inhibitors against 4'phosphopantetheinyl transferase of <i>Mycobacterium tuberculosis</i>	RSC Advances	Akshay Rohilla and Anil K. Tyagi

2017	Virtual Screening, pharmacophore development and structure based similarity search to identify inhibitors against IdeR, a transcription factor of <i>Mycobacterium tuberculosis</i> .	Scientific Reports	Akshay Rohilla and Anil K. Tyagi
2017	Differential roles of iron storage proteins in maintaining the iron homeostasis in <i>Mycobacterium tuberculosis</i> .	PLoS ONE	Prachi Nangpal and Anil K. Tyagi
2015	Novel isoniazid-amidoether derivatives: Synthesis, characterization and antimycobacterial activity evaluation	Med. Chem. Commun	Deepak Kumar, Beena Negi, Saqib Kidwai, Anil K. Tyagi, Ramandeep Singh and DS Rawat.
2014	Synthesis of novel 1,2,3-triazole derivatives of isoniazid and their <i>in vitro</i> and <i>in vivo</i> antimycobacterial activity evaluation	European Journal of Medicinal Chemistry	Deepak Kumar, Beena, Saqib Kidwai, Anil K. Tyagi, Ramandeep Singh and Diwan S. Rawat.
2013	Whole cell screening based identification of inhibitors against the intraphagosomal survival of <i>Mycobacterium tuberculosis</i> .	Antimicrobial Agents and Chemotherapy	Praveen Kumar and Anil K. Tyagi.
2013	KefB inhibits phagosomal acidification but its role is unrelated to <i>M. tuberculosis</i> survival in host.	Scientific Reports	P. Vineel Reddy, Pragya Sidhwani and Anil K. Tyagi
2013	Unique Residues at the 3-fold and 4-fold axis of Mycobacterial Ferritin are required in Oligomer Switching.	Biochemistry	Prachi Nangpal and Anil K. Tyagi.
<b>Articles</b>			
1. Neetika Jaisinghania, Stanzin Dawa, Kaurab Singh, Ananya Nandy, Dilip Menon, Purva D. Bhandari, Garima Khare, Anil Tyagi and Sheetal Gandotra (2018). Necrosis driven triglyceride synthesis primes macrophages for inflammation during <i>Mycobacterium tuberculosis</i> infection. <i>Frontiers in Immunology</i> . doi: 10.3389/fimmu.2018.01490.			
2. Swati Singh, Garima Khare <sup>1</sup> , Ritika Kar, Prahlad C. Ghosh and Anil K. Tyagi <sup>1</sup> (2018). Identification of <i>Mycobacterium tuberculosis</i> BioA inhibitors by using structure based virtual screening. <i>Drug Design, Development and Therapy</i> , 12, 1065- 1079 ( <sup>1</sup> co-corresponding author).			
3. Akshay Rohilla, Garima Khare <sup>1</sup> and Anil K. Tyagi <sup>1</sup> (2018). A combination of docking and cheminformatics approaches for the identification of inhibitors against 4'phosphopantetheinyl transferase of <i>Mycobacterium tuberculosis</i> . <i>RSC Advances</i> , 8, 328. ( <sup>1</sup> co-corresponding author).			

4. Akshay Rohilla, Garima Khare<sup>1</sup> and Anil K. Tyagi<sup>1</sup> (2017). Virtual Screening, pharmacophore development and structure based similarity search to identify inhibitors against IdeR, a transcription factor of *Mycobacterium tuberculosis*. Accepted in Scientific Reports, 7: 4653. (<sup>1</sup>co-corresponding author)
5. Garima Khare, Prachi Nangpal and Anil K. Tyagi (2017). Differential roles of iron storage proteins in maintaining the iron homeostasis in *Mycobacterium tuberculosis*. PLoS ONE 12 (1): e0169545.
6. Garima Khare, Priyanka Chauhan, Prachi Nangpal, Ritika Kar and Anil Kumar Tyagi. (2016). Tuberculosis: current situation, challenges and intervention strategies. In A. Datta and V. P. Sharma (Eds.), Recent advances in communicable and non-communicable diseases. Capital Publishing group (pp 77-109). New Delhi, India.
7. Deepak Kumar, Garima Khare, Beena Negi, Saqib Kidwai, Anil K. Tyagi, Ramandeep Singh and DS Rawat. (2015) Novel isoniazid-amidoether derivatives: Synthesis, characterization and antimycobacterial activity evaluation. Med. Chem. Commun. DOI: 10.1039/C4MD00288A.
8. Deepak Kumar, Beena, Garima Khare, Saqib Kidwai, Anil K. Tyagi, Ramandeep Singh and Diwan S. Rawat. (2014) Synthesis of novel 1,2,3-triazole derivatives of isoniazid and their in vitro and in vivo antimycobacterial activity evaluation. European Journal of Medicinal Chemistry 23 (81): 301-313.
9. Garima Khare<sup>1</sup>, Praveen Kumar and Anil K. Tyagi. (2013). Whole cell screening based identification of inhibitors against the intraphagosomal survival of *Mycobacterium tuberculosis*. Antimicrobial Agents and Chemotherapy 57(12): 6372-6377 (<sup>1</sup>co-corresponding author)
10. Garima Khare, P. Vineel Reddy, Pragya Sidhwani and Anil K. Tyagi. (2013) KefB inhibits phagosomal acidification but its role is unrelated to M. tuberculosis survival in host. Scientific Reports 3(3527) doi:10.1038/srep03527.
11. Garima Khare, Prachi Nangpal and Anil K. Tyagi. (2013). Unique Residues at the 3-fold and 4-fold axis of Mycobacterial Ferritin are required in Oligomer Switching. Biochemistry 52(10): 1694-1704.
12. Garima Khare, Ritika Kar and Anil K. Tyagi. (2011). Identification of Inhibitors against *Mycobacterium tuberculosis* Thiamin Phosphate Synthase, an Important Target for the Development of Anti-TB Drugs. PLoS ONE 6(7): e22441.
13. Garima Khare, Vibha Gupta, Prachi Nangpal, Rakesh K. Gupta, Nicholas K. Sauter and Anil K. Tyagi. (2011). Ferritin Structure from *Mycobacterium tuberculosis*: Comparative Study with Homologues Identifies Extended C-terminus involved in Ferroxidase Activity. PLoS ONE 6(4): e18570.
14. Nidhi Jatana, Sarvesh Jangid, Garima Khare, Anil K. Tyagi and Narayanan Latha. (2011). Molecular modeling studies of Fatty acyl-CoA synthetase (FadD13) from *Mycobacterium tuberculosis* – a potential target for the development of antitubercular drugs. J. Mol. Model. 17(2): 301-313.
15. Vibha Gupta, Rakesh K. Gupta, Garima Khare, Dinakar M. Salunke, Avadhesh Surolia and Anil K. Tyagi. (2010). Structural Ordering of Disordered Ligand-Binding Loops of Biotin Protein Ligase into Active Conformations as a Consequence of Dehydration. PLoS ONE 5(2): e9222.
16. Garima Khare, Vibha Gupta, Rakesh K. Gupta, Radhika Gupta, Rajiv Bhat and Anil K. Tyagi. (2009). Dissecting the Role of Critical Residues and Substrate Preference of a Fatty Acyl-CoA Synthetase (FadD13) of *Mycobacterium tuberculosis*. PLoS ONE 4(12): e8387.
17. Vibha Gupta, Rakesh K. Gupta, Garima Khare, Dinakar M. Salunke and Anil K. Tyagi. (2009). Crystal

Structure of Bfr A from *Mycobacterium tuberculosis*: Incorporation of Selenomethionine Results in Cleavage and Demetallation of Haem. PLoS ONE. 4(11): e8028.

18. C. M. Santosh Kumar, Garima Khare, C.V. Srikanth, Anil K. Tyagi, Abhijit A. Sardesai and Shekhar C. Mande. (2009). Facilitated Oligomerization of Mycobacterial GroEL: Evidence for Phosphorylation-Mediated Oligomerization. J. Bacteriol. 191(21): 6525-6538.
19. Debashree Basu, Garima Khare, Shashi Singh, Anil K. Tyagi, Sanjeev Khosla, Shekhar C. Mande. (2009). A novel nucleoid-associated protein of *Mycobacterium tuberculosis* is a sequence homolog of GroEL. Nucleic Acids Res. 37(15): 4944-4954.
20. Mohd Akif, Garima Khare, Anil K. Tyagi, Shekhar C. Mande, and Abhijit A. Sardesai(2008). Functional Studies on Multiple Thioredoxins from *Mycobacterium tuberculosis*. J. Bacteriol. 190(21): 7087-7095.
21. Vibha Gupta, Rakesh K. Gupta, Garima Khare, Dinakar M. Salunke and Anil K. Tyagi. (2008). Cloning, expression, purification, crystallization and preliminary X-ray crystallographic analysis of bacterioferritin A from *Mycobacterium tuberculosis*. ActaCrystallogr Sect F StructBiolCrystCommun 64(Pt 5): 398-401.
22. Vibha Gupta, Rakesh K. Gupta, Garima Khare, Avadhesh Surolia, Dinakar M. Salunke and Anil K. Tyagi. (2008). Crystallization and preliminary X-ray diffraction analysis of biotin acetyl-CoA carboxylase ligase (BirA) from *Mycobacterium tuberculosis*. ActaCrystallogr Sect F StructBiolCrystCommun 64(Pt 6): 524-527.
23. Shruti Jain, Garima Khare, Pushplata Tripathi and Anil K. Tyagi. (2008). An inducible system for the identification of target genes for a regulator in mycobacteria. American Journal of Biochemistry and Biotechnology 4(3): 226-230.

### Conference Presentations

#### Invited talks/Oral Presentations:

1. Garima Khare. Identification and evaluation of inhibitors against important drug targets of *Mycobacterium tuberculosis* by using structure based virtual screening. Presented as a invited speaker at National Conference on “Contemporary Researches in Computer Aided Drug Designing”, held at Assam University, Silchar, 10<sup>th</sup> – 11<sup>th</sup> March 2018. (Invited talk)
2. Garima Khare. Identification of inhibitors against Thiamin Phosphate Synthase (MtTPS) of *Mycobacterium tuberculosis* by homology modeling. Presented at “Microbes in Health and Agriculture”, December 7-10, 2015, held at Jawaharlal Nehru University, Delhi.
3. Garima Khare. Determination of the structure of Thiamin Phosphate Synthase (MtTPS) of *Mycobacterium tuberculosis* by homology modeling and identification of inhibitors by using virtual screening. Presented at National Science Day Symposium, 2012, held at University of Delhi South Campus.
4. Garima Khare. Determination of the structure of Thiamin Phosphate Synthase (MtTPS) of *Mycobacterium tuberculosis* by homology modeling and identification of inhibitors by using virtual screening. Young Scientist Oral presentation at Symposium on “Microbes in Health and Agriculture”, 2012, held at Jawaharlal Nehru University, Delhi.

#### Poster Presentations:

1. Garima Khare, Praveen Kar and Anil K. Tyagi. Whole cell screening based identification of inhibitors

against *Mycobacterium tuberculosis*. Presented at International Conference on “Innovation in TB diagnostics, Drug targets and Biomarkers” held at JBTDRC, Mahatma Gandhi Institute of Medical Sciences, Sevagram, Wardha on 27<sup>th</sup> – 28<sup>th</sup> January 2014.

2. Garima Khare, Ritika Kar and Anil K. Tyagi. Identification of inhibitors Against *Mycobacterium tuberculosis* Thiamin Phosphate Synthase, an important target for development of anti-TB drugs. Presented at interdepartmental UGC-SAP symposium organized by Department of Biochemistry, UDSC (March 2011).
3. Garima Khare, Vibha Gupta, Rakesh K. Gupta, Radhika Gupta, Rajiv Bhat and Anil K. Tyagi. Dissecting the role of critical residues and substrate preference of a Fatty Acyl-CoA Synthetase (FadD13) belonging to a virulence associated operon of *Mycobacterium tuberculosis*. Presented at international symposium “Understanding and Managing Pathogenic Microbes (UMPM 2010)” organized by Institute of Microbial Technology, Chandigarh (January 2010).
4. Garima Khare, Vibha Gupta, Rakesh K. Gupta, Rajiv Bhat and Anil K. Tyagi. Biochemical characterization of FadD13 from *Mycobacterium tuberculosis* and identification of residues crucial for the enzymatic activity. Presented at international symposium “Emerging trends in tuberculosis research: Biomarkers, Drugs and Vaccines” organized by ICGEB, Delhi (December 2008).

#### Professional Societies Memberships

- Life member of “The Society of Biological Chemists (India)”.
- Life member of “Association of Microbiologists of India”.

#### Projects (Major Grants / Collaborations)

##### Completed :

Project Title: Understanding the VirS mediated acid induced responses of *Mycobacterium tuberculosis* in maintaining the pH homeostasis *in vitro* and in host

Funding Agency: Department of Biotechnology, Government of India. The project is part of the “Innovative Young Biotechnologist Award” for the year 2013 with independent Grant-in-aid of Rs. 50.00 lakhs. August 2014 – July 2017.

##### Approved (Sanction letter awaited):

1. “Drug discovery approaches for the effective control of tuberculosis – target based virtual screening and whole cell screening of medicinal plants”- In collaboration with Dr. Anupam Talukdar, Assam University and Dr. Pankaj Chetia, Dibrugarh University. Approved by DBT.