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### **Research Interests**

#### **Host-Pathogen interaction during Infection (Tuberculosis)**

The emergence of drug resistant strains of tuberculosis has contributed to the fact that *Mycobacterium tuberculosis* remains one of the most successful pathogens. The laboratory uses cell biology, protein chemistry, tissue culture and recombinant DNA based approaches. The main focus is on identifying multifunctional housekeeping enzymes of both the host and pathogen that could be essential in the process of infection and survival of intracellular *M.tuberculosis*. The laboratory is also involved in basic aspects such as bacterial iron metabolism and infection as well as applied aspects such as identifying novel drug targets and biomarkers for TB.

Recently, our laboratory has identified that the *M.tb* H37Rv glycolytic enzyme Glyceraldehyde-3-phosphate dehydrogenase (GAPDH; Rv1436) is localized at the bacterial surface, where it plays a role in sequestration and internalization of human iron transport protein-transferrin., Since the last several years studies have focused primarily on the role of small iron chelators- the mycobactins and carboxymycobactin for iron uptake in *M.tb*. Ours is the first report to demonstrate the presence of a novel pathway for iron uptake via mycobacterial transferrin receptors. Further studies are aimed at understanding the detailed events in this process. In addition, efforts are also aimed at the analysis and characterization of other multifunctional proteins that play a role in virulence.

## Research Publications/Book Chapter

1. Malhotra H, Sheokand N, Boradia VM, **Raje CI**, Raje M Exosomes, tunable nano vehicles for macromolecular delivery of transferrin and lactoferrin to specific intracellular compartment., *Journal of Biomedical Nanotechnology*, (2015) Accepted for publication
2. Boradia VM, Malhotra H, Thakkar JS, Tillu VA, Vuppala B, Patil P, Sheokand N, Sharma P, Chauhan AS, Raje M, **Raje CI** *Mycobacterium tuberculosis* acquires iron by cell surface sequestration and internalization of human holo-transferrin. *Nature Communications* 5 (2014), Article number: 4730, doi:10.1038/ncomms5730. (**Impact Factor 11.47**)
3. Boradia VM, Raje M and **Raje CI** Protein Moonlighting in Iron Metabolism-Glyceraldehyde-3-phosphate dehydrogenase (GAPDH). *Biochemical Society Transactions* (2014), 42 (6) 1796-1801 DOI: 10.1042/BST20140220.
4. Sheokand N, Malhotra H, Kumar S, Tillu VA, Chauhan AS, **Raje CI** and Raje M. Moonlighting cell surface GAPDH recruits Apo Transferrin to effect iron egress from mammalian cells. *J. Cell Sci.* (2014) Oct 1;127 (Pt 19):4279-91. doi: 10.1242/jcs..
5. Sheokand N, Kumar S, Malhotra H, Tillu V, **Raje CI**, Raje M Secreted glyceraldehyde-3-phosphate dehydrogenase is a multifunctional autocrine transferrin receptor for cellular iron acquisition. *Biochem. Biophys. Acta.* (2013), 830(6):3816-27.
6. Rawat P, Kumar S, Sheokand N, **Raje CI**, Raje M. The multifunctional glycolytic protein glyceraldehyde-3-phosphate dehydrogenase (GAPDH) is a novel macrophage lactoferrin receptor *Biochem. Cell Biol.* (2012), 90(3):329-38.
7. Kumar S, Sheokand N, Mhadeshwar MA, **Raje CI**, Raje M. Characterization of glyceraldehyde-3-phosphate dehydrogenase as a novel transferrin receptor. *Int.J. Biochem. Cell Biol.* (2012), 44:189– 199.
8. Kathania M, **Raje CI**, Raje M, Dutta RK, Majumdar S. Bfl-1/A1 acts as a negative regulator of autophagy in mycobacteria infected macrophages. *Int. J. Biochem. Cell Biol.* (2011), 43(4):573-85.
9. **Raje CI**, Kumar S, Harle A, Nanda JS and Raje M. The macrophage cell surface Glyceraldehyde-3-phosphate dehydrogenase is a novel transferrin receptor. *J. Biol. Chem.* (2007), 282(5):3252-3261.
10. Boradia VM, Raje M and **Raje CI\*** Cell Surface *Mycobacterium tuberculosis* GAPDH functions as a transferrin receptor. **Invited book chapter** submitted for the upcoming book (Dec 2015) Moonlighting Proteins: Novel Virulence Factors in Bacterial Infection. John Wiley and Sons, Editor. Dr. Brian Henderson.

### **Conferences/Abstracts**

1. Boradia VM, Malhotra H, Thakkar JS, Tillu VA, Sheokand N, Raje M and **Raje CI** Mycobacterial Glyceraldehyde-3-phosphate dehydrogenase (GAPDH) is involved in the siderophore independent acquisition of transferrin iron. **Oral presentation/ Abstract/ Poster presentation** at the Biochemical Society Conference entitled Biological and Biomedical Consequences of Protein Moonlighting 29<sup>th</sup>-30<sup>th</sup> July 2014.
2. Boradia V, Tillu VA, Raje M, **Raje CI** *Mycobacterium tuberculosis* H37Rv glyceraldehyde-3-phosphate dehydrogenase – a receptor for human transferrin. Abstract/Poster Bangalore Microscopy Course, NCBS, Bangalore, September 2012.
3. Kathania M, Raje M, **Raje CI**, Dhiman R and Majumdar S Colocalization of Autophagosome Marker, LC3 with *Mycobacterium tuberculosis* H37Rv bearing phagosomes in bfl-1/A1 siRNA treated THP-1 cells. Abstract/Poster Emerging Trends in Tuberculosis Research: Biomarkers, Drugs & Vaccines ICGEB, December, 2008.

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2. Department of Science and Technology (DST)