

**About me:**

Ravi Kumar has finished his PhD from Molecular biophysics unit of Indian Institute of Science, Bangalore. During his PhD, he has worked on mycobacterial transcription factors and studied their structural as well as biochemical aspects of transcription regulation. Currently his group at CFTRI is focusing on two main themes. One of which is Diabetes, a life style associated disorder where the role of food molecules and the underlying mechanism of action is being evaluated in terms of insulin release from pancreatic-beta cells. In another theme, his group is deciphering the mechanism of chromosomal condensation and segregation in Mycobacterial species that affects the livestock, poultry and fish.

**Research area:****1. Role of food molecules in insulin release from pancreatic-beta cells:**

Food molecules which were regarded as to have only nutritional value, are now considered to have health-promoting properties. In recent past, some studies have been carried out to demonstrate the beneficial role of food molecules in many lifestyle disorders. For example, flavonoids which are widely distributed in fruits and other parts of the plant, have been shown to have antioxidant, anti-inflammatory, anti-carcinogenic and coronary protection activities. In this regard, our group focuses on dietary molecules which may induce the insulin secretion from pancreatic-beta cells. We investigate the detailed molecular events and signaling cascades playing a crucial role in insulin secretion. Such studies would enhance our understanding towards food molecules to develop a personalized diet for better health.

**2. Understanding the mechanism of chromosomal condensation and segregation:**

The DNA molecule is an elegant device created during evolution to store the memory of the genetic information. DNA molecules carrying genetic information are inordinately long in size and therefore cannot be accommodated in the cells as such. To overcome this problem cells condense the DNA molecule many folds. In the past few years, people have shown a resurgence of interest in bacterial cell division that involves the key processes of DNA replication,

chromosome segregation and septa formation. Unlike its eukaryotic counterpart which has distinct stages for DNA replication, chromosome condensation and chromosome segregation followed by cytokinesis, bacterial DNA replication, condensation and segregation events are not seen as distinct phases but occurs progressively as the DNA replicates during cell division.

Our group is working to decipher the mechanism of chromosomal condensation and segregation in Mycobacterial species and our model organism is *M. smegmatis*. Many mycobacterial bacilli (*M. avium*, *M. bovine*, *M. marianum*, *M. paratuberculosis* etc.) causes infection to ruminants, poultry and fishes resulting in decreased product quality and overall reduction of the economy. Furthermore, consumption of such products poses a risk to human health. This study could pave the way for identification and characterization of novel drug targets as well as potential food molecules to contain such diseases.

Awards:

- 1) SERB young scientist start-up grant.
- 2) DST-INSPIRE faculty award.
- 3) International Travel Fellowship, Department of Science and Technology, Govt. of India

#### **Publications/Book chapters:**

- **Jaiswal RK**, Prabha TS, Manjeera G, Gopal B. *Mycobacterium tuberculosis* RsdA provides a conformational rationale for selective regulation of  $\sigma$  factor activity by proteolysis. *Nucleic Acids Res*, 2013, 41, 3414-23.
- **Jaiswal RK**, Manjeera G, Gopal, B. Role of a PAS sensor domain in the *Mycobacterium tuberculosis* transcription regulator Rv1364c. *Biochem. Biophys. Res. Comm.* 2010, 398, 342-349.
- Thakur KG\*, **Jaiswal RK\***, Shukla JK, Praveena T, Gopal B. Over-expression and purification strategies for recombinant multi-protein oligomers: A case study of *Mycobacterium tuberculosis*  $\sigma$ /anti- $\sigma$  factor protein complexes. *Prot. Exp. Purif.* 2010, 74, 223- 230.

- Conformational features of sigma factor/anti-sigma complexes: a versatile module linking environmental stimuli with bacterial transcription. Joshi A, Shukla JK, **Jaiswal RK**, Goutam K, Gopal B. 2013, Iisc Press-WSPC publication.

**Symposia/conferences/workshops attended:**

- Participated in International Conference on Biomolecular Forms and Functions organized by Indian Institute of Science, India from 8th-11th January 2013.
- Participated and presented a poster titled “Mycobacterium tuberculosis RsdA provides a conformational rationale for selective regulation of  $\sigma$  factor activity by proteolysis” in the conference on “Structural biology of molecular transport” held at Murnau, Germany from 17th-20th October, 2012.
- Presented a poster titled “Regulation of Mycobacterium tuberculosis transcription regulator Rv1364c by a PAS sensor domain” in the meeting on “Regulation of biochemical and cellular processes in diverse systems” held at Indian Institute of Science, Bangalore from 13th-15th December, 2010.
- Participated in Indian Institute of Science centenary conference from 13th-16th December 2008 at Indian Institute of Science, Bangalore.
- Participated in Mass spectrometry conference and workshop organized jointly by Indian Institute of Science and Jawaharlal Nehru Centre for Advanced Science and Research at Bangalore from 3rd-5th November, 2008.
- Participated in CCP4 workshop on Computational Crystallography organized by Molecular Biophysics Unit, Indian Institute of Science, Bangalore during February 18th-22th, 2008.
- Attended ACT-X Tenth Asian Conference on Transcription jointly organised National Centre for Biological Sciences, Indian Institute of Science and Jawaharlal Nehru Centre for Advanced Science and Research, India from 13th-16th January 2008.

- Participated in Indian Academy of Science and Chinese Academy of Science organized by Indian Institute of Science, India from 21st-23rd October 2007.

**Students:**

1. Suchitra Pradhan (PhD student)
2. Mahindra VP (JRF)
3. Swetha K (Project student)
4. Swathy VB (JRF)