Multidisciplinary Centre for Advance Research and Studies (MCARS),
Jamia Millia Islamia University

The Wellcome Trust/DBT India Alliance (IA/I/15/2/502086)

Advertisement Date: 24th Jan 2017

Applications are invited for two posts of **JRF in "The Wellcome Trust/DBT India Alliance (IA/I/15/2/502086) Intermediate Fellowship".**

Project entitled: "Chromosome cohesion mediated regulation of homologous recombination process in *E. coli*". **The details regarding project and JRF positions are attached as an annexure.**

Educational Qualifications: MSc (in any area of **Life-sciences/Bioinformatics**) with a minimum of **55 % aggregate marks** (equivalent CGPA). For **JRF-1**, a prior research experience in programming/scripting languages (PERL, R, MATLAB, programming language PYTHON and C++) and for **JRF-2**, a prior research experience fluorescence microscopy or Flow cytometry or molecular biology techniques (**JRF -2**) will be preferred. Candidates with CSIR/UGC/ DBT/ICMR JRF/DST INSPIRE-PHD fellowship as well as interested in pursuing a Ph.D program will be preferred.

Fellowship: - As per **The Wellcome Trust/DBT India Alliance** rule

Duration: The appointment will be purely on temporary basis for first year initially which can be further extended based on the performance of the candidate. However, the duration of JRF is co-terminus with the duration of the Project and will have no financial liability beyond duration of the project.

Note: No TA/DA will be paid to candidates appearing for the interview.

How to Apply: A cover letter (maximum one page-explaining about yourself and interest in the research project) along with your detailed CV should be sent to **Dr. Mohan C Joshi** via email, msaturnjosh@gmail.com, by **20th Feb 2017**.

In your application, do mention the JRF position (JRF-1 or 2) you are applying for.

Date of Interview: - After preliminary screening, successful candidates will be informed over email and will be asked to appear for the interview with their original certificates. No separate letter will be issued for the interview.

Dr. Mohan C Joshi

Assistant Professor
MCARS, Jamia

Annexure

Background: Genetic diversity in microbes is driven by homologous recombination (HR) by accumulating mutations and exchanging genetic material via horizontal gene transfer (HGT) under-stress. HR is an evolutionarily conserved process across organisms, however it remains hitherto unknown how this mechanism regulates efficiency & fidelity of DNA double strand break DSB repair and HGT in bacteria. In eukaryotes, HR mediated processes are promoted during S/G2 phase (cohesion) and repressed during G0 but due to strong indirect effects of cohesion mutants it remains difficult to test this hypothesis experimentally.

In our recent study, we demonstrated that replication and segregation are not simultaneous in *E. coli* (cohesion). Further, cohesion timing along the genome is not consistent, as few regions of the chromosome experienced prolonged cohesion (patchy cohesion) (**Joshi et al., PNAS 2011**). Furthermore, we demonstrated that patchy cohesion in *E. coli* is regulated by a single subunit protein (SeqA) (**Joshi et al., PLOS Gen. 2013**). These discoveries in *E. coli* provide a mutable and highly attractive model system to study HR mediated processes during cell-cycle. Our preliminary data demonstrated efficiency of DSB repair is modulated by cohesion timing along the *E. coli* genome.

These findings for the first time provide empirical evidences that HR mediated processes are modulated during cell cycle in *E. coli*. **My lab at newly established Multidisciplinary Centre for Advance Research and Studies (MCARS) at Jamia Millia Islamia (JMI) University is seeking highly motivated Junior Research Fellows** to undertake following questions;

JRF-1: What is the chromosome organization during DNA double strand break repair (DSB) repair?

Multi-color high-resolution mapping of chromosome organization using single-locus tagging of genetic loci (**Joshi et al., PNAS (2011) and PLOS Genetics (2013)**) as well as a recently developed multi-color chromosome painting approach, have shown that bacterial nucleoid organization is dynamic during cell-cycle. We would like to investigate the organization and dynamics of genetic loci/domain/nucleoid during cell-cycle. **Experimental detail:** The approach will include genome engineering (Linear DNA recombineering), large DNA fragment isolation (Pulse Field Gel Electrophoresis, PFGE), **high-resolution microscope imaging** (using high-end wide-field microscope equipped with 10 filter cube turret, automated image capturing, time lapse imaging and EMCCD camera), image processing, software development, statistical tools and 3D image rendering & analysis.

JRF-2: How does cohesion regulate HR mediated DSB repair efficiency and fidelity along the *E. coli* genome?

It has been assumed that any DSB across genome is repaired with similar efficiency and fidelity. However, our preliminary data for the first time demonstrates that DSB repair efficiency as well as fidelity is biased for specific regions of genome that remains co-localized for prolonged duration (cohesion) during cell-cycle. I hypothesize that prolong association of sister strands during cell-cycle promotes efficient DSB repair. **Experimental detail:** To test the hypothesis, unique restriction enzyme sites will be engineered across genome and repair efficiency will be measured by determining cells viability post-DSB induction (CFUs). A mutant antibiotic gene (with a frame-shift mutation in promoter region) will be engineered across genome and repair fidelity will be tested by resistant colony formation in different genetic backgrounds.