Indian Institute of Science
Centre for BioSystems Science and Engineering
BSSE Seminar

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Therapeutic and prophylactic nanomaterials for biomedical applications

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ABSTRACT
Temperate bacteriophage are amongst the simplest organisms that can be said to make a developmental decision. Upon infecting a bacterium, they either produce many offspring and kill the bacterium (lysis), or lie dormant and replicate along with the bacterium (lysogeny). This lysis-lysogeny decision depends on the state of the bacterium, environmental conditions, and interestingly the number of phage that have simultaneously infected the bacterium. Phage lambda can even distinguish between one or two viral genomes being present in an infected cell. I will discuss work in which we examined computer models of millions of small genetic networks to see what features are required to produce such an ability to count genomes and bias the developmental decision accordingly. We found that the networks that did this in the most robust way tended to separate the functions of decision-making and decision-maintenance, which may provide an interesting way of looking at other developmental decisions. If there is time I'll also describe population dynamics models of phage-bacteria ecosystems which indicate why such a counting strategy may be useful for phage when they compete with other phage.

ABOUT THE SPEAKER:
Dr. Praveen Kumar Vemula is a faculty at the Institute for Stem Cell Biology and Regenerative Medicine (inStem), Bangalore. His work spans the fields of biomaterials, drug delivery, medical devices, and chemical biology. He has published >60 peer-reviewed papers, and has >20 issued or pending national/international patents. Several technologies developed in his lab have formed the foundation for multiple products on the market and currently under development. His technologies led to the launch of four companies including Sepio Health (anti-pesticide technologies company, in India), Artus Therapeutics (a drug discovery company for IBDs, in USA), Skintifique (a skincare company, in France), and Alivio Therapeutics (an inflammation targeting company, in USA).

PhD – Indian Institute of Science, Organic Chemistry, 2005

Postdoc-1 – City University of New York, 2005-2007

Postdoc-2 – Harvard Medical School, Harvard-MIT Health Science and Technology, 2008-2012

Faculty – inStem, 2013 to present