



**Centre for Biosystems Science and Engineering**

**S E M I N A R**

**at 2:00 PM on February 2, 2016**

**Seminar Hall, MRDG, Biological Sciences**

**Genetically Engineered Polypeptide Nanoparticles for Drug Delivery**

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Packaging chemotherapeutics into the core of polymeric nanoparticles can improve their therapeutic efficacy by increasing plasma half-life, tumor accumulation and intracellular uptake, and by protect the drugs from premature degradation. To this end, we conjugated paclitaxel (PTX), a hydrophobic drug, to recombinant chimeric polypeptides (CPs) that spontaneously self-assemble into near-monodispersed nanoparticles. CP-PTX nanoparticle increased the systemic exposure and the tumor uptake of PTX compared to free drug and the FDA approved taxane nanoformulation (Abraxane®). In a murine cancer model of human triple negative breast cancer and prostate cancer, CP-PTX induced near complete tumor regression after a single dose in both tumor models, whereas at the same dose, no mice treated with Abraxane survived for more than 80 days (breast) and 60 days (prostate) respectively. These results show that a molecularly engineered nanoparticle with precisely engineered design features outperforms Abraxane, the current gold-standard for PTX delivery. In another approach, we designed recombinant asymmetric tri-block polypeptides (ATBP) that self-assembles into rod-shaped nanoparticles, which can be used to conjugate diverse hydrophilic molecules, including chemotherapeutics into their core. This simple strategy of encapsulation of hydrophilic small molecules by conjugation to an ATBP can be used to effectively deliver a range of water-soluble drugs and imaging agents in vivo.

**About the speaker:**

Dr. Bhattacharyya is an Associate in Research in the department of Bio-medical Engineering, Duke University. He received his B.Sc. and M.Sc. degree from Jadavpur University and Ph.D. from IICT, Hyderabad. He did his post-doctoral studies in the Center for Biologically Inspired Materials and Material Systems, Duke University. His research interests includes drug delivery, recombinant polypeptide, liposomes, nano-biomaterials, etc. He is a reviewer of Molecular Biosystems, and Current Drug Delivery. So far he co-mentored seven undergraduates.