



Bala Rao



Associate Professor,
Department of Chemical
and Biomolecular
Engineering

B. Chem. Engg., Institute
of Chemical Technology,
Mumbai, India

MS in Chemical
Engineering Practice, MIT,
Cambridge, MA

PhD, MIT, Cambridge, MA

Address:

Box 7905, EB1,
Dept. of Chemical and
Biomolecular Engineering,
NCSU,
Raleigh, NC 27695

Phone: 919-513-0129

Email: bmrao@ncsu.edu

<http://www.che.ncsu.edu/raogroup/>

In vitro models of early placentation in humans/engineered proteins and peptides as tools in cell biology

Research emphasis:

Early placental development in humans is poorly understood due to ethical and legal constraints on research with human embryos and limited availability placental samples from early gestation. To overcome these limitations, we are using of human embryonic stem cells (hESCs) for developing in vitro models for early placental development in humans. We have also developed a molecular toolbox – the ability to make proteins and peptides with tailored binding affinities and specificities for a given target. We are using this toolbox to enable applications in live cell imaging, biosensing, separations and generation of custom biochemical inhibitors.

Selected publications:

Sarkar, P., Randall, S. M., Collier, T. S., Nero, A., Russell, T. A., Muddiman, D. C. and Rao, B. M. *Activin/Nodal Signaling Switches the Terminal Fate of Human Embryonic Stem Cell-derived Trophoblasts* Journal of Biological Chemistry 2015 (290) 8834-8848

Menegatti, S., Hussain, M., Naik, A. D., Carbonell, R. G.* and Rao, B. M*, *mRNA display selection and solid-phase synthesis of Fc-binding cyclic peptide affinity ligands*, Biotechnology and Bioengineering 2013 Mar; 110(3) 857-870 * co-corresponding authors

Gera, N., Hussain, M. Wright, R. C. and Rao, B. M. *Highly Stable Binding Proteins Derived from the Hyperthermophilic Sso7d Scaffold*, Journal of Molecular Biology 2011 Jun 409(4):601-16

Application :

- Fundamental studies in placental development
- Regenerative potential of placental cells
- Unique tools for cell biology

Collaboration potential:

- New reagents for separation, biosensing, live cell imaging, custom inhibition or other custom applications
- Making engineered cells/organisms with tailored pathways using tailored proteins
- Toxicity testing in an in vitro placental model
- Immune system interactions in the placenta