

Undergraduate Research Project in Therapeutic Protein Engineering

Host research laboratory

The Wittrup Lab (<http://web.mit.edu/kdw-lab/>) at the David H. Koch Institute for Integrative Cancer Research, Massachusetts Institute of Technology (MIT), Cambridge, MA (USA), is engaged in the development of protein engineering technologies and the discovery of new molecules for the use in therapy, with a particular focus on cancer.

Project background

Given the complexity within the tumor microenvironment, it is unlikely that a single drug will be sufficient to disrupt the complex tumor-promoting intercellular signaling that leads to metastasis. The suppression of such networks may be achieved by the development of cross-reactive molecules. The aim of this undergraduate research project is to develop high-affinity and cross-reactive protein based-ligands against previously validated cancer targets, characterize their binding mode, and determine their therapeutic potential *in vitro*.

Methodology of work

The work will involve a wide range of molecular biology and biochemical techniques. The undergraduate will gain experience in relevant protein engineering techniques, including generating combinatorial libraries encoding therapeutic proteins with yeast display surface. Protein expression and purification will be performed, and the resulting molecules will be analyzed using a variety of techniques, including ELISA, BioLayer Interferometry (BLI), and surface plasmon resonance (SPR). Finally, the capability of cross-reactive therapeutic molecules to affect cancer cells will be assessed *in vitro* using conventional cell culture assays (flow cytometry-based GPCR-ligand binding, flow cytometry-based calcium mobilization, chemotaxis, cell migration and invasion bioassays).

Requirements

The student should be highly motivated, organized as well as open to and interested in learning and applying new techniques in different disciplines. A good knowledge of molecular biology, biochemistry and mammalian cell culture is required. The ideal candidate will be a rising senior interested in pursuing a full year project starting in the summer and continuing with enrollment in course 7.18 during the fall.

To apply for the position, please send a CV and a letter of motivation to Dr. Alessandro Angelini (aleange@mit.edu).