Atul Bhattarai

**Host**: Dr. Richard Grosberg, University of California, Davis

**Title**: Experimental analyses of alteration of fusibility in the colonial hydrozoan *Hydractinia symbiolongicarpus.*

**Visit narrative**:

I conducted my summer internship in Dr. Richard Grosberg's lab at the University of California, Davis. The focus of the internship was the study of self/non-self recognition (allorecognition) behavior in the colonial hydrozoan *Hydractinia symbiolongicarpus.* Indeterminate and encrusting growth pattern of *H. symbiolongicarpus* colonies on hermit crab shells leads to intense competition for the limited space. Colonial self/non-self compatibility has evolved to facilitate such competition. Colonies that make contact will either fuse, forming a behaviorally integrated but genetically chimeric individual or reject, inducing cnidocytes at the point of contact to damage the other competitor.

The goal of the project was to validate the existence of alteration of fusibility – a fused colony is capable of altering the allorecognition profile of its partner. Several observations led us to hypothesize the existence of alteration of fusibility – (1) fused partners can exchange cnidocytes that can de-differentiate and proliferate in the chimera and (2) chimeras comprised of different genotypes show differences in physiological and developmental integration with other genotypes.

The allorecognition experiment consisted of two main steps. The first step was the experimental identification of fusion/rejection profiles of all sibling colonies against each other. The second step in the allorecognition experiment was to select three colonies that matched the required allotypic profiles and create chimeras of two colonies to test against the third.

Unfortunately, the second step in the experiment was disrupted by a spread of bacterial infection which resulted in loss of large amounts of colony mass as I removed the diseased tissue to prevent further spread and death. The second step of allorecognition experiment is still in progress as the colonies heal after antibiotic treatments and regrow to reach the size necessary to complete the experiment.

If I were to redo the project from the start, I would immediately create multiple explants of all subject colonies early in their development when they have prolific growth. This would provide insurance in an event of colony size reduction or death due to bacterial infection. Also, a significant amount of time during the project was spent in the care of animals until they reached the size necessary to conduct the allorecognition experiments. Growing multiple copies of each colony would greatly speed the process because required explants could be excised from multiple smaller stock colonies instead of a single large one.

In addition to the allorecognition experiments, we also conducted confocal miscroscopy to visualize the cnidocyte-sensory neuron complexes that participate in rejection between two colonies. Since microscopy of this type has never been done in *H. symbiolongicarpus*, we used freshwater cnidarian *Hydra magnipapillata* as a guide, modifying its protocol where necessary. Previous confocal microscopy on *H. magnipapillata* was conducted successfully by my postdoc mentor Dr. David Plachetzki so it served as an ideal candidate to guide confocal microscopy in *H. symbiolongicarpus*.