Targeted transgenesis with *Nematostella vectensis* and behavioral observations in their planula larvae

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Different model organisms have been used over the years in the field of neurobiology research. The phylum Cnidaria diverged before the evolution of centralized nervous systems and brain in Bilaterians and possess nervous systems in form of a nerve net. It is interesting that such a simple nervous system can create behavior, and what it can reveal about neural circuits in general.

It is now time to widen the range of cnidarian used in neurobiology with an Anthozoa specie, the sea anemone *Nematostella vectensis*. Indeed, this animal has an informative position on the phylogenetic tree of cnidarians, as well as an interesting position regarding bilaterians.

Nematostella vectensis is a specie that is easily manageable in lab conditions for whom molecular tools have been established for transgenesis purposes. But for now, *Nematostella* cannot be considered as a complete model organism yet. For example, binary transgenesis systems, calcium-imaging techniques, and targeted transgenesis systems still need to be established to facilitate the use of molecular tools and to better the understanding of this model organism.

In this project, an PhiC31/attP 'landing site' system is being created, to allow for precise transgene insertions in the genome. The advantage of this system over random insertion systems is the lack of a positional effect in transgenesis. It is thus one of the essential steps to create a model organism.

To do so, attP 'landing sites' were inserted randomly by Meganuclease-mediated integration in *Nematostella* genome, and a stable transgenic line is in the process of being created. Future prospects of creating an endogenous PhiC31 producing line have been initiated by finding a way to express this integrase in the germline.

In addition, little is known about *Nematostella* free-swimming larvae, called planulae. Here, the planula larvae behavior towards different light conditions were observed. The goal of this experiment was to determine the best conditions to observe the planula, and to monitor its reaction to different light stimuli. Different experiment designs, light exposure dispositions, color treatments and analysis methods have been tested in this work. Although no definite responses to lights were observed, an experimental set-up to monitor planulae behavior is now available.

Overall, this project will bring a valuable supplement to already recognized transgenesis tools and unique insights toward the understanding on the larval behavior of the sea anemone *Nematostella vectensis*.

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