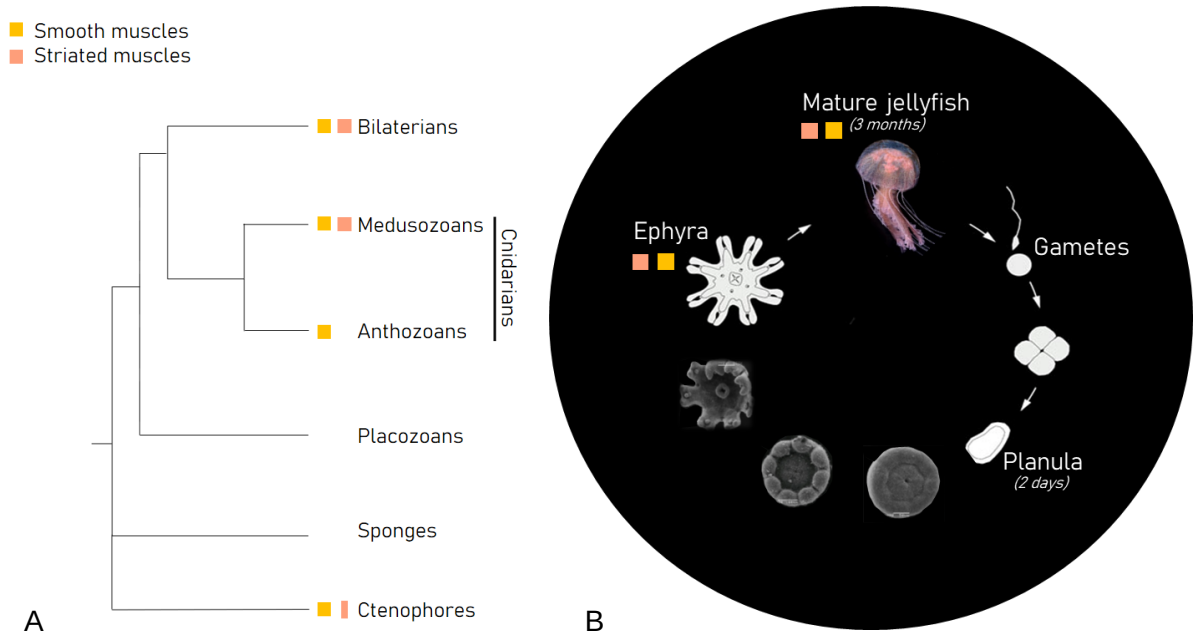
Neuropeptide regulation of muscle contraction in the jellyfish *Pelagia noctiluca*

Team Cnidevo – BIOM Banyuls-sur-Mer, France

Master 2 project – 1st semester 2026

Neuropeptides are short peptides acting as chemical messengers, produced and released by neurons. Neuropeptides bind to specific receptors, such as the ones found in neuromuscular junctions, where neuropeptides released by neuronal cells bind a receptor exposed by the muscular cell and modulate contraction.

Among metazoans, fast contracting striated muscles are found in bilaterians and medusozoans (cnidarian jellyfish). While the development and contraction of striated muscle cells are well documented in bilaterians, the regulation of medusozoan muscle cells is largely unknown. The objective of this internship will be to characterize an identified putative neuropeptide likely to play a role in muscle contraction in a novel laboratory model, the scyphozoan jellyfish *Pelagia noctiluca*, uniquely developed by our Cnidevo team.



Meduzosoa is a key group to study striated muscles

A: Striated muscles are found only in medusozoans, bilaterians, and one species of ctenophore
B: The direct *Pelagia noctiluca* life cycle allows easy access to developing striated muscles

Our available single cell RNAseq data showed that specific neuropeptides are expressed in distinct neurons in *P. noctiluca*. In particular, we showed that a LPRSamide neuropeptide coding gene is expressed in neuronal cells which surround the swimming striated muscles of the *P. noctiluca* medusa, while those striated muscles express a putative LPRSamide GPCR receptor. The predicted peptide belongs to the PRXamide peptide family which in cnidarians is involved in several biological processes, notably oocyte maturation and spawning.

This Master's project aims at investigating the expression, binding affinity and function of the LPRSamide neuropeptide in *P. noctiluca*. The specific objectives are:

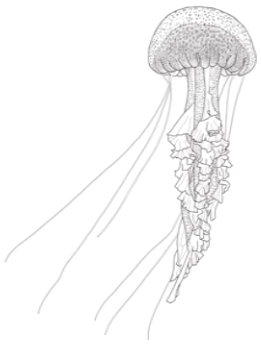
1) Probe the specificity of the PRXamide putative receptor for the LPRSamide peptide by cell culture–based "deorphanization".

2) Determine the localization of the neuropeptides and the morphology of the LPRSamide-expressing cells, at different developmental stages, using custom antibodies.

3) Determine the function of the peptide and putative receptor through gene knockdown by antisense Morpholino injection in *P. noctiluca* zygotes.

4) Further characterize the function the neuropeptide through the addition of neuropeptides on jellyfish, quantifying the changes in behavior and muscle contraction.

The Master student will join the "Cnidarian Regeneration, Development and Evolution" team (www.cnidevolab.com), of the "Integrative Biology of Marine Organism" unit (BIOM, UMR7232), which is part of the Observatoire Océanologique of Banyuls-sur-Mer (Sorbonne University/CNRS). This Master project can lead to a PhD in the same team on muscle development, in the framework of the recently funded ANR project MYOMEDUSA, in collaboration with IBDM in Marseille.



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