MOM-OR-DAD - Marine annelids as a model for disentangling the molecular basis underlying the evolution of reproductive strategies and reproductive timing

Alternative developmental and reproductive programs provide powerful sources of adaptive variation, which greatly enhances survival in changing environments. Yet, how divergent reproductive strategies and traits evolve remains poorly investigated particularly in the ocean, where the dramatic effects of climate change and anthropogenic impact on reproductive dynamics threaten entire animal communities. For this, I plan to close this knowledge gap by investigating the molecular and genomic basis underlying the divergent reproductive strategies and reproductive timing in Platynereis marine bristleworms. These animals are easy to breed in laboratory conditions, are genetically-accessible, and display a kaleidoscopic diversity of reproductive traits in closely-related species. Specifically, I plan to: 1) dissect the molecular mechanisms of the drastically divergent reproductive strategies of the sister species P. dumerilii and P. massiliensis, and 2) decode the genomic basis of alternative lunar reproductive periodicity in Platynereis species. Thus, I will combine my experience in working on the reproduction and chronobiology of these models with evolutionary genetics, population and comparative genomics, functional genomics and transcriptomics strategies mastered in the host lab. On one hand, I will provide ground-breaking insights on how molecular machinery can be drastically rewired generating novel and adaptive combinations of reproductive traits. On the other, I will shed light on the elusive molecular nature of lunar reproductive periodicity, a widespread phenomenon particularly in the marine environment, and its evolution. Currently, endocrine disruption and light pollution are severely affecting animal sexual development and reproductive timing, respectively, challenging the conservation of entire ecosystems. In this context, this research will also provide fundamental resources to better understand their effects on the marine environment.

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