INTERNSHIP PROPOSAL

Laboratory name: Mechanics and Genetics of Embryonic and Tumoral Development,
Physico-Chimie Curie, Institut Curie-Cnrs, Inserm
CNRS identification code: UMR 168

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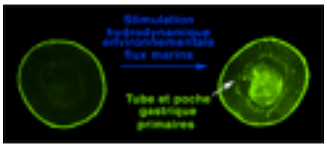
Internship location: Institut Curie, Paris
Thesis possibility after internship: YES
Funding: NO

Myosin-dependent environmental hydrodynamic marine mechano-biochemical stimulation of first multicellular organisms evolutionary emergence: Underlying mechanotransduction mechanism



Summary

The evolutionary emergence of the primitive gut (called endomesoderm (EM)) in first Metazoa, one of the decisive events that have conditioned the major evolutionary transition leading to the origin of animals, is thought to have been intimately associated to the invagination of primitive multi-cellular tissues (*i.e* gastrulation) and its differentiation. However, the biochemical cues at the origin of such primitive gut formation remain uncertain.

Interestingly, the activation of both Myo-II and the beta-cat pathway by Y654-beta-cat phosphorylation, have been found to be mechanotransductively triggered in leading to EM morphogenesis in *Drosophila* embryos and its specification in the gastrulating and epibolying species *Drosophila* and Zebrafish respectively, two species having diverged from first bilaterian ancestor around 570 million years ago (Pouille et al, Science Signal. 2009, Brunet et al, Nature Com. 2013).

We recently found that hydrodynamic mechanical strains, reminiscent of soft marine flow, trigger tissue gastrulation and inversion via a Myosin-dependent mechanotransductive process, in the metazoan *Nematostella vectensis (Cnidaria)* and the multi-cellular choanoflagellate *Choanoeca flexa* (see Figure) considered as the closest living relative to metazoans.

These observations suggest that primitive gut emergence in Metazoa may have been initiated by marine mechanical strains in multicellular pre-Metazoa more than 700 million years ago, thanks to Myosin mechanosensitive properties crucial for this evolutionary transition (Nguyen et al, Front Cell Dev Biol 2022).

The project consists in searching for the underlying molecular mechanism of the translation of the mechanical strains into the biochemical signals leading to the Myosin activation involved and conserved in these distinct species from earliest metazoa, beginning in *Nematostella* embryos.

Speciality(ies) that seem(s) more adapted to the subject: Soft Matter and Biological Physics