

# How to build muscle

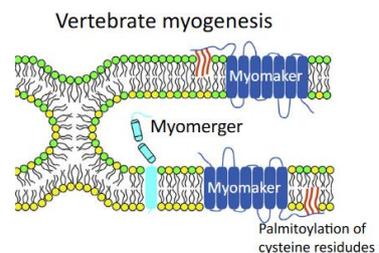
## Keywords

Myofibers formation, fusion pore, model bio-membranes, *in vitro* assays, theoretical modeling, biophysics, biochemistry

## Context

Membrane fusion is key in a variety of biological processes among which virus entry in a cell, neurotransmitter or hormone release, sperm-egg fertilization, or muscle fibers formation. Two apposed lipid membranes have to merge and a pore has to form and expand. If a wide range of protein machineries enabling fusion has already been uncovered, some are still unknown. Moreover, much remain to be understood about the precise and versatile mechanisms by which those different machineries promote fusion.

Recently, exciting progress has been made in vertebrate muscle cell-cell fusion. Muscle cells are known to fuse together in order to form multinucleated fibers during development to constitute the skeletal muscle, a process which is also needed for muscle regeneration and adaptation to exercise. From cell experiments, two proteins were identified as key for fusion: myomaker and myomerger. However, neither their precise role in the fusion pathway nor their precise physical action on membranes have yet been uncovered.



## Project

Our team routinely uses various bio-membrane models and *in vitro* membrane fusion assays to decipher the mechanisms for fusion pore formation. The intern will learn biophysical reconstitution techniques and adapt them in order to test the fusogenic properties of purified myomaker and myomerger proteins on artificial lipid membrane, which has not yet been done to the best of our knowledge. Several physical and chemical membrane parameters such as membrane rigidity, tension, curvature and lipid composition could be explored. Depending on the preferences of the candidate, a theoretical model to explain membrane fusion with these proteins could also be developed. The internship will take place in a very multidisciplinary environment and could be followed by a PhD position (funding is not secured). The intern is not required to practice body-building to apply for this internship.

## Reference

Petrany, Michael J., et Douglas P. Millay. « Cell Fusion: Merging Membranes and Making Muscle ». *Trends in Cell Biology* 29, n° 12 (1 décembre 2019): 964-73. <https://doi.org/10.1016/j.tcb.2019.09.002>.

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