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Force-controlled Patch-clamp With Fluidfm

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Patch clamp, a technology based on glass capillaries, is the gold standard for electrophysiology experiments, in particular for the recording of voltage-gated ion channels.

FluidFM is a force-controlled pipette, relying on AFM cantilevers with an embedded microchannel, which make it a versatile tool from single-cell biology to metal microprinting.

By inserting an electrode in the FluidFM fluidic circuit together with a reference electrode in the physiological solution of the petri dish (~150 mM NaCl), we were able to simultaneously measure the ionic current and the cantilever deflection (force controlled Scanning Ion Conductance Microscopy).

The FluidFM setup with the electrodes can be directly utilized as patch clamp setup.

Currently, we are employing cylindrical probes (supposed to mimic the apex of a glass capillary) to be approached onto the cell membrane with force-control, followed by application of an underpressure to suck in the cell membrane “patch”. This strategy seems promising leading to reproducible formation of a gigaseal on different cells in sequence with the same probe.