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Does geometric constraint of individual muscle cells promote differentiation?

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Understanding the interplay between electrical coupling, mechanical stimuli and transcription factors in the context of muscle cell differentiation is a challenge for mechanobiology and muscle tissue engineering. We aim to determine the correlation between mechanical and geometrical constraints and spatially resolved differentiation, focusing on single cell scale. I will present my research done on myoblast cells (C2C12) on square and rectangular adhesive micropatterns.

Myoblast cells are specifically interesting as their shape changes from round to elongated in vivo during differentiation. While it has been shown that transcription factor expression of C2C12 depends on their shape, it remains unknown whether this results in a different differentiation fate. Therefore, the aim of our research is to correlate geometrical constraints with differentiation in 2D. The degree of differentiation can be measured along different types of markers, like expression of various transcription factors, proliferation rate, and myoblast membrane potential to shed light both on proteomics and on function.

We focus on early differentiation (timespan of 3 hours). Even at such short time scales, our results point towards an important impact of geometric constraints on membrane potential and proliferation. I will also present our first results on protein expression and transcription.

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