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Bio-electric phenomena during growth and regeneration

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The development of new cell imaging techniques has enabled us to investigate spatiotemporal electrical gradients and their influence on cell migration and pattern formation of developing tissues. Membrane voltage changes can trigger biophysical process inside the cell, which in turn can activate genetic signaling pathways regarding processes like cellular differentiation or apoptosis. Because electric signals can travel faster than chemical cues and are more precise than mechanical forces, they have been investigated regarding their potential role as pattern formation regulators. Using targeted manipulation of ion flow and voltage-dependent dyes, it was observed that bioelectric patterns play a vital role in controlling morphogenesis and axial patterning. In this talk, I present the most interesting and promising finding regarding the bio-electrical dynamics of development, outline the techniques used in modern electrophysiology and describe how manipulating bioelectric gradients can alter the target morphology of developing Xenopus frogs and Planarian worms.

Author: JEDRYSZEK, Jan (Jagiellonian University)

Presenter: JEDRYSZEK, Jan (Jagiellonian University)

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