SPRING Meeting

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Keywords: vcscb seminar

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Meeting Details

Start Date / Time	September 8, 2021 at 9:00 AM
End Date / Time	September 8, 2021 at 10:00 AM
Duration	1 hour(s)
Location	Zoom
Presenter Name	Gregor Neuert, Ph.D.
Presentation Title	Cell physiology in kinetic environments
Status	This meeting has already occurred

Meeting Agenda/Notes

Membership Renewal Talk

All cells employ signal transduction pathways to respond to changes in extracellular stimulus concentration. Physiologically relevant changes in many different stimuli vary in both concentration and rate in healthy and diseased states. Switch-like changes in stimulus concentration show that the strength of signaling and overall cellular response is dependent on stimulus concentration, which in many cases needs to exceed a certain threshold. However, how stimulation rate influences signaling and cell behavior remains poorly understood. We developed experimental and theoretical methodologies to investigate how stimulation rates impact cell signaling. Through this approach, we discovered how gradual environments impact cell signaling and viability. We applied traditional acute and gradually changing environmental stressors to yeast cells and found a novel and phosphatase-specific rate threshold mechanism of the evolutionarily conserved p38 / Hog1 MAPK signaling pathway. We further discovered that human monocytes and T-cells survive better slowly than acute changing osmotic stresses of the same stress type, intensity, and total exposure. We identified differential regulation of different Caspases as the active regulators of this phenotype. We also discover an increase of the amino acids proline and glutamine protects cells against gradually increasing stress. We then demonstrated that measurements of temporal dynamics in signal transduction contain essential information to infer predictive and mechanistic models of signal transduction systematically with these datasets. We could predict the temporal signaling response in different environments and mutants in single cells. We anticipate our experimental and computational approaches to provide a blueprint for dissecting stimulation rate-dependent regulatory mechanisms in many other systems.

Attachment

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