BDR SEMINAR (Kobe & online hybrid)

David Meyer

Schumacher Laboratory, Institute for Genome Stability in Aging and Disease, Medical Faculty, University Hospital and University of Cologne

Monday, February 10, 2025

15:00-16:00

1F Auditorium, DB Building C, Kobe / Broadcast online via Zoom

Zoom meeting URL will be announced on the event day by e-mail.

※This seminar is open only to BDR members.

This seminar is a part of the BDR Stage Transition Project Seminar Series for 2024-2025.

Aging by the Clock, Yet Without a Program

Summary

Aging is a universal phenomenon, yet its underlying mechanisms remain a topic of debate. While evolutionary and damage-based theories both attribute aging to the weakening of selective pressures after reproduction-leading to the accumulation of molecular damage-programmatic aging theories suggest that tightly regulated developmental processes may inadvertently drive aging once their primary function is fulfilled. Programmed aging theories go further, proposing that aging itself is actively selected. In this seminar, I will show that neither a deliberate program nor an unintended continuation of one is necessary to explain aging and aging clocks; rather, the accumulation of stochastic variation can sufficiently account for both. I will discuss how aging clocks-tools that estimate biological age and assess health status can shed light on these contrasting views. By focusing on stochastic variation, we demonstrate that the progressive accumulation of random errors in molecular systems is sufficient to build highly accurate aging clocks. I will introduce BiT age, a transcriptomic clock that overcomes the noise inherent in gene expression data, and show how applying it in Caenorhabditis elegans reveals striking variations in neuronal aging trajectories. Building on these insights, we performed an in silico drug screen that identified both known and novel neuroprotective compounds, validated in vivo for their ability to decelerate neurodegeneration. By exploring the role of stochasticity in aging and its connection to developmental processes, this seminar will illustrate how aging clocks can not only deepen our understanding of aging but also accelerate the discovery of geroprotective interventions.

References

- Meyer, D.H. and Schumacher, B. (2021), BiT age: A transcriptome-based aging clock near the theoretical limit of accuracy. Aging Cell, 20: e13320. https://doi.org/10.1111/acel.13320
- Meyer, D.H., Schumacher, B. Aging clocks based on accumulating stochastic variation. Nat Aging 4, 871–885 (2024). https://doi.org/10.1038/s43587-024-00619-x
- Björn Schumacher, Christian Gallrein, David Meyer et al. Neuron-type specific aging-rate reveals age decelerating interventions preventing neurodegeneration, 29 May 2024, PREPRINT (Version 1) available at Research Square [https://doi.org/10.21203/rs.3.rs-4360587/v1]

Host: Ichiro Hiratani

Laboratory for Developmental Epigenetics

Contact: ichiro.hiratani@riken.jp, akie.tanigawa@riken.jp