The 53rd Biomechanics Seminar

2026 年 10 月 23 日（金）16:00～17:00

京都大学 医生物学研究所

南部総合研究 1 号館・医生研 1 号館 1 階セミナー室 3

https://www.infront.kyoto-u.ac.jp/en/access/

演　題：Conserved Mechanisms of Bleb-based Extravasation Across Cell Types and the Triggers of Bleb Formation

講演者：Mizuki Morita, Ph.D.
Specially Appointed Researcher (JSPS PD)
Division of Biomedical Engineering, Institute of Engineering,
Tokyo University of Agriculture and Technology

要　旨：Extravasation, the process by which circulating cells exit blood vessels and enter surrounding tissues, is a fundamental biological event shared by developmental cell migration and cancer metastasis. However, the mechanisms that drive vascular exit remain incompletely understood. Using an avian embryonic vascular model that enables direct imaging, we compared primordial germ cells (PGCs), which naturally extravasate during embryonic development, with multiple human cancer cell lines.

We found that PGCs and multiple cancer cell types formed membrane blebs, transient spherical protrusions of the plasma membrane driven by intracellular pressure, during extravasation, suggesting a conserved morphodynamical strategy for vascular escape. However, the upstream Ca^{2+} signaling mechanisms differed among cell types. PGCs and HT-1080 cells primarily relied on store-operated Ca^{2+} entry through the STIM1–Orai1 pathway, allowing extracellular Ca^{2+} influx, whereas PC-3 and MDA-MB-231 cells predominantly utilized IP_3R-mediated Ca^{2+} release from the endoplasmic reticulum.

These findings indicate that a conserved bleb-based extravasation program can be supported by distinct calcium signaling pathways, raising the question of what triggers bleb formation during extravasation. We therefore sought to identify physical cues capable of inducing blebbing and focused on hydrostatic pressure as one candidate mechanical stimulus. Using an in vitro pressure-loading system, we found that elevated hydrostatic pressure induced prominent bleb formation.

Together, our findings suggest that bleb-based extravasation is a conserved morphodynamical program with cell-type-dependent upstream regulation, while hydrostatic pressure represents a physical stimulus capable of triggering bleb formation.
https://www.sciencedirect.com/science/article/pii/S0012160625001332

講演言語：日本語

連絡先：京都大学 医生物学研究所　安達 泰治　adachi@infront.kyoto-u.ac.jp