LiMe
Institute for Life and Medical Sciences
Kyoto University

1st mechanosensory physiology seminar

2025 March 10th, 11:00-12:00

Conference Room, 1st Floor, Bldg. No2

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Heterogeneous ECM dynamics regulate cell survival and abdominal epithelium remodeling in *Drosophila*

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Abstract

In *Drosophila* metamorphosis, the abdominal larval epidermal cells (LECs) rapidly undergo apoptosis and replaced by adult histoblasts within 20 hours in two distinct phases. During the first 5 hours, the early phase is characterized by infrequent, isolated LEC apoptosis and slow histoblast proliferation. This is followed by the late phase, characterized by mass LEC apoptosis, occasionally in clusters, to spatially accommodate the rapidly proliferating histoblasts. However, it remains unclear what upstream regulator coordinates the opposing cell fates of LEC apoptosis and histoblast proliferation. In this study, we demonstrate that the basal extracellular matrix (ECM) components underlying LECs and histoblasts exhibit distinct dynamic behaviors. We discovered that the ECM underlying the epithelium rapidly degrades early during LEC elimination. The loss of ECM beneath LECs also reduces EGFR/ERK signaling activity, promoting the occurrence of clustered LEC apoptosis in the late phase. Genetic prevention of ECM degradation delayed LEC elimination by maintaining high EGFR levels and diminishing clustered apoptosis. In parallel, while other ECM components underlying histoblasts also continuously degrade, laminins initially degrade partially and then expand together with the histoblasts. We hypothesize that the new laminin deposition or expansion act as a scaffold for the rapid histoblast proliferation. These findings suggest that the spatiotemporally heterogeneous dynamics of ECM components coordinate the precise molecular mechanisms underlying LEC apoptosis and histoblast expansion to complete the tissue replacement process in the *Drosophila* abdominal epithelium.

Reference article: Yuswan, Sun, Kuranaga, Umetsu, PLOS biology, 2024