BDR SEMINAR (Kobe/online hybrid)

Mechanobiology Seminar Series presents

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Monday, July 31, 2023

11:00-12:00

5F Seminar Room (C501), DB Building A, 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.

Elevated temperature fatally disrupts the distribution of cortical nuclei in the early Drosophila embryo

Summary

Temperature is a key factor controlling animal survival, and animals have found diverse strategies to cope with extreme conditions. Animals that can't actively regulate their body temperature often rely on behavioral adaptations to withstand thermal variability during adult stages of their life, when they are mobile. Though, possible strategies used during the sessile embryonic stages are less clear. Non-behavioral strategies to adapt to variable temperatures are especially relevant in embryonic stages of insects, where deposited eggs can be exposed to thermal fluctuations.

Here we use the genetic model organism, fruit fly Drosophila melanogaster, to understand the effects of elevated temperature on fly embryonic development. We identified the first few hours of embryonic development as a critical window, where an exposure to elevated temperature increased embryonic lethality. During the first hours of embryonic development, the embryo establishes a cell layer around the yolk, called the blastoderm. Defects in the formation of the blastoderm affect the developmental programs that follow, either through local defects in cell differentiation, or through global defects due to non-uniform properties of the blastoderm tissue. Using a classic cell biological approach, we found that an exposure to elevated temperature perturbed the normal uniform arrangement of cells, and in extreme cases produced holes in the blastoderm.

Based on published datasets of genomic variations across fly populations from various native climates, we identified and tested candidate genes that were sufficient to increase the robustness of blastoderm formation and to rescue embryo lethality at elevated temperatures. Our results expose a vulnerability in early embryonic development at elevated temperatures, and propose that the expression levels of our candidate genes could be used as indicators to predict fitness of insect populations that are exposed to increasing temperature variations.

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