The Complex Effects of Stimulated Climate Temperature Increase on the Social Amoeba Dictyostelium discoideum and Their Bacterial Endosymbionts

Xinye Qian
Washington University in St. Louis

Follow this and additional works at: https://openscholarship.wustl.edu/wuurd_vol13

Recommended Citation
https://openscholarship.wustl.edu/wuurd_vol13/166

This Abstracts J-R is brought to you for free and open access by the Washington University Undergraduate Research Digest at Washington University Open Scholarship. It has been accepted for inclusion in Volume 13 by an authorized administrator of Washington University Open Scholarship. For more information, please contact digital@wumail.wustl.edu.
The Complex Effects of Simulated Climate Temperature Increase on the Social Amoeba Dictyostelium discoideum and Their Bacterial Endosymbionts

Xinye Qian

Mentor: Joan Strassmann

Environmental stress can result in strong ecological and evolutionary effects on natural populations. Global warming can affect not only individual species but also mutualistic associations. Here, we used the soil-dwelling social amoeba, Dictyostelium discoideum, as a model system to simulate how climate temperature increase affects the social amoeba Dictyostelium discoideum and their bacterial endosymbionts, Burkholderia.

D. discoideum has a very dynamic relationship with bacteria. It predates bacteria, can be infected by bacteria, and can also form symbiotic associations with different bacterial species. D. discoideum’s association with bacteria appears to be binary, with some amoebae (called farmers) consistently carrying bacteria through their social life cycles, while others (called non-farmers) do not.

In the first part of our project, we studied the adaptive divergence of thermal tolerance in natural populations of D. discoideum. We used clones from two populations that differ in climate and altitude (Virginia, VA, and Texas, TX), and tested them under moderate and thermal conditions using common garden experiment. We found that TX population (the high-temperature origin population), had higher fitness than VA population (the lower-temperature origin population) under the thermal condition, while there was no difference between two populations under moderate condition. These results suggest that D. discoideum has diverged in response to temperature mediated selection, with Texas population having locally adapted to thermal stress.

In the second part of our project, we studied how simulated climate temperature increase affects amoeba-Burkholderia symbiosis. We mixed and matched D. discoideum with two facultative symbionts B. hayleyi and B. agricola, to see how they affect host’s thermal tolerance. We found that B. agricola made no difference to D. discoideum’s thermal tolerance (both to their native hosts and other hosts). However, B. hayleyi significantly decreased D. discoideum’s thermal tolerance (both to their native hosts and other hosts). In addition, under thermal stress, B. hayleyi killed most of the D. discoideum from other hosts and caused a breakdown of symbiosis. This did not happen to their native hosts, indicating potential host adaptation between B. hayleyi and their native D. discoideum hosts. Taken together, these results suggest the complex effects of climate temperature increase on the amoeba-Burkholderia symbiosis.