A meta-experimental evolution approach: new insights into genomics of adaptation of multiple organisms in complex environments.

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Résumé

Under current global change, organisms across all domains of life must adapt to the environmental challenges by natural selection, or they risk going extinct. Global change does not merely consist of changes in temperature, but also includes many other environmental stressors such as drought or the presence of pollutants. However, while much is known about the speed of evolutionary change in response to a single stressor, little is known about evolutionary responses to complex environmental challenges. To answer this question, we performed controlled evolution experiments using different stressors (temperature, copper, salinity...) on organisms from across the tree of life. We evolved viruses, bacteria and eukaryotes under four treatments: one control (no stress), two single stressors, and one multiple stressors. Then, we performed short-read whole genome re-sequencing of evolved populations and their ancestors, in order to analyze the effect of environmental complexity on the genomics adaptation. We identified in each system the number and type of mutations that are either fixed or have experienced significant frequency change in the different treatment. This work allowed us to assessing how the mutational landscape and genomic target of adaptation differ between complex and simple environments. Answering this question is crucial to determine whether or not organisms will be able to adapt to global changes.

Mots-Clés: Meta experiment, Experiemental evolution, Multiple stressors, Genomics of adaptation

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