PREreview Journal Club - InBio Journal Club at IBIS - 27 OCT 2017

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[Compensatory evolution via cryptic genetic variation: Distinct trajectories to phenotypic and fitness recovery]

[Sudarshan Chari, Christian Marier, Cody Porter, Emmalee Northrop, Alexandra Belinky and Ian Dworkin

, october 10, 2017, version 1, BioRXiv]

[http://dx.doi.org/10.1101/200725]

PREreview Guidelines

Overview and take-home messages:

Write a short (1 paragraph) summary of what the main findings of the research were and how this work has moved the field forward. This could take the following structure:

Note on group : This BioRXiv preprint was read and reviewed during the Institute for Integrative and Systems Biology journal club at Université Laval, Québec on october 27 2017. The attendance that week was 2 profs, 5 MSc students, 4 Phd students, 4 postdocs from the Biology and Biochemistry departments.

MAIN QUESTION

1-The authors want to know if there will be compensation of a deleterious trait using standing genetic variation.

2- will there be a difference in the phenotypic response to artificial and natural selection for a given genetic background. IN other word, they compare direct and indirect fitness compensation since they select for a specific trait (the biologist determines what has a high fitness in artificial selection) or for maximum fitness (natural selection).

The authors use artificial and natural selection on drosophila lines that have been created by specific crossings leading to the integration of specific mutants. They also have a line to control for unintended selection in the lab. They measure several phenotypes on the different lines created by selection at different generations: wing size, courtship behaviour, survival, competition ability, fecundity

Positive feedback:

As the aim of the PREreview Journal Club is to support the authors by providing constructive feedback, the reviewer(s) should also include positive remarks to encourage future posting of preprints. Remember, the authors are human too! To help guide you, here are a few questions you might ask yourself after reading the preprint:

WHY IS THIS STUDY RELEVANT? WHAT WHERE THE INTERESTING POINTS?

This idea of compensation is known in unicellular organisms, now done on multicellular ones, which makes it interesting.

It shows the importance of evolutionary compensation in general (should be explained in more detail in discussion)

The experimental design and work done (massive amount of lab work) was very well designed to answer their question.

Figure 1 shows interesting and surprising results since the deleterious trait does not "come back" to its "normal" value under natural selection, but COULD return, as shown very clearly by artificial selection

Figure 3. presents very interesting results on how males have higher fitness without having "normal" wings

A few points that are very important and interesting but that would need to be discussed more / made clearer in the ms (in intro or discussion)

1-the ms gives a mechanism by which deleterious mutations can be found at low frequency in a natural population, and this is generalizable to other systems

2-the results explain why closely related species have diverged in a trait but are both still there: one species (species 1) has lost it but persists while in the other species (species 2) it is a "necessary" trait. In systems like these, one can look for the traits that "compensate" for the "missing" trait in species 1 and if it comes from standing genetic variation. It is an interesting observation for the study of speciation and rapid evolution.

3-It answers the question as to whether genetic constraints or selection will control evolutionary trajectory, and shows that both factors act.

Next are your concerns. Remember you are writing to another human being, so be polite and realistic. Also, if you are unsure about something, be honest and say you are unsure. This is a learning process, so don't feel afraid to admit if you are not confident about your concerns, or part of the work is out of your area of expertise.

Major concerns:

Here the reviewer(s) should list 2-3 major concerns about the research (if they exist). This may relate to:

TO IMPROVE

-The authors could add predictions and make the scope of the study larger (generalizing outside of Drosophila). Predictions will help the reader follow where the paper is going.

-If Dollo's law was presented in the introduction, it could become the basis for a prediction, which would make the "return" to the normal trait even more surprising.

-Explain what are the implications for natural populations and explain what is the difference between loosing a trait versus changes of other nature in a trait.

-explain why we can exclude the effects of de novo mutations. Why are we sure that evolution uses SGV? Two points make it possible to say that it is cryptic genetic variation which allowed the adaptation observed in the various experiments: the speed of appearance of the phenotypic responses and their observation in several parallel lines. For those readers who are more accustomed to hearing about compensatory evolution

by spontaneous mutations in microbial species, it may be important to emphasize this point further as it is the basis of the ms.

-In methods, the authors state about the BASE population: "This general population of flies should be segregating much of the natural variation in the FVW population." It is unclear whether the introgression method is effective in getting rid of the majority of the alleles of the strain initially carrying the mutation. If it is well known that 8-10 backcross are sufficient to isolate a locus in Drosophila, it should be mentioned for those who know nothing about this model species and who read the paper. If this is not the case, then it is a limitation to discuss. It is important when comparing phenotypes of NS strains to those of BASE (Figure 4). If many other loci are associated with vc1 in BASE, some may interact inconsistently with alleles in the natural population. For example, when greater larval competitiveness is observed after natural selection, this higher phenotype could be caused by the removal of incompatible alleles associated with vc over generations, and not the selection of cryptic genetic variation.

Minor concerns:

Here the reviewer(s) can mention 3-5 minor concerns that are not critical to the understanding and conclusions of the research, but would improve the overall flow or clarity of the manuscript. These concerns might include the following questions:

Technical

-mutations must be explained in more details for non-specialists. In the discussion we learn that the 3 mutations have different "severity" (in discussion).

-If methods could be described in one or more figure, it would help a lot, especially since several lines with acronyms must be followed

-Add page and line numbers would be great to help give specific comments

-results are repeated in discussion section. Maybe a result + discussion combined section would flow better?