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ECR SPOTLIGHT

ECR Spotlight – Keity Johanna Farfán Pira

ECR Spotlight is a series of interviews with early-career authors from a selection of papers published in Journal of Experimental Biology and aims to promote not only the diversity of early-career researchers (ECRs) working in experimental biology during our centenary year, but also the huge variety of animals and physiological systems that are essential for the 'comparative' approach. Keity Johanna Farfán Pira is an author on 'A *cis*-regulatory sequence of the selector gene *vestigial* drives the evolution of wing scaling in *Drosophila* species', published in JEB. Keity Johanna conducted the research described in this article on the selector gene *vestigial* and its role in wing size evolution in *Drosophila* species in Marcos Nahmad's lab at Cinvestav-IPN, Mexico City, Mexico. She is now a postdoctoral fellow in the lab of Erica L. Westerman at University of Arkansas, Fayetteville, AR, USA, investigating evo-devo of regulatory regions and genes in determinant processes of development and behavior in insects.

Keity Johanna Farfán Pira

Describe your scientific journey and your current research focus

I started my life in the scientific field since I was an optimist and passionate about biology. With a major in this area, and after graduating with a master's degree in Molecular Biomedicine, I decided to follow the evolutionary-developmental path during my PhD studies. At this point, my scientific journey started with an interest in knowing if the regulatory sequences on an important selector gene, *vestigial*, have a role in the evolution of wing formation. To evaluate this, I acquired skills in the use of genetic editing tools such as CRISPR/Cas9 to do replacements of *cis*-regulatory sequences of the *vestigial* gene in phylogenetically distant *Drosophila* species. This scientific journey inspired me to continue my current research, evaluating the impact of regulatory regions and genes and exploring their direct relationship with phenotypic traits and/or behaviors in *Bicyclus anynana*, as a current postdoctoral fellow in the Westerman Lab, University of Arkansas.

How would you explain the main finding of your paper to a member of the public?

Our research investigated the importance of some DNA sequences and their role in controlling the development of wings in fruit flies. We found that after replacing these sequences from a distant fruit fly species into the DNA of a closely related fruit fly species, the size of the wings in the new individuals was smaller! This is interesting, because the distant fruit fly species do not have proportional wing growth, with respect to the whole body. This finding helps us to better understand how specific DNA sequences control growth and development of wings in fruit flies.

What are the potential implications of this finding for your field of research, and is there anything that you learned during this study that you wish you had known sooner?

This finding is interesting and is useful for the evo-devo field of wing formation of drosophilids, due to the understanding and possible predictions of the appearing of new features that determine essential developmental processes in the evolutionary history, which is super interesting! For me it is fascinating to see a phylogenetic tree of species and be familiar with the points where the natural conditions or other adaptation processes probably changed the 'natural course' of gene transcription or gene regulation to modify any biological process, as in this case. With all this in mind, I wish I had known sooner at what specific point in the evolutionary history of the fruit flies the proportional growth between wing–body appeared, and if, in all the intermediate species of *D. virilis* and *D. melanogaster*, there exist other interesting features that determine certain developmental processes.

Which part of this research project was the most rewarding/challenging?

Definitively, the molecular process to obtain the final individuals with the regulatory region of *D. virilis*. We absolutely knew the correct way to obtain them, but we did not know if all those individuals would be viable or if they would survive after the Cas9 and gRNA egg injections, or after some genetic crosses to obtain the stable and homozygous lines. Therefore, a usual question was if we could know the direct effect of the sequence replacement at the end of the project.

What do you think experimental biology will look like 50 years from now?

I consider that doing research in 50 years will be an interesting challenge. We will probably have access to new advances in genetic

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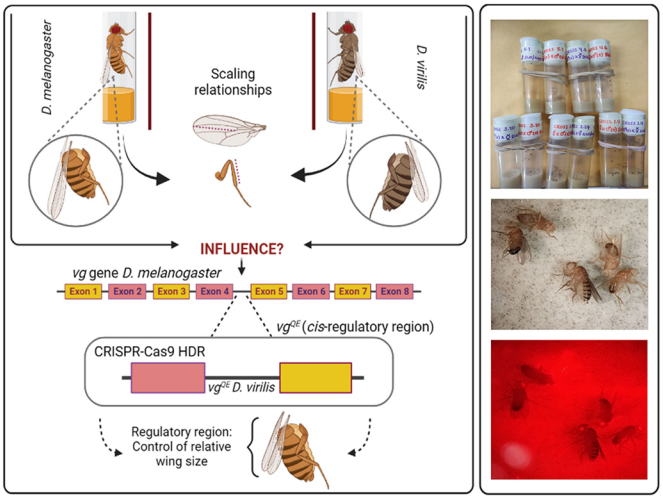

***vestigial* Quadrant Enhancer (vg^{QE}) is a *cis*-regulatory sequence responsible for the evolution of wing scaling relationships in *Drosophila* species.** Right side of the image shows the intermediate steps to identify the mutant flies: the stable lines generated with CRISPR/Cas9, the final morphology expected in mutant flies, and the same flies with the fluorescent eye marker confirming the DNA replacement into the genome.

engineering tools to modify and manipulate not only DNA, but also another biological molecule such as RNA or proteins of interest with high precision and efficiency for the biological and medical areas. Additionally, the use of artificial intelligence and machine learning can transform the way we implement experimental biology, and with interdisciplinary research, will permit us to address important questions.

If you had unlimited funding, what question in your research field would you most like to address?

With unlimited funding, I would like to investigate, through large-scale experiments, the influence of genes and regulatory regions in developmental processes, but adding the ecological factor to completely understand the 'real' answer of their influence on life and how this influences the decisions of different organisms.

What would make you want to continue in a research career?

I find that interacting and exchanging ideas with experienced colleagues in my field or related fields is a great source of motivation and inspiration for my research career. This can allow early-career scientists to gain valuable insights and guidance, helping us to understand key situations and changes in scientific research. By learning from the experiences and perspectives of others, we can effectively plan a research course that is intellectually stimulating and impactful.

What's next for you?

As a postdoctoral researcher, I am excited to continue expanding my knowledge within my research field, acquiring new skills and abilities to conduct investigation projects. I hope to gain a deeper understanding of the evolutionary and genetic processes that influence development and behavior of organisms. My greatest aim is to use this knowledge to inspire and contribute to the personal and academic improvement of other people that may be interested in this fascinating field, forming my own lab and investigation line.

Reference

Farfán-Pira, K. J., Martínez-Cuevas, T. I., Evans, T. A. and Nahmad, M. (2023). A *cis*-regulatory sequence of the selector gene *vestigial* drives the evolution of wing scaling in *Drosophila* species. *J. Exp. Biol.* **226**, jeb244692. doi:10.1242/jeb.244692