Poster

How would I be BIGGER?

Decisions to make a bigger eye

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ABSTRACT

Motivation: Understanding how the eye regulates its size could be helpful to comprise the mechanisms underlying those human diseases produced by an imbalance between cell growth and mitosis. We started by asking the main question by observing the "holloptic eyes", the dorsal extension of the eyes of males of certain fly species wich are overgrown and cover the whole dorsal head at the expense of a total reduction of the dorsal head capsule. This trait is widely distributed along the dipteran tree of life/phylogeny, although within a group not all species ought to show it. This fact suggests either that the male holoptic trait is ancestral, but has been lost in many instances or alternatively, it has appeared independently many times. If the latter, one would hypothesize that the genetic mechanism responsible for eye development is easily modifiable to obtain a holoptic eye, either by changing the same gene in each instance or by different genetic changes but with similar phenotypic output. Often holoptic eyes are produced because the dorsal ommatidia are very large. Candidate regulating genes are very well conserved between human and drosophila, making this organism an amenable model.

Methods: We followed differents approaches to obtain a similar trait to holloptic eyes. Firstly, to produce large ommatidia dorsally, we drove an RNAi against the cell size regulator gigas, the human orthologue TSC2, using the dorsally expressed GAL4 driver Iro C-GAL4. On the other hand, we have carried out several other eye-targeted genetic manipulations in an attempt to modify cell size in independent ways, including some affecting the mTOR and dpp/BMP2 pathways and Myc. Then we tried to get smallers head capsule by altering Wnt/Wg pathway.

Results: The attenuation of gigas in the dorsal eye resulted in larger cells in the discs and larger ommatidia in the adult eye. The lenses of the dorsal ommatidia in the eyes of IroC-Gigas RNAi adults are indeed (approximately 1,6X larger than those of control eyes. However, unexpectedly, the total eye size (measured as its surface) of IroC-Gigas RNAi and control flies was very similar. The rest of the genetic manipulations doesn't produce size changes in the eye.

Conclusions: Our results indicate that the eye controls its size not by counting cells, but by measuring its total surface or cell mass. And even more when the eye has a reference, wich is not altered (the ventral eye side), the final size remains constant.

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