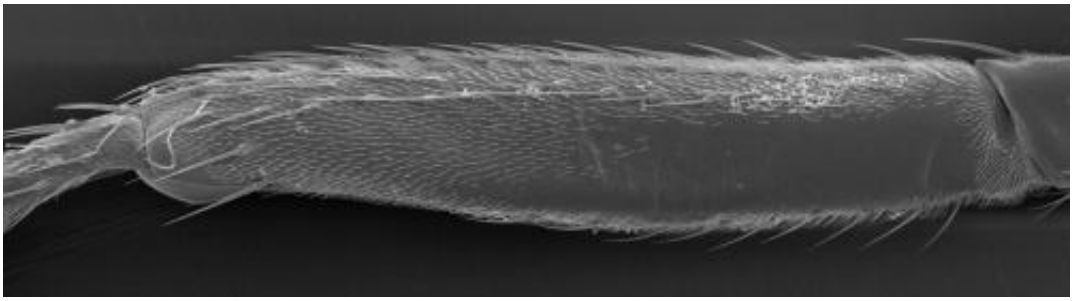
A surprising new function for small RNAs in evolution

April 19 2013



An international research team in including Christian Schlötterer and Alistair McGregor of the Vetmeduni Vienna has discovered a completely new mechanism by which evolution can change the appearance of an organism. The researchers found that the number of hairs on flies' legs varies according to the level of activity of a so-called microRNA. The results, published in the journal *Current Biology*, shed a completely new light on the molecular mechanisms of evolution.

It has long been known that certain proteins, known as transcription factors, directly control the way in which information is read from DNA. As a result, it is widely believed that changes in genes encoding such proteins underlie the mechanisms responsible for evolutionary adaptation. The idea that small RNA molecules, so-called microRNAs, may play an important part in evolutionary changes to animals'

appearance is completely new. An international team of researchers, including Christian Schlötterer and Alistair McGregor from the Institute of Population Genetics of the University of Veterinary Medicine, Vienna (Vetmeduni Vienna), has now published a study that describes such an evolutionary mechanism.

Small and large bald patches

Insect bodies are generally covered with a large number of microscopic hairs. This is the case for the legs of many closely related species of the fruit fly genus Drosophila, although the animals have a bald patch on the second pair of legs, intriguingly known as the naked valley. Previous work had shown that the size of this patch is regulated by the gene ultrabithorax (Ubx) and that it differs between species. However, the work at the Vetmeduni Vienna showed that similar differences are shown by individuals from different populations of Drosophila melanogaster.

Their search for the genetic basis of the variation led the researchers to a segment of fruit fly DNA that contained four genes. Three of these genes were known to encode proteins with no role in the development of the hairs. The fourth gene, known as miR-92a, encodes a microRNA. Previous experiments had shown that an increase in activity of the miR-92a gene was associated with a loss of hairs from the animals' wings. By overexpressing the gene in the legs of the fruit flies, the scientists were able to cause hair loss on the animals' legs.

Schlötterer is naturally excited by the findings. "This is the first experiment to show that natural variation in the expression of a microRNA can lead to a change in the appearance of an organism. MicroRNAs can fine-tune the level at which genes are expressed, so evolutionary changes in the production of microRNA would be an elegant way to cause morphological changes."

More information: Arif, S. et al. Evolution of mir-92a Underlies Natural Morphological Variation in Drosophila melanogaster, *Current Biology*, (23(6), pp.523-528). dx.doi.org/10.1016/j.cub.2013.02.018