ABSTRACT

Urbanization, globalization and increased international mobility have made the vector-borne viral diseases, dengue, zika and chikungunya fever, threats to a large fraction of the world population. Historically, dengue and chikungunya cases were confined to tropical and sub-tropical regions of the world, but recent years have seen their expansion into temperate areas. For instance, autochthonous cases of dengue and chikungunya have been reported in southern France and Croatia since 2010 and Italy suffered from chikungunya outbreaks in 2007 and 2017. The (re)-emergence of dengue and chikungunya in Europe are dependent on the arrival and establishment of their competent vector, the mosquito *Aedes albopictus*. *Aedes albopictus* is an aggressive invasive species that move out of its native home range in south East Asia reaching every continent except Antartica in the past 40-50 years.

Europe is characterized by a temperate climate with a clear seasonality that translates into a seasonal emergence and activity of mosquitoes. When mosquito emerge in late spring (May-June), temperature averages between 16-18ºC in Italy, while in summer temperature averages 24-25 ºC, with picks above 30ºC. Temperatures at the time of mosquito emergence and during the pick of summer have already been proven to be thermal stressor linked to modulation in immunity gene expression and susceptibility to viral infection. This suggests that the global expression profile of mosquitoes in spring may be different than that of summer mosquitoes, which may potentially affect their vector competence or response to insecticides.

I tested this idea in this study by analyzing the transcriptome profile of mosquitoes reared at 18ºC, 28ºC and 32ºC.

Despite being limited by the limited knowledge on the functions of *Ae. albopictus* genes, my results still indicate a trend of activities which are elicited or downregulated at different temperatures. I clearly see differences in the expression profile of both larvae and adults when reared at 18ºC *versus* 32ºC suggesting that indeed the physiology of mosquitoes in spring and summer times is different. For instance, I observed that the number of differentially-expressed genes was highest between larvae and adults reared at 18ºC (2798 genes) and lowest for eggs hatching at 32ºC (95 genes). This may be due to the fact that at 18ºC growth is delayed resulting in a continuous adaptation to a not optimal growing temperature. Optimal growing temperature is 28ºC. Activities related to translation, oxidative stress and proteolysis were among the most enriched in upregulated genes in larvae reared at 18ºC, supporting the hypothesis that a slower growth at a low temperature is highly-energetically demanding for mosquitoes because of the need to keep supporting protein turn-over.

Besides detecting differences across stages and rearing temperatures, another interesting finding was the list of genes consistently differentially-expressed between larvae and adults at all tested temperature, a total of six genes. Interestingly, the levels of expression of these six genes were similar across all tested-temperatures suggesting a significant role in development. One of the future perspectives of my study is to focus on these six genes to understand their phenotype. Particularly, my aim would be to identify a gene upregulated in the larvae which impairs mosquito development when knocked-down. A gene with this phenotype would be an ideal effector to be employed in genetic-based strategies of mosquito population suppression.