A novel insecticide resistance mechanisms in malaria vectors

Malaria has halved since 2000, with 80% of the reduction attributable to the use of insecticides, which are now under threat of resistance. Insecticide resistance is at a critical tipping point in public health, with some mosquito populations showing resistance to all insecticides and the strength and impact of this resistance is escalating every year. John Vontas group, with Vasileia Balabanidou the main researcher, and their collaborators at the University of Crete and other research Institutes, discovered a novel and very important insecticide resistance mechanisms in mosquitoes. Quantitative modification of epicuticular cuticular hydrocarbons associated with increased expression of a 4G cytochrome P450 enzyme, dramatically slow the uptake of insecticides, giving the necessary time to the detoxification enzymes to act on insecticide molecules, before they reach their molecular targets, in the nervous system. The mechanism produces a striking resistance phenotype and broadens resistance to multiple insecticide classes. This work improves our understanding of insecticide resistance and may facilitate the development of insecticides with greater specificity to mosquitoes and greater potency. The work is published today in *Proceedings National Academy of Science (PNAS)*.

It is a highly innovative and very important research for public health, which elucidates insecticide resistance mechanisms in the major malaria vector. It promotes the international recognition of FORTH/IMBB and significantly contributes to the establishment of excellence in the field of vector borne disease, Nektarios Tavernarakis, the Director of IMBB and Professor at the University of Crete, said.

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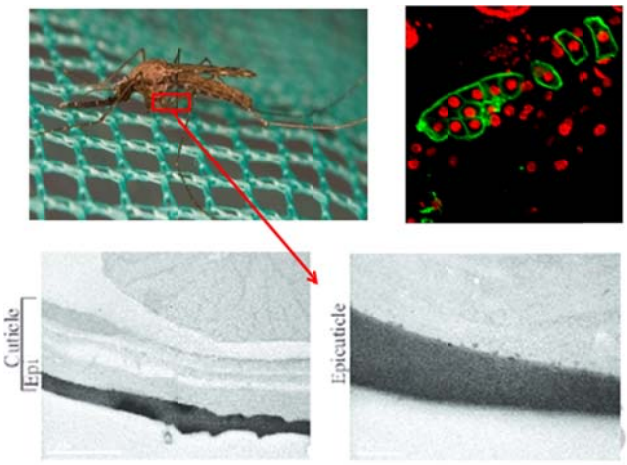

Figure 1. Insecticide resistant *Anopheles gambiae* "walking apathetic" on impregnated bednets (**up-left**). Higher synthesis of epicuticular lipids, catalysed by 4G P450 monooxygenases in oenocytes (**up - right**), make a thick epicuticular layer in resistant mosquitoes (**down-right**), which substantially delays insecticide uptake, giving time to detoxification mechanisms to act and protect the insect nervous system, thus producing striking levels of broad spectrum insecticide resistance phenotype.