**Metarhizium anisopliae** pathogenesis of mosquito larvae: a verdict of accidental death.


**Introduction**

Mosquitoes vector a wide range of diseases (e.g. dengue, yellow fever and malaria) which have devastating impacts on human health. Over half the world’s population is at risk of mosquito-transmitted diseases.

Recent studies show that **Metarhizium anisopliae**, a soil borne fungal pathogen of terrestrial insects, offers an environmentally friendly alternative to chemicals so it is clear. How this terrestrial pathogen kills the aquatic larval stage is unclear.

We demonstrate for the first time that **M. anisopliae** kills mosquito larvae via a mechanism that does not follow the traditional host-pathogen response, as the species have not evolved to interact.

**Methods**

A number of methodologies were utilised to determine the mode of pathogenicity. Including:
1. Spectrophotometry to assess Caspase activity.
2. Fluorescent microscopy to assess conidial viability and the damage caused by the fungus to the mosquito.
3. qPCR to determine transcript levels of *Aeae* pygmy response genes and **M. anisopliae** pathogenicity genes.

**Results**

Mosquitoes did not mount a defence response to the fungus to the mosquito to apoptosis. Conidia appear contained within the gut lumen (Fig. 2A–B) with no evidence of conidial invading the haemocoel.

Mosquito maintains bodily functions, producing compact faecal pellets, containing conidia still actively expressing GFP (Fig. 2D).

Mosquito larvae was concomitant with larval mortality between 36–72 hr. post infection (pi).

**Conclusions**

- **Mortality of mosquito larvae exposed to** **M. anisopliae** is multifactorial. It is not due to invasion and colonisation of the host but entails **M. anisopliae** proteases, triggering stress induced apoptosis which ultimately leads to host death, hence the verdict of accidental death.
- **Key pathogenic determinants are expressed in the mosquito larvae but the established infection process of the terrestrial host is not observed.**
- **The mosquito larvae did not mount a strong defence response to** **M. anisopliae** – Larvae have either not evolved appropriate receptors identifying **M. anisopliae** as a pathogen, as is the case for terrestrial hosts or the lack of interaction between the fungus and insect limits the mosquitoes ability to recognise an attempted infection.
- **Cecropins and Hsp70 genes were down regulated as larval death occurs linking mortality to autolysis though Hsp70 mediated Caspase activity.**
- **M. anisopliae** retains pre-formed pathogenic determinants which mediate host mortality, but unlike true aquatic fungal pathogens, does not recognise and colonise the larval host.

**References**


**Acknowledgements**

The authors gratefully acknowledge funding from ERFDF INTERREG and KESS.