



# Disruption of the reproductive capacity of *Aedes* mosquitoes by targeting lncRNAs

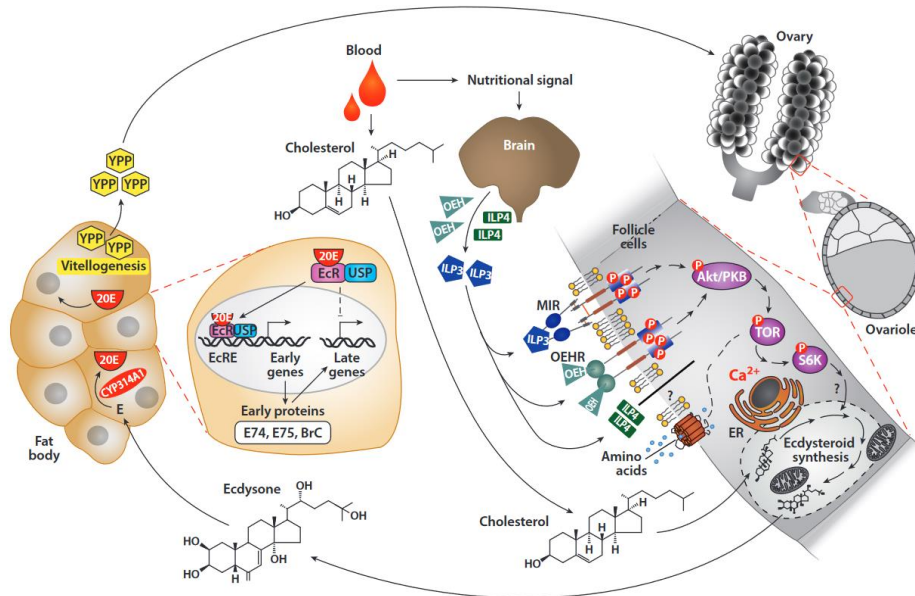
Alexandros Belavilas-Trovas  
PhD fellow



*Ae. albopictus*

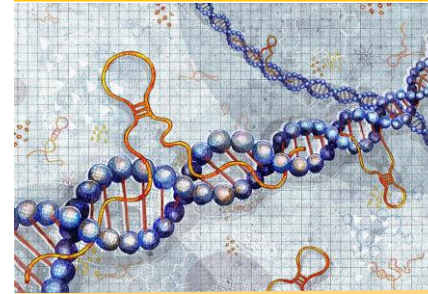


*Ae. aegypti*



Signaling pathways of vitellogenesis (Roy *et al* 2018)

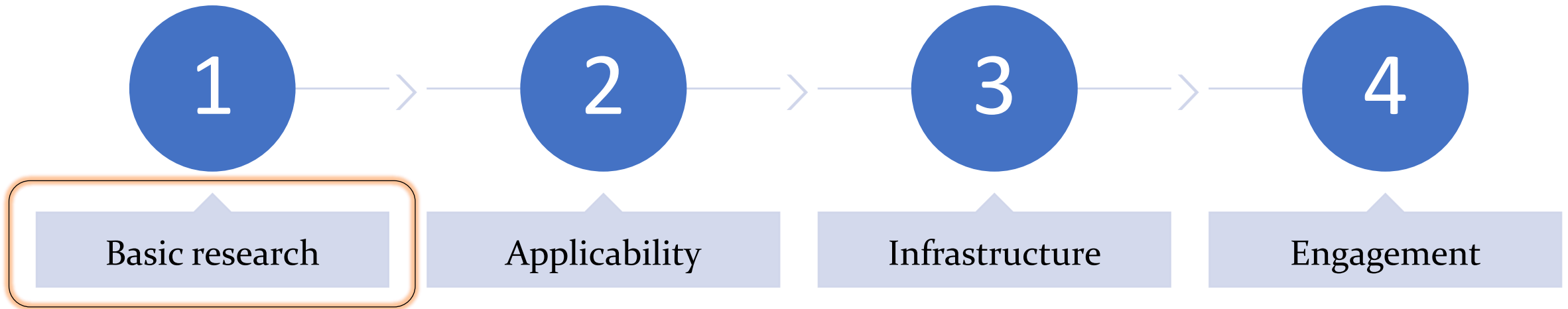
## Long non-coding RNAs (lncRNAs)



- Transcripts >200nt
- No coding potential
- Regulators of biological pathways
- Species-specific

➤ Promising tools for species-specific control approaches

# Impact of STSM on scientific growth & career



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**A species-specific lncRNA modulates the reproductive ability of the Asian tiger mosquito**

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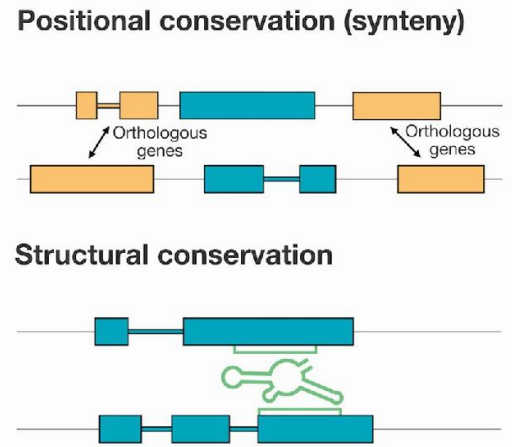
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Long non-coding RNA (lncRNA) research has emerged as an independent scientific field in recent years. Despite their association with critical cellular and metabolic processes in plenty of organisms, lncRNAs are still a largely unexplored area in mosquito research. We propose that they could serve as exceptional tools for pest management due to unique features they possess. These include low inter-species sequence conservation and high tissue specificity. In the present study, we investigated the role of ovary-specific lncRNAs in the reproductive ability of the Asian tiger mosquito, *Aedes albopictus*. Through the analysis of transcriptomic data, we identified several lncRNAs that were differentially expressed upon blood feeding; we called these genes Norms (Non-coding RNA in Mosquito ovary). We observed that silencing some of these Norms resulted in significant impact on mosquito fecundity and fertility. We further focused on Norm3 whose silencing resulted in 43% oviposition reduction, in smaller ovaries and 53% hatching reduction of the laid eggs, compared to anti-GFP controls. Moreover, a significant downregulation of 2 mucins within a neighboring ~100 kb mucin cluster was observed in smaller anti-Norm3 ovaries, indicating a potential mechanism of *in-cis* regulation between Norm3 and the mucins. Our work constitutes the first experimental proof-of-evidence connecting lncRNAs with mosquito reproduction and opens a novel path for pest management.

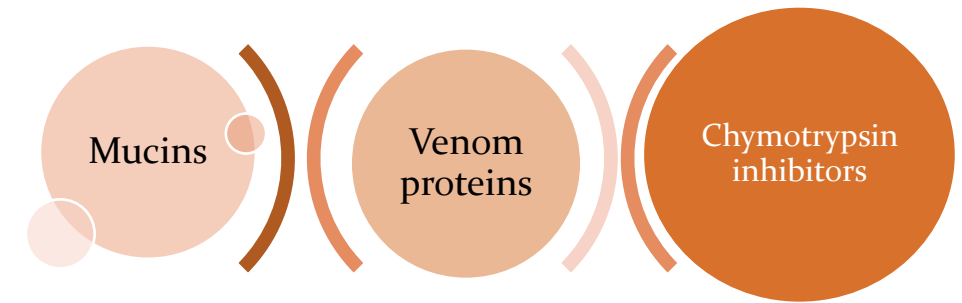
**KEYWORDS**  
*Aedes albopictus*, tiger mosquito, RNAi pest control, lncRNA, long non-coding RNA, species-specific control

**1 Introduction**

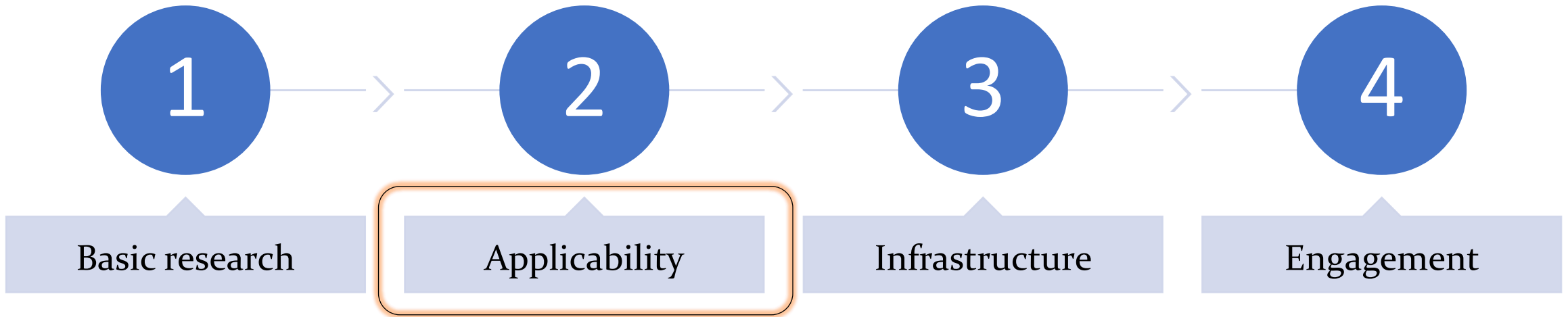
The remarkable progress of next-generation sequencing and genomics technologies that took place during the past 20 years revealed an unexpected world of transcribed, non-coding (nc) genomic elements that by far exceed in numbers the protein-coding transcripts (Chavakis, 2005). Long non-coding RNAs (lncRNAs) represent one class of functional ncRNA transcripts, characterized by species specificity and tissue-specific.



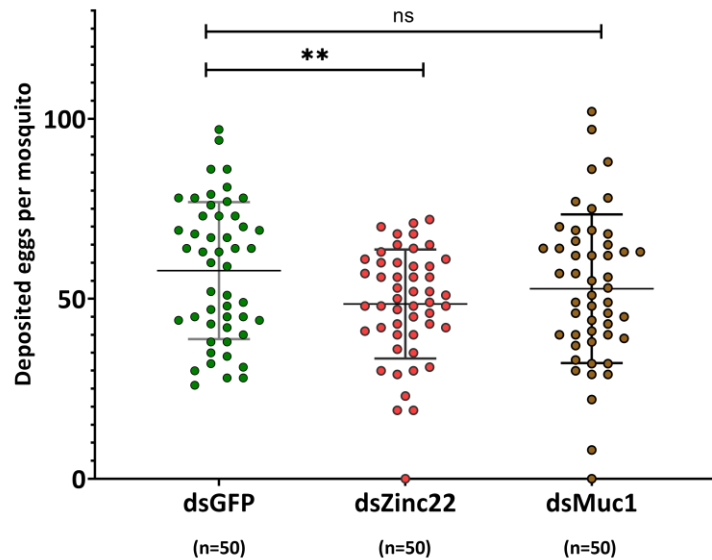
➤ A conservation model between two divergent reproductive lncRNA genes of *Ae. aegypti* & *Ae. albopictus*



# Impact of STSM on scientific growth & career



➤ Reduced fecundity



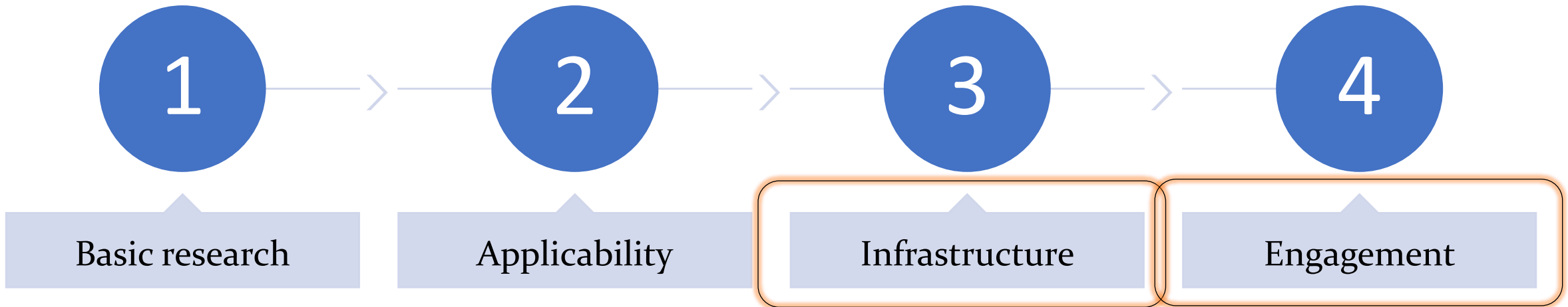
➤ Provoked smaller ovaries



Control

Treatment



# Impact of STSM on scientific growth & career



*Ae. aegypti*



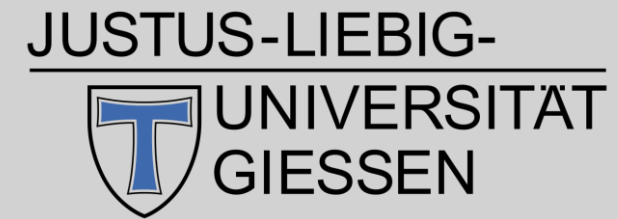
Microinjector

-  Joined a divergent, multicultural environment
-  Prepared the ground for broader collaborations

# Acknowledgements



- Prof. Kostas Mathiopoulos (supervisor)



- Prof. Marc Schetelig (host)
- Dr. Irina Häcker