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Novel systems to study vector-pathogen interactions in malaria

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Some parasitic diseases, such as malaria, require two hosts to complete their lifecycle: a human and an insect vector. Although most malaria research has focused on parasite development in the human host, the life cycle within the vector is critical for the propagation of the disease. The mosquito stage of the *Plasmodium* lifecycle represents a major demographic bottleneck, crucial for transmission blocking strategies. Furthermore, it is in the vector, where sexual recombination occurs generating “de novo” genetic diversity, which can favor the spread of drug resistance and hinder effective vaccine development. However, understanding of vector-parasite interactions is hampered by the lack of experimental systems that mimic the natural environment while allowing to control and standardize the complexity of the interactions. The breakthrough in stem cell technologies has provided new insights into human-pathogen interactions, but these advances have not been translated into insect models. Here, we review *in vivo* and *in vitro* systems that have been used so far to study malaria in the mosquito. We also highlight the relevance of single-cell technologies to progress understanding of these interactions with higher resolution and depth. Finally, we emphasize the necessity to develop robust and accessible *ex vivo* systems (tissues and organs) to enable investigation of the molecular mechanisms of parasite-vector interactions providing new targets for malaria control.

KEYWORDS

mosquito, *Plasmodium*, organoids, tissue explant, membrane feeding assay (MFA), Anopheles

1 Introduction

Mosquitoes are responsible for the transmission of many life-threatening diseases, causing millions of deaths every year. Malaria is one of the deadliest infectious diseases affecting half of the world's population and causing over half a million deaths per year (WHO, 2022). It is caused by apicomplexan parasites of the *Plasmodium* genus and is transmitted by the bite of a female *Anopheles* mosquito. The parasite survival in the mosquito is necessary for the spread of malaria and is therefore a target for the development of transmission blocking strategies (Yu et al., 2022).

Novel Systems For The Study Of Human Disease

Julia Schneider



Novel Systems For The Study Of Human Disease:

Unveiling the Magic of Words: A Overview of "**Novel Systems For The Study Of Human Disease**"

In a world defined by information and interconnectivity, the enchanting power of words has acquired unparalleled significance. Their ability to kindle emotions, provoke contemplation, and ignite transformative change is truly awe-inspiring. Enter the realm of "**Novel Systems For The Study Of Human Disease**," a mesmerizing literary masterpiece penned by way of a distinguished author, guiding readers on a profound journey to unravel the secrets and potential hidden within every word. In this critique, we shall delve in to the book is central themes, examine its distinctive writing style, and assess its profound affect the souls of its readers.

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