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Investigation of the influence of antimicrobial peptides on the developmental stages of Toxoplasma gondii

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Toxoplasma gondii is an intracellular protozoan parasite of high medical relevance, especially in immunocompromised individuals and during pregnancy. Current therapeutic approaches are limited in their efficacy across the parasite's life cycle stages and often associated with adverse effects. Antimicrobial peptides (AMPs), particularly cationic (KAMPs) and proline-rich peptides (PrAMPs), have emerged as promising candidates for adjunct antiparasitic therapies due to their broad-spectrum activity and low cytotoxicity.

This study aims to investigate the morphological and ultrastructural effects of selected AMPs on *T. gondii* in vitro. Special attention will be given to their action on both tachyzoites and bradyzoites, the latter being notoriously resistant to conventional treatment. Using confocal laser scanning microscopy (CLSM), scanning electron microscopy (SEM), and scanning transmission electron microscopy (STEM), we seek to characterize AMP-induced alterations on parasite membranes, intracellular organelles, and host-parasite interfaces. Beyond its descriptive anatomical scope, this project contributes to a mechanistic understanding of AMP action at the cellular level and to evaluate their potential as a supplement to existing therapeutic strategies. Establishing the morphological correlates of AMP activity could serve as a basis for the development of targeted interventions against toxoplasmosis and other apicomplexan infections.

Based on preliminary in vitro models, we hypothesize that AMPs exposure may result in disturbed ribosome assembly and membrane disruption in *T. gondii*, potentially impairing essential cellular processes such as protein biosynthesis and intracellular survival. These assumptions will be systematically tested through morphometric and ultrastructural analyses.

Initial results indicate lower survival rates of the tachyzoites as determined by DAPI staining.

Keywords

Toxoplasma gondii, Antimicrobial peptides (AMPs), Tachyzoites, Ultrastructural analysis, Congenital toxoplasmosis, Treatment

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Professional Status of the Speaker

PhD Student

Junior Scientist Status

Yes, I am a Junior Scientist.

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