Conditional Inactivation of ap2-mrp by Di-Cre System Leads to Arrest in Plasmodium falciparum Growth

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Malaria is a mosquito-borne disease that caused over 619,000 deaths in 2022, Plasmodium falciparum being the most lethal species which affects humans. Although the disease has affected humans for millions of years, there is still much we do not understand about the parasite's life cycle and its progression. This study focused on the Apicomplexan-specific Api-AP2 DNA-binding protein family which has been suggested by previous research to influence the development of the parasite and play a role in its commitment to the sexual stage of the life cycle. The project was based on one regulator from this family, AP2-MRP (Master Regulator of Pathogenesis), to determine its function, which had yet to be understood. After locating and excising the gene by combining CRISPR-Cas9 and Di-Cre systems, the knockout was confirmed of ap2-mrp using qRT-PCR. Next, the associated proteins were collected using chromatin immunoprecipitation and magnetic beads, and identified using mass spectrometry. The results illustrated that ap2-mrp plays a large role in the growth of the parasite and the development of merozoites, This was illustrated by the down-regulation of other red blood cell invasion-associated proteins in the life cycle of P. falciparum approximately -8 fold. This not only determined the importance of ap2-mrp and its gene family, but also emphasized how ap2-mrp could be used as a drug target, putting a stop to the rapid development of the parasite in red blood cells, thus preventing fatal cases.

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