FlukEEE: Exploitation of Extracellular Vesicles via Ellipsometry

Diagnostics of the Liver Fluke

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Abstract

Fasciola hepatica is a parasitic trematode responsible for fascioliasis, one of the most widespread parasitic infections affecting livestock worldwide. The disease causes severe health deterioration in cattle and sheep, leading to substantial economic losses in agriculture, and also represents a growing public health concern, with a lot of human infections reported globally. Although several diagnostic methods are currently available, their sensitivity, specificity, or practicality in field settings remain limited, highlighting the need for improved diagnostic approaches.

In recent years, extracellular vesicles (EVs) have emerged as promising biomarkers for disease diagnosis. EVs are nano-sized vesicles secreted by cells that mediate intercellular communication and carry molecular cargo reflective of the physiological and pathological state of the organism of origin. Parasitic helminths, including *F. hepatica*, release EVs that can be detected in host biological fluids, offering a potential non-invasive diagnostic target.

This project aims to investigate the suitability of *F. hepatica*–derived EVs as diagnostic biomarkers by developing a novel protein ellipsometry-based detection assay.

First, EVs will be isolated and characterised from stool samples obtained from infected and non-infected cattle and sheep. Subsequently, an ellipsometry-based assay will be designed in which antibodies targeting candidate *F. hepatica* EV markers are immobilised onto a surface. Upon exposure to biological samples, selective binding and capture of parasite-derived EVs are expected to result in a measurable increase in surface thickness, enabling their detection. Finally, the performance of the assay will be evaluated in complex biological samples, assessing its specificity and ability to discriminate between infected and non-infected animals.

Overall, this study aims to establish a robust workflow for EV isolation from livestock stool samples and to develop and validate a sensitive, non-invasive, and cost-effective diagnostic assay for fascioliasis. The successful implementation of this approach could improve parasite surveillance and disease management in livestock, reduce agricultural economic losses, and provide a foundation for future applications in human health diagnostics.