Low-cost, point-of-care blood-based nucleic acid test for schistosome infections

Rory Barnes, University of Glasgow

Schistosomiasis is primarily endemic to rural, low-resource areas with inadequate water and sanitation infrastructure. Currently available diagnostics include microscopy, rapid CCA (antigen) tests and PCR assays. They either lack sensitivity or are prohibitively costly and complex to be used as point-of-care devices in these settings, which limits their impact on timely interventions. In this project, we aim to address the trade-off between diagnostic sensitivity, cost, and complexity by integrating highly sensitive nucleic-acid amplification assays into a single, low-cost lateral-flow device. We have developed loop-mediated isothermal amplification (LAMP) assays that detect the two *Schistosoma* species that are most prevalent on the continent of Africa, where over 85% of global Schistosomiasis cases occur. We modified LAMP primers for *S. haematobium* and *S. mansoni* with labels to enable binding of amplicons to gold nanoparticles conjugated to antibodies, which are then immobilised on the streptavidin-coated test line of a lateral flow strip to indicate a positive result. The limit of detection (LoD) within 30 minutes for the *S. haematobium* and *S. mansoni* assays were 2000 and 20,000 copies of target sequence, respectively. These preliminary results provide proof-of-concept that these assays are able to detect these *Schistosoma* species using LAMP assays combined with a lateral-flow readout. Next, we will investigate methods to improve the sensitivity of these tests, their ability to detect cell-free parasite DNA in serum, and multiplex the assays into an integrated, simple to use ‘one-pot’ assay.