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Sensitivity and specificity of human point-of-care circulating cathodic antigen (POC-CCA) lateral flow test by using latent class models in a Bayesian analysis for rapid diagnosis of schistosomiasis in African livestock

Introduction

Schistosomiasis is a major neglected tropical disease (NTD) of public health and veterinary importance. The morbidity and mortality inflicted upon livestock animals in sub-Saharan Africa has been largely underestimated and overlooked, in part due to a lack of sensitive, field-applicable diagnostic tests. An inexpensive, non-invasive, and sensitive diagnostic test would enable both prevalence mapping and development of more appropriate intervention programmes. This study aimed to assess the sensitivity and specificity of the currently available commercial point-of-care circulating cathodic antigen test (POC-CCA), originally designed for *Schistosoma mansoni* detection in humans, for the detection of intestinal livestock schistosomiasis caused by *Schistosoma bovis* and *Schistosoma curassoni*.

Methods

Five diagnostic techniques, namely, POC-CCA, the circulating anodic antigen test, Kato-Katz technique, miracidial hatching technique and organ and mesentery inspection (for animals from abattoirs only) were applied to samples collected from 195 animals (56 cattle, 57 goats and 82 sheep from abattoirs and living populations) from two sites (Richard Toll and Barkedji) in Northern Senegal. To account for imperfect reference diagnostic tests, we utilised a pseudo-gold standard positive (positive for any diagnostic test) and negative (negative for all diagnostic tests) to generate a Bayesian latent class model (BLCM) to assess the sensitivity and specificity of POC-CCA.

Results

POC-CCA sensitivity varied by host and/or parasite species – at >50% amongst cattle infected with *S. bovis* but <50% amongst goats and sheep infected with *S. curassoni*. Mean POC-CCA specificity, however, remained relatively high across host and parasite species, as well as geographical region. We will discuss our results in terms of their implications and applications for the improved control and elimination of schistosomiasis from a One Health perspective.

Conclusions

Overall, our results indicate that POC-CCA may be superior for West African *Schistosoma* species detection in cattle, compared with detection in small ruminant hosts, additionally, POC-CCA may be superior for detection of *S. curassoni*, over *S. bovis*. Different *Schistosoma* species may produce varying amounts of CCA, harbour differing metabolic pathways, or possess diverse patterns of CCA excretion, potentially contributing to different POC-CCA accuracies. Host species may impact on test performance due to urine consistency, CCA metabolism rates, and cross-reactions with other infections. The observed variation in test performance across sites and parasite species hold implications for the applicability of POC-CCA, as it may hinder our ability to establish universally valid thresholds for disease prevalence that inform control programmes. Future work is needed to develop livestock-specific affordable and field-applicable diagnostic tests to enable determination of the true extent of livestock schistosomiasis in sub-Saharan Africa.

Presentation category – C

Presentation of choice – O

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