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ORIGINAL PAPER

Serological and molecular detection of *Strongyloides stercoralis* infection among an Orang Asli community in Malaysia

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Abstract Detection of *Strongyloides stercoralis* infection particularly in asymptomatic individuals is often hampered due to the lack of standard diagnostic tools. In this study, the use of serological and molecular approaches were investigated for the detection of *S. stercoralis* infection among an Orang Asli (indigenous) community following a preliminary detection by microscopic examination of faecal samples. Out of 54 individuals studied, 17/54 (31.5 %) were detected to be positive for *S. stercoralis* infection by enzyme-linked immunosorbent assay (ELISA), compared to 0/54 (0 %) by faecal examination. Further confirmation performed by a nested polymerase chain reaction (PCR) using DNA extracted from faecal samples of these 17 individuals yielded 3/17 (17.6 %) positives for *S. stercoralis* DNA amplification. No amplification was seen with the other 37 faecal samples, which were negative by microscopy and ELISA. As the high ELISA positive results were suspected to be false-positives, ELISA is not recommended for use as a detection tool but may be beneficial for evaluating the effectiveness of anti-*Strongyloides* drugs. The present finding indicated that PCR should be considered as an alternative diagnostic tool for the detection of *S. stercoralis* infection.

Introduction

Strongyloides stercoralis is a cosmopolitan nematode commonly found in tropical and subtropical regions of the world, including Europe, America and Southeast Asia (Siddiqui and Berk 2001). Infected individuals may be asymptomatic or symptomatic (e.g. diarrhoea, pneumonia, gastrointestinal bleeding and hemorrhagic pneumonitis) depending on the host immune response and number of larvae at the affected areas of the body (Montes et al. 2010). Being able to complete its life cycle in the environment, the mode of transmission is mainly by penetration of human's skin by the infective larvae present in contaminated soil (Olsen et al. 2009). In autoinfection, *S. stercoralis* larvae may develop into the infective larvae stage within the gastrointestinal tract and continuously reinfect the host for decades causing chronic infection affecting cutaneous, gastrointestinal and pulmonary systems. In addition, this type of infection can progress to hyperinfection and dissemination to other organs especially in immunosuppressed individuals resulting in fatal outcomes in more than 85 % of cases (Siddiqui and Berk 2001; Igra-Siegman et al. 1981).

Currently, there has been an estimation of 30 to 100 million people being infected globally (Bethony et al. 2006). Nevertheless, the true prevalence of *S. stercoralis* is often queried due to the lack of standard diagnostic tools (Olsen et al. 2009; Verweij et al. 2009). For example, in Northern Australia, Thailand and the US, the prevalence rates ranged from 0–60, 15–39 and 0–4 %, respectively (Johnston et al. 2005; Nontasut et al. 2005; Siddiqui and Berk 2001).

In most of the developing countries, the common diagnostic method employed is microscopic examination of stool samples for the presence of *S. stercoralis* larvae (Devi et al. 2011; Nontasut et al. 2005). This method is useful when the larvae load is high, such as in acute *S. stercoralis* infections, but not in cases where the larvae number is low (Siddiqui and Berk 2001). This may lead to underestimation of the prevalence rate of *S. stercoralis* infection due to false-negative results. Concentration techniques (e.g. Baermann) and methods for larval cultivation (e.g. Harada-Mori and Petri dish) have been used for diagnosis, but they are labour-intensive and therefore not recommended for use in large-scale studies (Yori et al. 2006).

Diagnostic methods utilising immunological approaches including enzyme-linked immunosorbent assay (ELISA),

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