Research Note

ELISA and immunoblot using purified glycoproteins for serodiagnosis of cysticercosis in pigs naturally infected with *Taenia solium*

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Abstract

The establishment of reliable serological methods for cysticercosis in pigs is important for the surveillance, control and prevention of taeniosis/cysticercosis in humans as well as in pigs to prevent economic loss. Both ELISA and immunoblot using glycoproteins (GPs) purified by a single step of preparative iso-electric focusing, which are highly useful for human cysticercosis, have been applied for a serological study in pigs naturally infected with *Taenia solium*. All sera from pigs showed similar responses to those in human cysticercosis. Therefore, it is expected that both ELISA and immunoblots using GPs would be useful in differentiating infected pigs from uninfected ones.

Neurocysticercosis (NCC) is one of the major causes of neurological disease and is spreading throughout the world (Schantz *et al*., 1992, 1998; Simanjuntak *et al*., 1997; White 1997; Wandra *et al*., 1999). Recently, we have established highly sensitive and specific serodiagnostic techniques for human cysticercosis using ELISA and immunoblot (Ito *et al*., 1998). This is the first report to show a similar sensitivity and specificity of ELISA compared with immunoblot for human cysticercosis. The antigens are glycoproteins (GPs) prepared by preparative iso-electric focusing. The purification method is basically a single step and the purity of the GPs is thoroughly different from lectin affinity purified GPs (Tsang *et al*., 1989). It is a major advance in serodiagnosis for human cysticercosis as highly specific ELISA can be used instead of immunoblot (Tsang *et al*., 1989). There are

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commercially available ELISAs for NCC but they fail to differentiate cross reactive echinococcosis (Sloan *et al*., 1995).

As cysticercosis is a zoonotic parasitic disease and the life cycle is completed between pigs and humans, the prevention, control and surveillance for cysticercosis should be based on surveillance in both humans and pigs.

In this short study, we aim to demonstrate that serological methods such as immunoblot and ELISA using new GP antigens can be useful for the detection of pigs infected with *T. solium* as in the case of cysticercosis in humans (Ito *et al*., 1998).

A total of eight sera from pigs (four from China, three from Mexico and one from Indonesia) naturally infected with *T. solium* was examined and all eight were found to harbour multiple cysticerci. All sera from pigs naturally infected with *T. solium* showed very similar antibody responses (fig. 1) as human cysticercosis (Ito *et al*., 1998). The ELISA optical density values were between 0.567 and 2.500 (maximum OD), whereas those from the uninfected four pigs were 0.076 ± 0.014. The cut-off value in human cysticercosis was 0.150 (Ito *et al*., 1998).

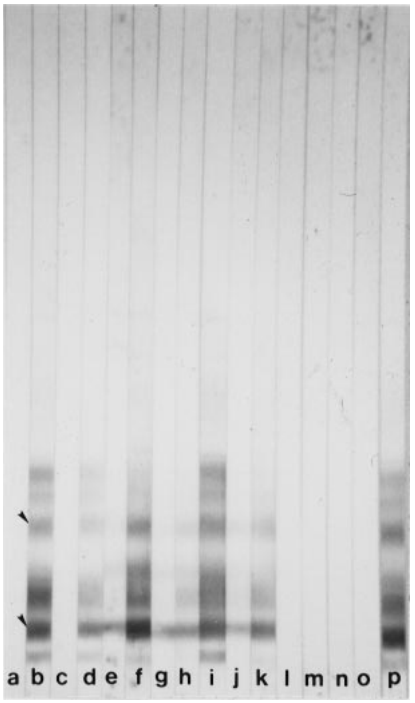

Fig. 1. Immunoblot figures of sera from eight pigs naturally infected with *T. solium* in Mexico (3), China (4) and Indonesia (1). Lanes a and o, normal pooled human serum; lanes b and p, cysticercosis pooled human serum; lanes c, l–n, uninfected individual pig sera; lanes d–k, naturally infected individual pig sera. All bands are specific to cysticercosis (Ito *et al*., 1998). Two arrowheads indicate most predominant bands of 10 and 26 kDa. All serum samples were examined at 1/100 dilution. Peroxidase-conjugated, anti-porcine IgG (H + L) and anti-human IgG (H + L) (Zymed Laboratories, Inc., San Francisco, CA 94080, Cappel, West Chester, PA 19380, USA, respectively) were used at 1/500 dilution (Ito *et al*., 1998).

These preliminary results strongly suggest that a new serodiagnostic technique using GPs purified by a preparative isoelectric focusing is most useful and reliable for both swine and human cysticercosis (Ito *et al*., 1998). To date, all sera from patients of cysticercosis with multiple cysts, confirmed parasitologically, showed specific antibody responses against these GPs. Most recently, two cases were reported with a single cyst in the brain. One showed an antibody response before surgical resection which fell below the cut-off level within one year after surgery (Ito *et al*., 1999), whereas the other showed no antibody response at all (Ohsaki *et al*., 1999). It is therefore of interest to establish the sensitivity of serodiagnosis for cases with a single cyst in the entire body in humans and pigs (Wilson *et al*., 1991). Antibody responses in sera from pigs experimentally infected with *T. solium* are currently being analysed in collaboration with Mexican, Ecuador and Belgian groups and human cases with a single cyst in the brain in collaboration with a South African group. Following these studies, it is hoped that serodiagnosis using specific antigens purified by a single step of preparative isoelectric focusing will be used both for swine and human cysticercosis.

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