

TSOL18 vaccine antigen of *Taenia solium*: development of monoclonal antibodies and field testing of the vaccine in Cameroon

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Taenia solium is a taeniid tapeworm, transmitted between humans and pigs. This zoonotic parasite has been eradicated in industrialized countries but is still very prevalent in developing countries. Both the adult and larval stages can establish in humans, causing taeniasis and cysticercosis respectively. Cysticerci may lodge in the brain and cause neurocysticercosis, one of the most important causes of acquired epilepsy in endemic areas. Control of *T. solium* is based on improvement of sanitation and pig husbandry systems, meat inspection and mass treatment of humans. Novel approaches include anthelmintic treatment and vaccination of pigs. The recombinant oncospherical antigen TSOL18 is the most promising vaccine candidate and has shown near 100% efficacy in experimental conditions. This thesis aimed to testing the vaccine in the field and to developing techniques to assess the success of vaccination.

Chapter 1 reviews the literature on the immunological aspects of taeniid cestode infections and the existing vaccines against *T. solium* cysticercosis in pigs. In chapter 2 an epidemiological study on porcine cysticercosis is described in the far north region of Cameroon, where a vaccine field trial with TSOL18 was going to be organized. Risk factors for transmission of *T. solium* were present and serological analysis of pigs showed a prevalence of porcine cysticercosis of 26.6 %. Chapter 3 reports on studies to characterize whether the principal antibody specificities raised by TSOL18 in pigs are against linear or conformational determinants. The original TSOL18 protein and two truncations were used in inhibition ELISA to determine their ability to inhibit the binding of protective pig antibodies to TSOL18. The results indicated that the dominant antibody specificities, and likely the host protective specificities, of TSOL18 are conformational epitopes. Chapter 4 describes the development of an antibody detection test for the specific diagnosis of porcine cysticercosis. A fraction with a major band of 14 kDa was obtained from crude cyst fluid of *T. solium* cysticerci by 2-step chromatography. In chapter 5 the efficacy of the TSOL18 vaccine is assessed under field conditions in Cameroon. Two hundred and forty 2-3 month old piglets were involved in the study. One or more pairs of piglets were

assigned to households, with one animal of each pair being vaccinated and the other acting as a non-vaccinated control. Vaccinated animals received three immunizations intramuscularly. At the time of the second immunization both vaccinated and control animals received an oral dose of 30 mg/kg oxfendazole. Necropsies were undertaken when the pigs were approximately 12 months of age. Viable *T. solium* cysticerci were identified in 20 control pigs, including 14 animals that were massively infected. No cysticerci were found in any of the vaccinated animals indicating that the vaccine provided a very high level of protection against naturally acquired infection with *T. solium* in pigs. In chapter 6, a monoclonal antibody (MoAb)-based inhibitive ELISA was developed to assess immune responses in vaccinated pigs that correlate with protection. In all vaccinated pigs screened at necropsy, anti-TSOL18 antibodies inhibited the binding of a MoAb specific to the conformational epitopes of TSOL18 antigen, suggesting an immune response that correlates with protection. In chapter 7 the efficacy of the TSOL18 vaccine is compared with that of other vaccines. Future research activities are suggested to improve our knowledge on the duration of the immunity of the vaccine and various other aspects of the vaccine production and delivery. The combined application of TSOL18 vaccination and a single oxfendazole treatment in pigs is a simple and relatively sustainable procedure that has the potential to control *T. solium* transmission in endemic areas and, indirectly, reduce the number of new cases of neurocysticercosis in humans.

References

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