

JOINT SPRING SYMPOSIUM 2007

“Integrated Parasite Control”

Danish Society for Parasitology

And

Danish Society for Tropical Medicine & International Health

Abstracts

Time: Friday 23 March, 2007 8:30-15:00

Venue: University of Copenhagen,
Faculty of Life Sciences (former KVL),
Auditorium 1-01,
Bülowsvej 17, 1870 Frederiksberg C.

INTEGRATED PARASITE CONTROL (IPC)

From vertical research projects on disease specific topics to integrated parasite control. How do we manage? Integration can be understood as the integration of control of specific diseases in the existing health care system, integration/collaboration of several disease control programmes or integration/combination of different control methods against a specific parasite infection.

In veterinary medicine IPC has been applied for years primarily due to the fast development of anti parasitic drug resistance and the simultaneous occurrence of many parasites with very different life cycle patterns. Another reason is the growing consumer demand for organic farming, which has to rely on non-chemical alternatives. Hence, IPC strategies have been developed including grazing management, livestock management, helminth hostile nutrition, rotation systems, biological control and selection of resistant animals in combination with smart use of the existing drugs.

In the human health sector, poor and resource scarce health care systems in least developed countries, overwhelmed by HIV/AIDS, have very few resources left for other health problems including the parasitic diseases. Multiple infections in the same individual, which is often the norm, affect disease progression, treatment strategy, drug efficacy and tolerance. However, improved diagnostic tools combined with effective drugs and drug combinations and in some cases vaccines have opened a window of opportunities to improve control measures.

There is a growing demand for cost-effective disease control for humans as well as livestock and this has led to many new initiatives across well-established borders. However, many limitations and knowledge gaps for evidence-based integrated parasite/disease control still remain to be elucidated. The Spring Symposium 2007 will attempt to focus on the latest experiences from both livestock and human health initiatives.

ABSTRACTS (O – oral presentation; P – poster)

O INTEGRATION OF NEGLECTED TROPICAL DISEASE CONTROL PROGRAMMES: CHALLENGES AND OPPORTUNITIES

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There is growing awareness in public health circles about the huge, yet significantly underestimated burden and societal impact due to the neglected tropical diseases. The good news is that efforts are getting underway to integrate neglected tropical disease control programmes with (i) interventions against malaria, HIV/AIDS and tuberculosis, and (ii) control measures targeting multiple neglected tropical diseases. Opportunities for integrated control of neglected tropical diseases include the following. First, there is considerable geographical overlap of the distribution of neglected tropical diseases, which provides leverage for preventive chemotherapy programmes targeting multiple diseases simultaneously. Second, the public health interventions are similar, largely built around the regular administration of safe and efficacious drugs that are either donated or available at low costs. Third, the similar strategic approaches might enhance cost-effectiveness of interventions. However, the following challenges have been identified. First, there is a need to develop efficient and cost-effective means for rapid identification and mapping of communities at highest risk of coinfection. Second, preventive chemotherapy programmes must be tailored for specific age groups, and take into consideration setting-specific issues, such as eco-epidemiological and socio-cultural factors. Third, new research is needed to determine the most appropriate time intervals, delivery systems, and monitoring platforms, especially for drug interactions, compliance and development and spread of drug resistance. Finally, the question must be addressed how one moves from morbidity control to transmission containment.

O INTEGRATED PARASITE CONTROL IN DOMESTIC ANIMALS

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Parasites remain a major impediment to welfare and production of domestic animals worldwide. A recent FAO/WHO/OIE-endorsed review concluded that helminth parasitism (in particular *Haemonchus contortus*) had the highest global index as an animal health constraint to poor livestock keepers in the world. Since the advent of modern broad spectrum anthelmintics in late 50ies, each new drug release has been followed by field reports of resistance in livestock within 5-10 years. Anthelmintic resistance is globally widespread in sheep, goats and horses and, more recently in cattle. This development together with a wish to be able to cope with parasites without medication, e.g. in organic farming or in resource-poor tropical farming, has led to exploration of novel, non-chemical approaches: strategic nutritional supplement, use of anti-parasitic forages, phytotherapy, nematophagous fungi, selective breeding for host resistance, vaccination and, not least, grazing management i.e. preventing heavy exposure through planned pasture changes between/within grazing seasons. Some alternatives have experimentally shown excellent results but the majority will never be 'stand-alone' measures of control. They will have to be integrated with restricted use of anthelmintics. The mode of using anthelmintics is also under revision by introducing the concept of targeted selective treatments i.e. treating clinically affected or susceptible animals (e.g. lactating) only, or targeting major contributors to pasture contamination, thereby ensuring that a large proportion of the parasite population remains unselected by the drug (the refugium). This represents a shift in paradigm in parasite control and practical experience is only slowly building up. In conclusion, integrated parasite control is undoubtedly more complex and laborious than preventive drug application. Consequently, the adoption is expected to be more difficult and a major effort will have to be devoted to getting 'the message across the fence' to farmers. Who will take on the job?

P POTENTIAL FOR IMPROVED CONTROL OF ASCARIS SUUM AND OTHER GEOHELMINTHS BY ADDITION OF CHITINOUS SOIL AMENDMENTS.

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A recent study on improved degradation of *Ascaris suum* eggs in soil yielded positive results. Contaminated soil amended with 1) 1% chitin or 2) 5% crushed crab-shell showed significant reduction in egg recovery over a 50-day period compared to 3) controls. 1) 59.4% red. $t=5.4802E-05$. 2) 41.5% red. $t=0.0057$. 3) 13.7% red. Application of a commercially available chitin-containing product developed for improved control of cyst-forming phytoparasitic nematodes could be tested for its effect *in vitro* and under field conditions. Achievement of faster degradation of *A. suum* and other hard-shelled geohelminth eggs could be profitable for the individual farmer in terms of improved animal health, less need for medical treatment and potential of faster pasture rotation. Especially producers of free-range animals e.g. swine and poultry might find an environmentally friendly control method beneficial.

Q IMPACT OF HOST IMMUNITY ON THE TREATMENT OF DRUG RESISTANT PLASMODIUM FALCIPARUM MALARIA IN TANZANIA.

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Background. In malaria endemic areas children may recover after chemotherapy of apparent drug-resistant *Plasmodium falciparum* malaria. This implies a synergy between drug treatment and acquired immunity. We examined this hypothesis in an area of moderately intense transmission of *P. falciparum* in Tanzania.

Methods. 100 children below five years of age with uncomplicated malaria were treated with either sulfadoxine-pyrimethamine (SP) or amodiaquine (AQ) and followed for 28 days. Mutations in parasite genes related to SP and AQ-resistance and IgG antibody responses with specificity for 13 *P. falciparum* antigens were measured in samples collected at day of enrolment.

Results. Parasitological or clinical treatment failures (TF) were observed in 38% and 68% of children receiving AQ and SP, respectively. In both treatment arms, prevalence and levels of anti-Glutamate-rich Protein (GLURP)-specific IgG, but not of any other antibodies, were significantly higher ($p<.001$), and prevalence of parasites carrying genotypes associated with SP and AQ resistance, lower ($p=.02$) in children with adequate clinical and parasitological response (ACPR) compared to children with TF. Furthermore, presence of GLURP-specific IgG antibodies influenced the risk for failing SP and AQ treatment more strongly than presence of parasite resistant haplotypes and levels of parasitaemia.

Conclusions. Our findings suggest that GLURP-specific IgG antibodies contribute to clearance of drug-resistant infections and support the hypothesis that acquired immunity enhances the clinical efficacy of drug therapy.

O ERYTHROPOIETIN (EPO) TREATMENT INCREASES SURVIVAL AND REDUCES NEURONAL APOPTOSIS DURING MURINE CEREBRAL MALARIA (CM)

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CM is an acute encephalopathy with increased expression of pro-inflammatory cytokines, sequestration of parasitised erythrocytes and localised ischaemia. In children CM induces cognitive impairment in about 10% of the survivors. Epo has shown to have significant anti-inflammatory, anti-oxidant and anti-apoptotic effects in various brain diseases. However, its role in CM remains to be elucidated. The neurobiological responses to exogenously injected Epo during murine CM was investigated.

Methods: Female C57BL/6j mice (4-6 weeks), infected with *Plasmodium berghei* ANKA, were treated with recombinant human Epo (50-5000U/kg/OD, i.p.) at different time points and studied on day 7, day 9, and when presenting signs of CM. Brain pathology was investigated by immunohistochemistry, immunofluorescence and TUNEL (Terminal deoxynucleotidyl transferase (TdT)-mediated deoxyuridine triphosphate (dUTP)-digoxigenin nick end labelling) as a marker of apoptosis. Pro-inflammatory cytokines were evaluated on mRNA level with qrt-PCR

Results:

- A. Localised neuronal apoptosis indicating irreversible pathology
- B. Epo increases survival in mice with CM in a dose and time dependant manner.
- C. Epo treated mice with CM showed significantly reduced apoptotic cell death.
- D. The time point of Epo treatment plays an important role.
- E. Epo reduces the expression of pro-inflammatory cytokines in the brain.

Interpretation:

This report shows a dose and time dependent neuroprotective effect of Epo in murine CM. Its possible therapeutic potential in humans needs to be further examined.

P SEVEN CASES OF TRICHINOSIS IN DENMARK DUE TO CONUMPTION AF A ROMANIAN SAUSAGE.

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NO ABSTRACT

P THE LUNGFLUKE: *PARAGONIMUS WESTERMANI*

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Paragonimus westmani is an almost ignored parasite in Denmark. I am worried especially because thousands of tourists travelling in tropical countries could be exposed to this parasite in endemic areas. They are unaware of the danger when they want to taste the different local dishes such as pickled or insufficiently cooked, fried or grilled crayfish, e.g. crabs or river prawns. In eastern Thailand in the Easaran area, *P. westmani* is endemic. There they have a local dish called Papaya salad that contains crushed crabmeat, which you should avoid. In Borneo they have wild boars that are infected with *P. westmani*, such that you can get the lung fluke by eating the meat if it is not well cooked. I was told, when we went on a field trip with the tropical school to the Easaran area, that the wild cats and tigers which catch crabs when the water is low are going around coughing in the jungle there. In English textbooks it is generally known that the lung fluke, *P. westmani*, can be mistaken for either tuberculosis or cancer. The treatment of this fluke is simple and effective with praziquantel campaired with the diseases mentioned above.

O SIMULATING CONTROL OF *TAENIA SOLIUM* INFECTIONS USING A MODIFIED REED-FROST MODEL

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The transmission dynamics of the human-pig zoonotic cestode *Taenia solium* is explored with both deterministic and stochastic versions of a modified Reed-Frost model. This model, originally developed for microparasitic infections (i.e. bacteria, viruses and protozoa), assumes that random contacts occur between hosts and that hosts can be either susceptible, infected or 'recovered and presumed immune'. Transmission between humans and pigs is modelled as susceptible roaming pigs scavenging on human faeces infected with *T. solium* eggs. Transmission from pigs to humans is modelled as susceptible humans eating under-cooked pork meat harbouring *T. solium* metacestodes. Deterministic models of each scenario were first run followed by stochastic versions of the models to assess the likelihood of infection elimination in the small population modelled. The effects of three groups of interventions were investigated using the model: 1) Interventions affecting the transmission parameters such as use of latrines, meat inspection, and cooking habits; 2) routine interventions including rapid detection and treatment of human carriers or pig vaccination; and 3) treatment interventions of either humans or pigs. It is concluded that mass-treatment can result in a short term dramatic reduction in prevalence, whereas interventions targeting interruption of the life cycle lead to long-term reduction in prevalence.

P COMPARING PCR AND MOSQUITO DISSECTION FOR MONITORING THE PROGRESS OF MASS DRUG ADMINISTRATION PROGRAMS FOR THE ELIMINATION OF LYMPHATIC FILARIASIS IN TANZANIA.

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Lymphatic filariasis, resulting from infection with the mosquito-borne filarial nematode *Wuchereria bancrofti*, is a major debilitating disease affecting more than 120 million people in countries with a warm and humid climate. The Global Programme for Elimination of Lymphatic Filariasis was launched by WHO in 2000 in order to assist in guiding programs for global control and elimination of this disease. The primary recommended measure is annual mass drug administration (MDA) in endemic areas with the aim of interrupting transmission by killing the microfilariae in infected humans and thereby preventing the vector mosquitoes from being infected and subsequently carrying the infection to other humans. In a longitudinal study in Tanzania, we investigate the effect of this strategy by monitoring lymphatic filariasis infection and transmission in a highly endemic community given annual MDA (ivermectin + albendazole) by the Tanzanian National Lymphatic Filariasis Elimination Programme. Transmission is monitored by catching and dissecting (for filarial larvae) vector mosquitoes once weekly in 50 houses throughout the study period (6 years). Here we report on a sub-study carried out to compare the dissection results to results from a newly developed PCR technique to detect filarial infection in the vectors.

O THE COMMUNITY-DIRECTED TREATMENT APPROACH VERSUS THE SCHOOL-BASED TREATMENT APPROACH IN THE CONTROL OF SCHISTOSOMIASIS AND SOIL-TRANSMITTED HELMINTHIASIS AMONG SCHOOL-AGE CHILDREN

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This study compared a community-directed treatment (ComDT) approach and a school-based treatment approach on schistosomiasis and soil-transmitted helminthiasis (STHs) in school-age children. It also compared the treatment coverage among enrolled and non-enrolled school-age children. Ten schools/villages were randomly allocated to the two approaches. After a baseline parasitological survey in randomly selected schoolchildren, all school-age children received a single dose of praziquantel (40 mg/kg body weight) against schistosomiasis and a single dose of albendazole (400 mg) against STHs by the different approaches. After 12 months, the prevalence of *Schistosoma mansoni* and *Trichuris trichiura* were similar between the areas with the ComDT and the school-based approaches ($P=0.66$ and 0.37), while the prevalence of *S. haematobium*, *Ascaris lumbricoides* and hookworm were significantly lower in the ComDT area compared to the school-based area ($P=0.005$, 0.006 and 0.01 , respectively). There was no difference in intensity of any infection between the areas. Treatment coverage among enrolled children was similar for the two approaches, but the ComDT approach achieved a significantly higher coverage among the non-enrolled children than the school-based approach ($P<0.0005$). The results of this study showed that the ComDT approach could be an effective approach in controlling schistosomiasis and STHs among school-age children and, furthermore, that the approach could reach a higher number of non-enrolled school-age children compared to the school-based treatment approach.

P NEW TECHNIQUE FOR WORM BURDEN ASSESSMENT OF ANGIOSTRONGYLUS VASORUM IN EXPERIMENTALLY INFECTED FOXES (VULPES VULPES)

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Assessing the *Angiostrongylus vasorum* worm burden of a host animal is very complicated due to the location in the peripheral branches of the pulmonary arteries. So, in field surveys approximate quantification is usually done by dissecting the pulmonary arteries and lung tissue, resulting in a high degree of worm damage and subsequent identification problems. In a large-scale study on experimental angiostrongylosis in foxes, a novel technique for reverse perfusion of the cardio-pulmonary vascular system was developed in order to recover as many intact worms as possible. Anaesthetized foxes were given heparin i.v. (350 IU/kg) in order to prevent blood clotting during *post mortem*. Three minutes later a lethal pentobarbital dose (100 mg/kg) was given, the thorax was opened and the thoracic organs were perfused *in situ*. The aorta, vena azygos and the both venae cavae were clamped off. About three litres of isotonic perfusion liquid (sodium citrate, 15 g/l + NaCl, 8.6 g/l dissolved in tap water) were pumped via a 16G needle into the left auricle, through the pulmonary veins, the lung capillaries and the pulmonary arteries to the pulmonary trunc from which it was led via a plast pipe (5 mm diameter) onto a sieve (200 µm aperture) for collection of worms. This procedure was followed by removal of the lungs, dissection of the pulmonary arteries and subsequent baermannization of the dissected lung tissue in normal saline. By estimating the total worm burden as the sum of recoveries made by perfusion, dissection and baermannization, respectively, 49%, 40% and 11% of the total worm burden were recovered by each of these three methods, respectively. In contrast to dissection and baermannization, however, close to 100% of the worms recovered by perfusion were intact.

P SIZE OF *ASCARIS SUUM* LARVAE IS AFFECTED BY PARENTAL GENOTYPE AND LOCATION IN THE INTESTINE IN PIGS

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It is well known that a very large proportion of *Ascaris suum* are expelled shortly after infection of pigs – both under natural conditions and after experimental infections. Until now the question whether there are differences between the small residual population of *Ascaris* that remain in the pig compare to the majority of parasites that are expelled has not been explored in a systematic manner. In order to investigate the effect of parasite genetics on establishment, pigs were infected with eggs of known genotypes and then killed at different time points: before, under and after expulsion. A PCR-RFLP method applied on the mitochondrial DNA was developed and used to discriminate between the offspring originating from four different *Ascaris* females (Type A, B, C and D). Each of 26 pigs was then inoculated with 2000 infective eggs (500 eggs of each type) and 6, 6 and 14 pigs were slaughtered at day 14 (before expulsion), 17 (during expulsion) and 28 pi. (after expulsion), respectively. At slaughter the small intestine was divided into 8 sections of similar length. Larvae from each section were isolated using an agar method. At day 17 pi. larvae were also isolated from 10% of the colon content. The length of the larvae was measured using photo equipment (day 14 and 17 pi.) and a regular scale (day 28 pi.) and the larvae were genotyped in order to identify the female from which they were originating from (A, B, C or D). At the three slaughtering days 6 (100%), 5 (80%) and 5 (37%) pigs, respectively were positive for *Ascaris* and a total 1908, 1616 and 675 larvae were analysed for each day, respectively. Random effect models with pig included as a random variable were used to analyse the response variable length on each day. Section (1-8) and type (A, B, C and D) were included as explanatory variables. The random effect (covariance) caused by pig was non-significant ($P = 0.12$; $P=0.16$; $P=0.33$). Both at day 14 pi. and 17 pi. the length of the larvae was significant affected by the interaction between type and section ($P < 0.0001$) as well with the total number of larvae in the sections ($P < 0.001$). At day 28 pi. the interaction between section and type was significant at $P=0.03$. In conclusion we have found preliminary evidence for a parental effect on the outcome of the size of the offspring in addition to a location-size effect, both possibly with a consequence on larvae fitness and therefore survival in the host.

Q CONSISTENT STRONGYLE EGG SHEDDING IN HORSES – A BASIS FOR IMPLEMENTATION OF SELECTIVE THERAPY

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Horses on pasture are constantly exposed to clinically important mixed strongyle infections, a group of helminth parasites comprising more than 50 different species. Traditionally, strongyle control is based on regular treatments throughout the year, but increasing levels of anthelmintic resistance has lead to recommendations of parasite surveillance and reduced treatment intensity. Thus, knowledge of horses shedding consistent numbers of strongyle eggs over time can lead to optimization of parasite control strategies. This study evaluated shedding of strongyle eggs in 424 horses on 10 farms when a selective anthelmintic treatment regime was used over a three year period. The horses were ranging from 1 year to 28 years of age, with a mean of 9.6. Faecal egg counts using the McMaster method were performed twice yearly, and horses exceeding 200 eggs per gram (EPG) of faeces were treated. The results are presented as probabilities of the EPG outcome, when two previous egg counts are known. A horse with no strongyle eggs detected in the two previous faecal examinations had an 82 % probability of a zero, and a 91 % of being below 200 eggs per gram in the third examination. A horse with the two previous egg counts below 200 EPG had an 84 % probability of being below 200 EPG the third time as well. When faecal egg counts exceeded 200 EPG on the previous two counts, the probability for a horse exceeding 200 EPG the third time was 59 %. In conclusion, these data demonstrate consistent shedding from one grazing season to another in a majority of horses despite

treatment of horses exceeding 200 EPG. This strongly supports the concept of selective anthelmintic therapy as a means to provide effective parasite control and yet delay development of anthelmintic resistance.

P PARASITE SPECIFIC IL-4 RESPONSES IN *ASCARIS SUUM* AND *TRICHURIS SUIS* INFECTED PIGS EVALUATED BY ELISPOT

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In many experimental settings it is useful to be able to measure changes in specifically induced cytokines at post-mRNA level over time. Specific measurement of IL-4 in particular is important for studies on nematodes due to its key function in driving the Th2 response. The objective of the present study was to develop an ELISPOT method to measure parasite specific IL-4 producing cells during experimental *Ascaris suum* and *Trichuris suis* infections in pigs. Two separate experiments were carried out, with *A. suum* and *T. suis* trickle infections, respectively. After parasite exposure, we were able to measure statistically significant increases in specific IL-4 production as well as blood eosinophils over time. Egg excretion and worm burdens at necropsy were measured. This method enables repeated and parasite specific measurement of IL-4 at protein level, which is valuable tool for future experimental settings.

Q DETECTING *BLASTOCYSTIS* USING PARASITOLOGICAL AND DNA-BASED METHODS: A COMPARATIVE STUDY

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Background: *Blastocystis* is a common intestinal parasite of world-wide distribution and can be found in patients with gastrointestinal symptoms as well as in healthy individuals. The parasite exhibits extensive genetic diversity, and it is hypothesized that the pathogenic potential of *Blastocystis* might be subtype-dependent. Studies of the molecular epidemiology of *Blastocystis* require highly sensitive screening methods for the detection of the parasite in faecal specimens. Numerous diagnostic methods have been used in such situations; however, these might differ remarkably in terms of e.g. diagnostic sensitivity.

The aim of this study was to compare the diagnostic efficacy of the formol ethyl-aceate concentration technique, permanent staining of faeces preserved with sodium acetic-acetate acid-formalin (SAF-PST) and xenic in-vitro culture with PCR regarding the detection of *Blastocystis* in faecal specimens from patients with suspected enteroparasitic disease.

Methods: One-hundred-and-nine faecal specimens were submitted to FECT, SAF-PST, in-vitro culture and PCR using genomic DNA extracted directly from faeces and from 28-day-old *Blastocystis* in-vitro cultures. PCR amplicons were dideoxysequenced to confirm positive results and to provide information on *Blastocystis* sp. subtype.

Results: Compared to *Blastocystis*-PCR, in-vitro culture, SAF-PST and FECT had a sensitivity of 93%, 85% and 56%, respectively. Twenty-six (24%) samples were positive by PCR; by dideoxysequencing, *Blastocystis* sp. subtype 3 was found in 12 samples, subtype 2 in 8 samples, subtype 1 in 4 samples, subtype 4 in 1 sample, and one sample was positive of both subtype 1 and 2. No association between subtype and FECT-negative result could be demonstrated, suggesting that the failure of the FECT to detect *Blastocystis* did not depend on subtype. PCR and dideoxysequencing results obtained by analysing long term in-vitro culture (28 days) did not differ from the results obtained by PCR and sequencing on DNA extracted directly from faeces. Hence, no preferential amplification of one isolate to another by in-vitro culture could be demonstrated in the present study.

Conclusion: Since in-vitro culture is sensitive, simple and inexpensive, it is suggested that in-vitro culture is used as the primary diagnostic test in studies of the epidemiology of *Blastocystis* and for selection of samples for further molecular characterisation.

O PARASITE CONTROL IN PETS: WHAT WORM WHEN?

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European Scientific Counsel Companion Animal Parasites (ESCCAP) was formed in 2005 when it was perceived that there was a gap in Europe for a consistent approach to the diagnosis and treatment of companion animal parasites. ESCCAP's objective is to develop guidelines for the control of major parasitic infections in companion animals in order to protect the health of pets, enhance the safety of the public and preserve the bond between pets and people. The long term goal for ESCCAP is that parasites are no longer an issue for pets or humans across Europe. The guidelines will be subject to regular revision in dialogue with practitioners and researchers across Europe, as the great diversity in parasites and their importance is recognised. Guidelines and other news for vets and pet owners will be presented on the website (www.esccap.org) and will also be disseminated by other means. Guideline No.1: Worm control in dogs and cats, was launched on the website December 2006, and guidelines on Control of Ectoparasites, Vector borne parasitic disease and Control of ringworm will follow. The first guideline identifies three "key" parasite groups that cause severe disease and/or pose a zoonotic risk and have high prevalence in some or all areas of Europe: *Toxocara* spp. and hookworm, *Echinococcus* spp. and *Dirofilaria immitis*. The guideline deals with geographical distribution and prevention by environmental control of parasite transmission, animal management and treatment. ESCCAP is an independent, non-profit making organisation registered in UK, expecting to get charitable status in 2007. It is presently sponsored by a number of pharmaceutical companies. ESCCAP has 8 members (and 3 trustees) with a solid background in parasitological research and/or clinical practice. Members are responsible for a region of Europe and all are rotated within 7 years.

O INTEGRATING *TAENIA SOLIUM* CYSTICERCOSIS / TAENIOSIS CONTROL WITH THAT OF OTHER NEGLECTED PARASITIC / TROPICAL / LIVESTOCK DISEASES

1Willingham III, A.L.; 1Mejer, H.; 1Thamsborg, S.M.; 1,2Johansen, M.V.;

2Magnussen, P.; 1,2Ørnbjerg, N. and the CESA Project

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Cysticercosis/taeniosis caused by the zoonotic pork tapeworm *Taenia solium* remains one of the most neglected of the neglected tropical diseases in spite of growing evidence concerning its widespread presence in developing countries and serious impact on human health and agricultural production. Treatment of *T. solium* human tapeworm carriers, which would block transmission of cysticercosis to both humans and pigs, could potentially be incorporated into already existing control programmes for soil-transmitted helminths, schistosomiasis and/or other neglected parasitic/tropical diseases. Likewise, managing the cysticercosis risk for pigs could be facilitated by improving pig production and marketing systems at the smallholder level. A new project funded by DANIDA's Council for Development Research (RUF) "Cross-Disciplinary Risk Assessment of *Taenia solium* Cysticercosis in Eastern and Southern Africa (CESA)" aims to build research capacity in that endemic region by taking a comprehensive approach to the cysticercosis issue through conducting integrated medical, veterinary, livestock production and sociological / anthropological studies. The CESA project is also expected to help strengthen the capacity of health and agricultural systems of the countries involved to address cysticercosis and other zoonotic, parasitic diseases thus providing the basis for a more sustainable solution for their surveillance and control.