Isolation of *Toxocara* Eggs from Flies in Northeast Thailand

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Background: *Flies are natural carriers of pathogens and play a considerable role in the mechanical transmission of many pathogens, such as viruses, fungi, bacteria, and parasites, in various regions of the world.*
Objective: *To investigate the existence of Toxocara spp. eggs on two types of flies, the Oriental latrine fly, Chrysomya megacephala, and the house fly, Musca domestica, in Ubon Ratchathani, Northeast Thailand.*
Material and Method: *Flies were collected by the use of sterilized insect sweeping nets at five types of sites, fresh-food markets, garbage piles, restaurants, school cafeterias, and paddy fields from September 2010 to October 2011. After centrifugation, sediments from each fly species were examined for parasites under a light microscope.*
Results: *From the analysis of 555 C. megacephala and 439 M. domestica adult samples, Toxocara eggs were isolated from only the former species in all sites except for the restaurants in the Warinchamrap. No other helminthes and protozoa were found on the body surfaces of both fly species.*
Conclusion: *The data suggest that C. megacephala is more likely to be a potential carrier of Toxocara eggs than M. domestica in areas frequented by humans in this region of Thailand.*

Keywords: *Toxocara spp., Chrysomya megacephala, Musca domestica, Mechanical vector, Thailand*

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The soil-transmitted nematodes, *Toxocara canis* and *Toxocara cati*, are considered to be a cause of a zoonotic disease in humans called toxocariasis by the ingestion of embryonated eggs. Toxocariasis is widespread, especially in unsanitary environments with poor individual hygiene, with young children being most at risk. The definitive hosts of *T. canis* and *T. cati* are dogs and cats respectively. Female worms in a definitive host may produce up to 200,000 eggs, thus contributing to the potential infection risk[1].

Flies are commonly associated with human dwellings, animal shelters, and unsanitary environments that provide the potential of pathogens in the forms of bacteria, viruses, protozoa, and helminth eggs to be spread into surrounding areas[2-4]. In Thailand, there is no information about the extent of *Toxocara* spp. carried by flies in public areas.

The objective of this study was to assess the existence of *Toxocara* spp. on the most common flies in the urban environment, *C. megacephala* and *M. domestica*[5], in several urban areas of Ubon Ratchathani Province, Northeast Thailand.

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Material and Method

The flies were collected individually from fresh-food markets, garbage piles, restaurants, school cafeterias and paddy fields in Muang Ubon Ratchathani and Warinchamrap Districts of Ubon Ratchathani Province (Fig. 1) by the use of insect sweeping nets once a month from September 2010 to October 2011. All flies were anaesthetized at -20°C for 15 min in the laboratory. Afterwards, the species of the flies were identified and *C. megacephala* and *M. domestica* were selected according to taxonomic keys of Kurahashi and Bunchu[6] and Tumrasvin and Shinonaga[7] respectively. The present study followed the method of Forster et al[8]. Both species of flies from each study site were pooled and soaked in 40 ml of 10% neutral

buffered formalin (pH 7.0) in a sterile plastic bottle (50 ml) for 5 min. After that, the bottles containing the flies were centrifuged at 1,500 rpm for 5 min (Nuve NF 800, Turkey). The sediment from each bottle was examined for parasites by staining with Lugol's iodine on a glass slide. More than 30 slides of samples from each site were examined under a light microscope (Carl Zeiss AxioLab A1, Germany). The parasites found on each slide were photographed using a mounted digital camera (Canon EOS 550D, Japan) and identified based on morphological appearances[9].

Results and Discussion

A total of 555 *C. megacephala* and 439 *M. domestica* adults were collected in this study. Table 1 shows the recovery of *Toxocara* eggs from the external surfaces of flies in each area of Muang Ubon Ratchathani and Warinchamrap, Ubon Ratchathani. *Toxocara* eggs (both embryonated and non-embryonated eggs) were collected from *C. megacephala* specimens (Fig. 2) from all sites except from the restaurants in Warinchamrap. No other helminthes and protozoa were collected from the fly species in the present study.

Results from the present study indicated that *C. megacephala* could be a carrier of *Toxocara* eggs in places of human activity in Ubon Ratchathani, Northeast Thailand. No *Toxocara* eggs were collected from the body surfaces of *M. domestica* flies.

A report from the Philippines revealed that *Toxocara* eggs were detected on samples of both fly species collected in typical urban slum areas[10]. Similarly, a study in Brazil showed that *Toxocara* eggs were found on the body surfaces of both species collected from a zoo[11]. Research in market and residential areas in Nigeria indicated that *Toxocara* eggs were collected from the external surfaces of 2.4% and from the intestinal tracts of 2.11% of a sample of *M. domestica* flies[12].

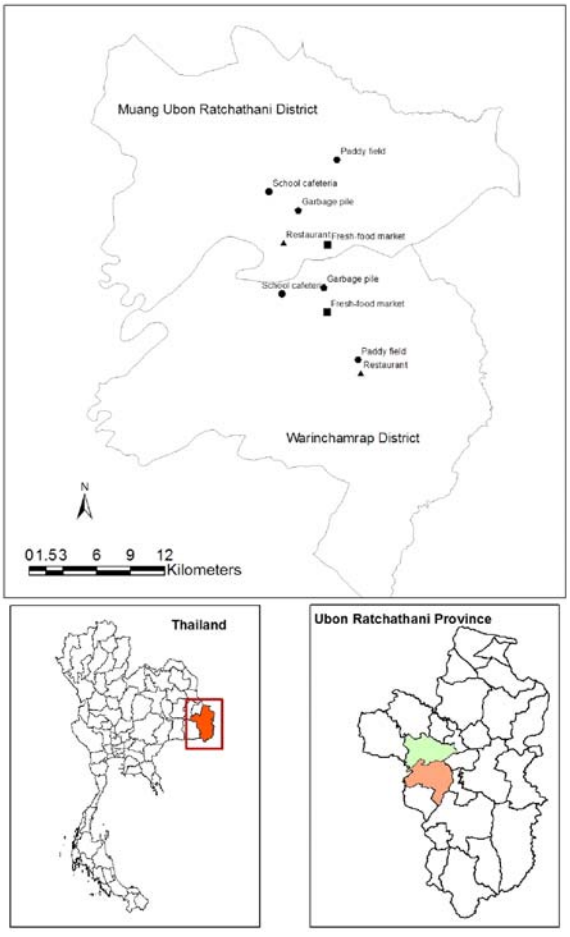

Fig. 1 Map of Ubon Ratchathani Province, Northeast Thailand, showing the study area.

Conclusion

The results from the present study suggested that *C. megacephala* is likely to be a potential carrier of *Toxocara* eggs in areas of human activity in Ubon Ratchathani, Northeast Thailand. It can be assumed that *Toxocara* spp. may be a public health problem presently and in the future in the study area and it is a problem that requires careful monitoring.

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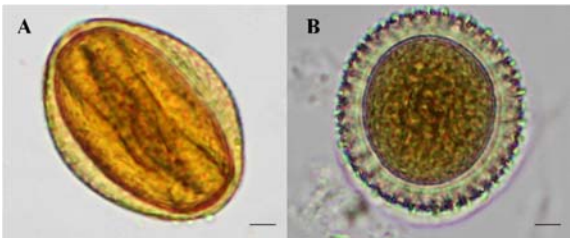

Fig. 2 Eggs of *Toxocara* spp. isolated from *Chrysomya megacephala* (A) embryonated egg (infective stage) (bar = 10 μm) (B) unembryonated egg (bar = 10 μm).

Table 1. Recovery of *Toxocara* eggs from *C. megacephala* and *M. domestica* in Ubon Ratchathani Province, Northeast Thailand

Collection sites	*Toxocara* eggs recovered (No. of flies collected)			
	Muang Ubon Ratchathani		Warinchamrap	
	CM	MD	CM	MD
Fresh-food markets	+ (60)	- (57)	+ (43)	- (49)
Garbage piles	+ (60)	- (60)	+ (56)	- (40)
Restaurants	+ (60)	- (60)	- (60)	- (51)
School cafeterias	+ (59)	- (38)	+ (42)	- (41)
Paddy fields	+ (55)	- (20)	+ (60)	- (23)

CM = *Chrysomya megacephala*; MD = *Musca domestica*
+ represents the fact that *Toxocara* eggs were found in the samples
- represents the fact that *Toxocara* eggs were not found in the samples

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Potential conflicts of interest

None.

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การแยกไข่พยาธิ Toxocara จากแมลงวันในภาคตะวันออกเฉียงเหนือของประเทศไทย

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ภูมิหลัง: แมลงวันเป็นพาหะธรรมชาติและเป็นกลไกสำคัญในการนำพาเชื้อโรคหลายชนิดได้แก่ ไวรัส รา แบคทีเรีย และปรสิต มาสู่คนในหลายภูมิภาคของโลก

วัตถุประสงค์: ศึกษาการเป็นพาหะเชิงกลนำไข่พยาธิของแมลงวันหัวเขียว Chrysomya megacephala และแมลงวันบ้าน Musca domestica ในจังหวัดอุบลราชธานี ภาคตะวันออกเฉียงเหนือของประเทศไทย

วัสดุและวิธีการ: ใช้สวิงโฉบแมลงที่ปลอดเชื้อจับแมลงวันบ้านและแมลงวันหัวเขียววันระหว่างเดือนกันยายน พ.ศ. 2553 ถึงเดือนตุลาคม พ.ศ. 2554 จากตลาดสด กองขยะ ร้านอาหาร โรงอาหารของโรงเรียนและทุ่งนา นำตะกอนจากการปั่นแมลงวันมาตรวจหาปรสิตภายใต้กล้องจุลทรรศน์แบบใช้แสง

ผลการศึกษา: ผลการตรวจหาไข่พยาธิจากตัวเต็มวัยของแมลงวันหัวเขียว C. megacephala จำนวน 555 ตัว และแมลงวันบ้าน M. domestica จำนวน 439 ตัว พบไข่ของพยาธิ Toxocara spp. เท่านั้น โดยตรวจไม่พบไข่พยาธิและโปรโตซัวชนิดอื่น และพบว่ามีเฉพาะแมลงวันหัวเขียวที่ตรวจพบไข่พยาธิ Toxocara spp. อย่างไรก็ตามผลการศึกษาพบว่าแมลงวันทั้งสองชนิดที่จับจากร้านอาหารในเขตอำเภอวารินชำราบ เป็นสถานที่เดียวที่ไม่พบไข่พยาธิชนิดใดเลย

สรุป: การศึกษานี้แสดงให้เห็นว่าแมลงวันเขียวมีความสามารถในการเป็นพาหะเชิงกลของพยาธิ Toxocara spp. ได้ดีกว่าแมลงวันบ้านในแหล่งที่อยู่อาศัยของคนจังหวัดอุบลราชธานีประเทศไทย