Prevalence of Paragonimus and Angiostrongylus cantonensis Infections in Snails in Southeastern China

Y.Z. Cheng, J. Hou, X.H. He, Z.K. Hong, L.S. Li, G.H. Lin, M.X. Chen and S.H. Chen

1Centers for Disease Control and Prevention, Fuzhou, 350001 Fujian, China
2College of Veterinary Medicine, South China Agricultural University, Guangzhou, 510642 Guangdong Province, China
3Longhai Centers for Disease Control and Prevention, Longhai, 325110 Fujian, China
4Zhangzhou Center for Disease Control and Prevention, Zhangzhou, 363000 Fujian, China
5National Institute of Parasitic Diseases, Chinese Center for Disease Control and Prevention, 200025 Shanghai, China

Abstract: Paragonimiasis and angiostrongyliasis are important food-borne parasitic diseases in a number of countries including China. Both diseases are transmitted by freshwater and terrestrial intermediate snail hosts. In the present investigation, we examined the prevalence of Paragonimus and Angiostrongylus cantonensis in the intermediate host snails in southeastern China’s Fujian province where paragonimiasis and angiostrongyliasis are endemic. The prevalence of P. westermani cercariae in the stream-type snail Semisulcospira libertina found in the breeding grounds in Shouning county was 0.99% in the upstream and 0.56% in the downstream, respectively. For pit-ditch type, the prevalence of P. westermani cercariae was 0.19% and 0.82% in upstream and downstream, respectively. The snail Tricula xiaoqiaoensis was infected with Paragonimus skrjabini cercariae with prevalence of 0.33% in the pit-ditch type and 1.52% in the seepage type in Zhejiang county. Prevalence of A. cantonensis larvae in Achatina fulica in Nan’an county in garbage stack, vegetable plot and crop land were 83.54, 39.53 and 19.23%, respectively. In Lianjiang county, prevalence of A. cantonensis larvae in snails Pila polita in trench, paddy field, residential ditch, vegetable irrigation ditch and pond in the same river system were 4.08, 8.82, 75.34, 34.04 and 5.56%, respectively. The snail Bellamya lithophaga found in the western suburb of Fuzhou city was identified as the new intermediate host for A. cantonensis with a prevalence of 14.38%. Demonstration of prevalence of Paragonimus and A. cantonensis in wild snails in Fujian province poses substantial risk for future outbreaks of the two food-borne parasitic diseases.

Key words: Paragonimiasis, angiostrongyliasis, Semisulcospira libertina, Tricula xiaoqiaoensis, Paragonimus skrjabini, Achatina fulica, Bellamya lithophaga

INTRODUCTION

Paragonimiasis and angiostrongyliasis are important food-borne parasitic diseases in a number of countries including China. Paragonimus infection in human can cause pulmonary, neurologic and abdominal diseases (Velez et al., 2003; Liu et al., 2008; Yaburo et al., 2008; Kim et al., 2009; Laine et al., 2009; Chen et al., 2010; Du et al., 2010; He et al., 2009) while symptom of Angiostrongylus cantonensis infection in human includes eosinophilic meningitis (Sawabe and Makiya, 1995; Lindo et al., 2002; Wang et al., 2005; Hochberg et al., 2007; Zhang et al., 2008). Interestingly, both of the parasites are transmitted by freshwater and terrestrial intermediate snail hosts. With the increase of people’s living standards and the pursuit of exotic and delicate foods, both paragonimiasis and angiostrongyliasis are emerging as important foodborne parasitic zoonoses (Waugh et al., 2005; Lv et al., 2008; Sohn et al., 2009), causing public health concern worldwide.

Fujian province is situated in the southeast coast of China and has a subtropical humid monsoon climate. The natural eco-environment there is well suitable for breeding and multiplying of various parasites and their intermediate/vector hosts. To assess the risk for snail hosts with infection of Paragonimus and A. cantonensis...
in this province and to strengthen public food safety awareness, we conducted a comprehensive investigation of Paragonimus and A. cantonensis infection in their intermediate snail hosts following standard procedures (Kim et al., 2009; Lindo et al., 2002; Zhang et al., 2008).

MATERIALS AND METHODS

Snail samples: Both freshwater snails and terrestrial snails were shown in Table 1 and 2 of the investigation. The on the spot snail samples were collected to study the relationship between different types of ecological environments and different snail hosts for which the geography was marked by GPS.

Testing methods: All specimens were taken back to the lab. The shells of Semisulcospira libertina and Tricula xiaoqiaoensis were broken and the livers were taken out to detected Paragonimus cercariae under microscope. Shells of Achatina fulica, Pila polita and Bellamy were removed to smash the muscle and viscera individually. After washing by tissue homogenization, the filtrate was placed in the refrigerator (4°C) for about 30 min. Then, the precipitation in lower layer was removed out to detected Angiostrongylus cantonensis larvae under microscope and the infection rate were observed as well as the infection degree. Statistical analysis on data diversity about infection rate and infection degree was conducted among different mini breeding grounds in the same investigation spot for one species of snail. The relationships between snail host infection and eco-environment of Paragonimus and Angiostrongylus cantonensis were analyzed. Of 80 Angiostrongylus cantonensis third stage larvae were isolated from Bellamya lithophaga and put into abdominal cavities of 2 rats. At the same time, 500,000 of penicillin were also injected to prevent bacterial infection. Since, day 35, Angiostrongylus cantonensis first stage larvae in rats' feces have been checked day by day. Rats were provided by experimental animal yard of Fujian province.

RESULTS AND DISCUSSION

The prevalence of P. westermani cercariae in the stream-type snail Semisulcospira libertina found in the breeding grounds of Yangmansi village in Shouning county was 0.69% (1/1,082) in the upstream and 0.56% (5/892) ($\chi^2 = 4.658, p<0.05$) in the downstream, respectively. For pit-ditch type, the prevalence of P. westermani cercariae were 0.19% (2/1,035) and 0.82% (10/1,219) ($\chi^2 = 4.15, p<0.05$) in upstream and downstream, respectively (Table 1).

The snail Tricula xiaoqiaoensis was found to be infected with Paragonimus skrjabini cercariae with prevalence in the pit-ditch type (0.33%, 7/2,116) and seepage type (1.52%, 28/1,834) ($\chi^2 = 15.99, p<0.05$) in Xibiao village of Zhenghe county. This result indicated that seepage type breeding ground may be more suitable for the growth of T. xiaoqiaoensis than the pit-ditch type, possibly due to that the former was able to keep a moist circumstance persistently (Table 1).

A. cantonensis larvae were found in the snail Achatina fulica at the Humei village in Nan’an county and in the snail Pila polita at the Xiaoan village in Lianjiang county. In the Humei village, prevalence of A. cantonensis larvae in A. fulica in garbage stack, vegetable plot and crop land were 83.54% (66/79), 39.53% (17/43) and 19.23% (10/52) ($\chi^2 = 24.797-53.251, p<0.05$), respectively (Table 2). The highest prevalence of A. cantonensis in A. fulica in garbage stack is possibly because garbage stack is close to the residential area and interconnected with kitchens of households. As the water for washing food or dishes is always spilled on garbage stack, the breeding ground is wet all year round.

At Xiaoan village of Lianjiang county in the east central Fujian province, prevalence of A. cantonensis in snails Pila polita in trench, paddy field, residential ditch, vegetable irrigation ditch and pond in the same river system were 4.08, 8.82, 75.34, 34.04 and 5.56%,
which poses substantial risk for future outbreaks of the two food-borne parasitic diseases. Therefore, integrated strategies should be taken to reduce or eliminate such risks.

ACKNOWLEDGEMENTS

This research is supported in part, by the Program for National S and T Major Program (Grant No. 2008ZX10004-001, 2008ZX10004-011, 2009ZX10004-302, 2009ZX10004-201), National Key Technology R and D Program (Grant No. 2008BAI56B03), National Natural Resources Platform Project (Grant No. 2005DKA21104) and the State Key Laboratory of Veterinary Etiological Biology, Lanzhou Veterinary Research Institute, Chinese Academy of Agricultural Sciences.

REFERENCES


