Short Report: Increased Detection Rate of *Strongyloides stercoralis* by Repeated Stool Examinations Using the Agar Plate Culture Method

Tetsuo Hirata,* Hiroshi Nakamura, Nagisa Kinjo, Akira Hokama, Fukunori Kinjo, Nobuhisa Yamane, and Jiro Fujita

Department of Medicine and Therapeutics, Control and Prevention of Infectious Diseases, Faculty of Medicine, University of the Ryukyus, Okinawa, Japan; Department of Clinical Laboratories, Ryukyu University Hospital, Okinawa, Japan; Department of Endoscopy, Ryukyu University Hospital, Okinawa, Japan

**Abstract.** To clarify the efficacy of repeated stool examinations by the agar plate culture method for the detection of *Strongyloides stercoralis* infection, 4,071 stool samples collected from 2,406 patients > 50 years of age in Ryukyu University Hospital were examined. The cumulative detection rate of *S. stercoralis* infection was 4.7% (112/2,406). At the first, second, third, and beyond fourth examinations, the detection rates were 3.6% (86/2,406), 1.5% (12/786), 2.6% (10/392), and 2.0% (4/198), respectively. From these results, the cumulative detection rate was estimated to be 7.4% when three stool samples were examined for all patients. Our study showed that repeated stool examinations increase the sensitivity of detection of *S. stercoralis* infection.

Strongyloidiasis is widely distributed in tropical and subtropical regions, and it is estimated that 50–100 million individuals worldwide are infected with *Strongyloides stercoralis*.1 Okinawa prefecture, a subtropical region of Japan, is known as an endemic area for this infection. In an earlier study in Okinawa, we found that the prevalence rate of *S. stercoralis* infection was 6.3% and that > 95% of the infected patients were > 50 years of age.2 The infective larvae of *S. stercoralis* develop in soil and penetrates intact skin. After infection, the larvae migrate to the duodenum and grow into mature females. Rhabditiform larvae hatched from eggs are ejected from the host. However, some of them develop into filariform larvae and reinfect through the colon or anal skin (autoinfection). Therefore, once a person is infected by *S. stercoralis*, the infection can last for a long time.

It has been reported that the agar plate culture method is highly efficient for the detection of *S. stercoralis* infection3–5 and that repeated stool examinations would increase the cumulative detection of *S. stercoralis* infection.5–11 However, there have been no large-scale studies regarding the association between the detection rate of *S. stercoralis* infection and repeated stool examinations using the agar plate culture method in previously unproven cases.

This study included 2,406 patients > 50 years of age in Ryukyu University Hospital, Okinawa, Japan, between 2004 and 2006. Patients previously diagnosed with strongyloidiasis were excluded from the study. The subjects consisted of 1,337 men and 1,069 women, with a mean age (SD) of 67.1 (10.0) years. A total of 4,071 stool samples collected from the 2,406 patients were examined for the detection of *S. stercoralis* infection using the agar plate culture method. The total detection rate of *S. stercoralis* infection was 4.7% (112/2,406). In all the *S. stercoralis*-positive patients, the severity of the strongyloidiasis was mild. The detection rates of *S. stercoralis* infection in men and women were 5.8% (78/1,337) and 3.2% (34/1,069), respectively, and significantly higher in men than in women (P = 0.002, χ² test). At the first examination, the detection rate of *S. stercoralis* infection was 3.6% (86/2,406). In 786 of 2,320 patients negative for *S. stercoralis* infection at the first examination, the stool examination was repeated, and 1.5% (12/786) of the patients were converted to positive for *S. stercoralis* infection. In 392 of 774 patients negative for *S. stercoralis* infection at the second examination, the stool examination was repeated again, and 2.6% (10/392) of the patients were converted to positive for *S. stercoralis* infection (Table 1). From these results, the cumulative detection rate was estimated to be 7.4% when three stool samples were examined by the agar plate culture method for all patients. The estimated detection rate after examination of three stool samples was 2-fold higher than that after a single examination.

Our results showed that repeated stool examinations increase the sensitivity of detection of *S. stercoralis*. Uparanukraw and others6 previously reported that the agar plate culture method detected *S. stercoralis* infection in 87.5%–96.4% of *S. stercoralis*-proven cases in a single examination, and 0%–5.9% of *S. stercoralis*-negative cases in a single examination. Sato and others7 showed that the agar plate culture method detected 57.8% of proven cases in a single examination. However, when three stool specimens were examined, their cumulative detection rate increased to 84.8%. Moustafa8 reported that the agar plate culture method detected 70.3% and 96.2% of *S. stercoralis*-proven cases by 1- and 3-day examinations, respectively. It is well known that detection of *S. stercoralis* larvae in feces is difficult, unless the patients have severe strongyloidiasis.9 This is because of the low output of *S. stercoralis* larvae in the stools of patients with chronic low-level infection.

In summary, this study showed that repeated stool examinations can increase the detection rate of *S. stercoralis* infection in previously unproven cases. In patients with mild strongyloidiasis, the estimated cumulative detection rate after examination of three stool samples was 2-fold higher than that after a single examination.

Received March 20, 2007. Accepted for publication June 22, 2007.

Authors’ addresses: Tetsuo Hirata, Akira Hokama, and Jiro Fujita, Department of Medicine and Therapeutics, Control and Prevention of Infectious Diseases, Faculty of Medicine, University of the Ryukyus, 207 Uehara, Nishihara, Okinawa, Japan, Telephone: 81-98-895-1144, Fax: 81-98-895-1414, E-mails: h400314@med.u-ryukyu.ac.jp, hokama-a@med.u-ryukyu.ac.jp, and fujita@med.u-ryukyu.ac.jp; Hiroshi Nakamura and Nobuhiwa Yamane, Department of Clinical Laboratories, Ryukyu University Hospital, 207 Uehara, Nishihara, Okinawa, Japan, Telephone: 81-98-895-1319, Fax: 81-98-895-1453, E-mails: nakahiro@jim.u-ryukyu.ac.jp and nobie@med.u-ryukyu.ac.jp.

* Address correspondence to Tetsuo Hirata, 207 Uehara, Nishihara 905-0125, Japan. E-mail: h400314@med.u-ryukyu.ac.jp
REFERENCES


