RESEARCH NOTE

SURVEY OF HOUSE RAT INTESTINAL PARASITES FROM SURABAYA DISTRICT, EAST JAVA, INDONESIA THAT CAN CAUSE OPPORTUNISTIC INFECTIONS IN HUMANS

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Abstract. The purpose of this study was to investigate the prevalence of house rat zoonotic intestinal parasites from Surabaya District, East Java, Indonesia that have the potential to cause opportunistic infection in humans. House rat fecal samples were collected from an area of Surabaya District with a dense rat population during May 2015. Intestinal parasites were detected microscopically using direct smear of feces stained with Lugol's iodine and modified Ziehl-Neelsen stains. The fecal samples were also cultured for *Strongyloides stercoralis*. Ninety-eight house rat fecal samples were examined. The potential opportunistic infection parasite densities found in those samples were *Strongyloides stercoralis* in 53%, *Hymenolepis nana* in 42%, *Cryptosporidium* spp in 33%, and *Blastocystis* spp in 6%. This is the first report of this kind in Surabaya District. Measures need to be taken to control the house rat population in the study area to reduce the risk of the public health problem.

Keywords: zoonotic intestinal parasites, opportunistic infection, house rat, densely populated area, Indonesia

INTRODUCTION

Intestinal parasitic infections are more prevalent in tropical regions of the deveoping world where sanitary conditions are poor (Savioli *et al*, 2004; Celiksoz *et al*, 2005). An increase in the density of human populations has been followed by an increase in the house rat population (Stojcevic *et al*, 2004). House rats living in close association with humans, play a role in human health (Stojcevic *et al*, 2004). An increase in house rats population can be followed by an increase in zoonotic parasitic diseases (Stojcevic *et al*, 2004; Youn, 2009). Some zoonotic deseases do not cause significant problems in humans. However, some zoonotic intestinal parasites cause gastrointestinal disease in humans and can then be spread from human to human. Humans can contract these diseases by consuming food or water containing parasites that are present because of contamination with house rat feces. Some of these parasites can cause mortality if contracted by immunocompromised patients such as *Strongyloides*

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Fig 1–A part of dense area at the study site, bordering by a small river and there is a traditional market on the back of row of houses.

stercoralis, Hymenolepis nana, Cryptosporidium spp, and *Blastocystis* spp (Markell *et al*, 1999). There are numerous reports of parasites causing opportunistic infections in immunocompromised patients (Cotte *et al*, 1993; Heyworth,1996; Glaberman *et al*, 2002; Shah *et al*, 2003, Lim *et al*, 2005; Erhabor *et al*, 2011) but there is little data about house rat zoonotic parasites that can potentially cause opportunistic infections in immunocompromised humans in Indonesia.

The objective of this study was to investigate the presence of house rat zoonotic intestinal parasites that have the potential to cause opportunistic infections in immunocompromised humans in Surabaya District, East Java, Indonesia where the prevalence of HIV/AIDS infections in humans is relatively high.

MATERIALS AND METHODS

Study site

The study site is a densely populated area in Surabaya District, East Java, Indonesia along a river, near a traditional market with poor hygiene and sanitation (Fig 1). People living in this area reported to the researcher that there is a large house rat population in the study area.

Sample collection and examination

The house rat fecal samples were collected from selected houses in the study area. Each house owner who agreed to participate was given two plastic containers to collect house rat two fecal samples from two different areas of the house. The study was conducted in May 2015.

The house rat fecal samples were examined microscopically after staining with 1% Lugol's iodine to examine for protozoa, helminth eggs and larvae, and modified Ziehl-Neelsen staining to examine for *Cryptosporodium* oocysts (WHO, 2003). Fecal culture was performed to examine for the rhabditiform larvae of *Strongyloides stercoralis* using Harada-Mori culture method (WHO, 2003).

Table 1
Prevalences of zoonotic intestinal parasites found in 98 house rat feces in the study area.

Parasite	No. positive %
Strongyloides stercoralis	52 (53)
Hymenolepis nana	41 (42)
Cryptosporidium spp	32 (33)
Blastocystis spp	6 (6)

RESULTS

Two house rat fecal samples per house were collected from 35 houses near the traditional market and 20 houses along the river. Nine houses near the traditional market and 3 houses along the river could collect only one house rat fecal sample per house. A total of 98 house rat samples were examined. The zoonotic intestinal parasites found that have the potential to cause opportunistic infections in immunocompromised patients were: *Strongyloides stercoralis* (53%, 52/98), *Hymenolepis nana* (42%, 41/98), *Cryptosporidium* spp (33%, 32/98), and *Blastocystis* spp (6%, 6/98) (Table 1).

DISCUSSION

Opportunistic parasites do not normaly cause disease in healthy humans, only those with compromised immunity, such as AIDS to which they can cause severe morbidity and mortality. Most AIDS patients die due to opportunistic infections (Nasronudin, 2007). In this study we evaluated prevalence of house rat intestinal parasites that have the potential to cause opportunistic infections in those with compromised immunity, such as AIDS patients; the study area has a high prevalence of HIV patients (Prasetyo, 2004; Prasetyo, 2005). The parasites found in our survey were *S. stercoralis, H. nana, Cryptosporidium* spp and *Blastocystis* spp.

In immunocompromised patients *S.stercoralis* infection may be subclinical, producing no significant symptoms (Neva and Brown, 1994). In immunocompromised patients *S.stercoralis* can cause autoinfection, where rhabditiform larvae in large intestine become filariform larvae, penetrate the intestinal mucosa or perianal skin and then reinfect the host resulting in an increasing density of parasites and prolonged infection, leading to severe symptom (Markell *et al*, 1999; Ridley, 2012). Sauca Subias *et al* (2005) have reported a case of *S.stercoralis* hyperinfection complicated by *Escherichia coli* bacteremia in a 45-year-old African with AIDS. Trione *et al* (2001) have reported disseminated infection due to *S.stercoralis* in 2 AIDS patients.

H.nana is the most common cause of infection in humans among others cestode infection. These infections are cosmopolitan, especially in children and in tropical areas such as Indonesia (Fausts *et al*, 1974). Prasetyo (2006) found a prevalence of 1.7% of *H.nana* infection in 60 students at a public elementary school in Gresik regency, near Surabaya, East Java, Indonesia. Arrasyd *et al* (2013) showed that 2 (2.6%) of 78 students at a public elementary school of Binjai, North Sumatera, Indonesia were *H.nana* positive. *H.nana* is a direct zoonotic parasite infecting human directly from animals (Markell *et al*, 1999). The natural definitive hosts are humans, mice and rats (Neva and Brown, 1994). *H.nana* infection may lead to hyperinfection causing more severe symptoms (Markell *et al*, 1999; Ridley, 2012) similar to *S.stercoralis* infection.

Cryptosporidium is a direct zoonotic parasite that infects humans directly from animals with no intermediate host

involved. Prasetyo (2004) has detected *Cryptosporidium* oocyst in house rat fecal samples. *Cryptosporidium* spp was recognized as a human pathogen in 1976 in two immunocompromised patients with persistent diarrhea (Neva and Brown, 1994). In1982 the number of reported cases began to increase dramatically with the AIDS epidemic (Petersen, 1992; Prasad, 2010). Prasetyo (2010) has reported 52.5% cryptosporidiosis in AIDS patients hospitalized in Dr Soetomo Hospital Surabaya with chronic diarrhea. The infective form is the oocyst that is passed into the feces. Ingestion of contaminated food or water and person to person transmission are the main route of infection (Ridley, 2012). Ingestion of this oocyst starts a new life cycle. After oocyst are formed in the cytoplasm of the enterocytes, they develop and are excreted in feces in a form that will infect other host (Ridley, 2012). Water contaminated with fecal material has been implicated in widespread outbreaks of cryptosporidiosis (Ridley, 2012). Standard chlorination levels by water treatment plant do not control this organism and levels of up 30 times higher than normal are needed to destroy the organism (Ridley, 2012). In immunocompetent individuals, cryptosporidiosis usually causes mild, self limited symptoms, but in immunocompromised patients cryptosporidiosis can become chronic and severe with watery diarrhea, abdominal cramp, weight loss, anorexia, malaise, and low grade fever (Peterson,1992; Juranec, 1995).

Blastocystosis is a zoonotic disease caused by *Blastocystis* spp. *Blastocystis* spp can infect humans, farm animals, birds, rodents, amphibians, reptiles, fish, and even insects such as cockroaches (Ridley, 2012). Prasetyo (2005) have detected the vacuolar form *Blastocystis* oocyst in house rat fecal sample. It has various morphological forms: vacuolar, granular, amoeboid, and cysts. It is transmitted by fecal-oral route. The common symptoms are abdominal discomfort, pain and diarrhea or constipation (Ridley, 2012). Infection occurs in both immunocopetent and immunocompromised individuals (Ridley, 2012). Conditions predisposing to infection include an immunosuppressed status, and irritable bowel syndrome (Ridley, 2012). Common symptoms include watery diarrhea, abdominal pain, and cramps, perianal pruritus, and excessive flatulence (Prasad, 2010; Ridley, 2012).

Our study found relatively high prevalences of zoonotic intestinal parasites in house rat feces which has the potential to cause severe morbidity in immunocompromised patients in the study area. Control of house rat populations in this area are needed urgently.

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