SHORT COMMUNICATION

PREVALENCE OF ENDOPARASITIC INFECTIONS AMONG RATS IN LABORATORY ANIMAL FACILITY AND MANAGEMENT (LAFAM), UITM SELANGOR

VELLAYAN, S.* AND SYAZWANI, S.

Faculty of Pharmacy, Universiti Teknologi MARA Selangor, 42300 Puncak Alam, Selangor
**Corresponding author:* vellayan@uitm.edu.my

ABSTRACT. A study on the prevalence of endoparasites of rats was conducted at the Laboratory Animal Facility and Management (LAFAM), UiTM Selangor, Puncak Alam. The fecal samples were collected from a total of 187 laboratory rats which included 112 Sprague-Dawley and 75 Wistar rats. The fecal samples were examined by direct smear technique and fecal floatation technique. From the total of 187 fecal samples examined, 35.83 % were found positive for endoparasites. Prevalence of endoparasites was higher in Wistar (54.67 %) compared to Sprague-Dawley rats (23.21 %). The most prevalent nematode parasites were *Syphacia muris* (68.66 %) followed by *Syphacia obvelata* (26.87 %). The prevalence of these parasites emphasizes the needs of careful monitoring in the LAFAM and therapeutic measures when necessary.

Keywords: laboratory rodents, endoparasites

INTRODUCTION

Laboratory rodents have been used in various experiments over a hundred years (Anderson *et al.,* 2015). Among its usage are in living system research in biomedical field, as well as human biology and behavioural study in animal (Franco, 2013). Thus, the cleanliness and health aspect of the rodents are seen as important so that all laboratory researches are conducted in ethical manners concerning the animal welfare. Studies have shown that by improving the general well-being of the rodents in laboratory tests, it will minimize distress and pain to the animals (Festing & Wilkinson, 2007).

Hence, in ensuring the ethical aspect of researches involving animals, it is pertinent to balance the benefits in scientific knowledge as well as the risks to the animals. Medeiros (2012) suggested the use of 3Rs concept (replacement, refinement, and reduction) to achieve acceptable balance.

Laboratory rodents are exposed to parasite infection if the laboratory neglect to take action on preventive measures. Among the measures that should be taken are periodical health screening, therapeutic strategies, and sterilization of cages and laboratory equipment. Proper laboratory management and supervision can avoid unwanted situations concerning laboratory rodents such as parasite infection (Medeiros, 2012). However, in some cases, laboratory management are more concern on reducing maintenance costs, hence the quality aspect is compromised. Infectious agents that have not been seen in many years will emerge if the issue is overlooked (Percy & Barthold, 2016). Such situation may cause severe problems in laboratory rodents as the health condition of the rodents has significant impact on reproducibility of the research (Percy & Barthold, 2016). According to a study by Medeiros (2012), the most frequent problems in laboratory rodent's

health issues are endoparasites infection and ectoparasites infestation which cause subsequent loss of time, funding as well as research effort. Therefore, the present study aims to determine the prevalence of endoparasitic infections among laboratory rats in Laboratory Animal Facility and Management (LAFAM) UiTM Selangor.

MATERIALS AND METHODS

This study was conducted at Laboratory Animal Facility and Management (LAFAM) UiTM Selangor, Puncak Alam. The laboratory rodent population consisted of 320 Sprague-Dawley and Wistar rats. All rats were housed individually in ventilated cages (IVC) (Brand, Country). There were three types of stocks available at LAFAM – breeding, weaning and holding adults. In this study, the holding adults were excluded to avoid interference with the ongoing research, thus only breeding and weaning rats were used. Fresh fecal samples were collected from each animal by lifting the tail and twisting it towards the back. The feces were then collected using sterile toothpicks and kept in 1.5 ml tubes and stored at 4 °C until further analysis.

For direct smear, a slight amount of feces was put on a microscope slide. After that, one drop of normal saline or distilled water was added to the feces and mixed thoroughly. As for the floatation method, 2 - 5 fecal pellets were collected from every cage or taken fresh from the rodents and put into a test tube. An amount of 0.9 % sodium chloride solution was then added to the collected feces. The feces were mashed and by using a mesh net, it was filtered. Next, the filtrate was transferred into a test tube. After that, 0.9 % sodium chloride solution was added into it until a meniscus formed above the edge of the test tube. A cover slip was placed on the meniscus and then it was left to stand for 15 minutes. Parasite eggs and some protozoan oocysts would rise to the top and adhere to the cover slip. After 15 minutes, the cover slip was lifted and inverted. The cover slip was then placed on a glass microscope slide. The prepared slide was examined using the 10x and 40x objectives under a light microscope. Any eggs observed under the microscope were captured for further identification of endoparasite species based on Ooi *et al.,* (1994), Farrar *et al.,* (1994) and Pinto *et al.,* (2001). Chi-square analysis was performed using SPSS (Version 21) statistical software to determine the association between parasitic infection and host rats.

RESULTS

This endoparasitic detection was performed on 187 laboratory rats (excluding the holding adults), of which 112 were Sprague-Dawley and 75 were Wistar rats. Out of the 187 fecal samples examined, 35.83 % (n=67) were found positive for endoparasites. Prevalence of endoparasites was higher in Wistar rats (54.67 %; 41 out of 75) compared to Sprague-Dawley rats (23.21 %) (26 out of 112) with a significant difference of X2=19.327, df=1 and P=0.00 from the chi-square analysis (Figure 1).

Syphacia muris, *S. obvelata* and *A. tetraptera* were detected in the present study. The most prevalent nematode parasites in both strains were *S. muris* and *S. obvelata* with prevalence of 68.66% and 26.87 % respectively. *A. tetraptera* was also found on Wistar (7.32 %). The prevalence of different species of parasites with their respective hosts were *S. muris,* 76.92 % (20 out of 26) in Sprague-Dawley 63.41 % (26 out of 41) in Wistar and prevalence of *S. obvelata,* 23.08 % (6 out of 26) in Sprague-Dawley 29.27 % (12 out of 41) in Wistar and prevalence of *A. tetraptera,* 0 % (0 out of 26) in Sprague-Dawley and 7.32 % (3 out of 41) in Wistar (Figures 2 and 3).

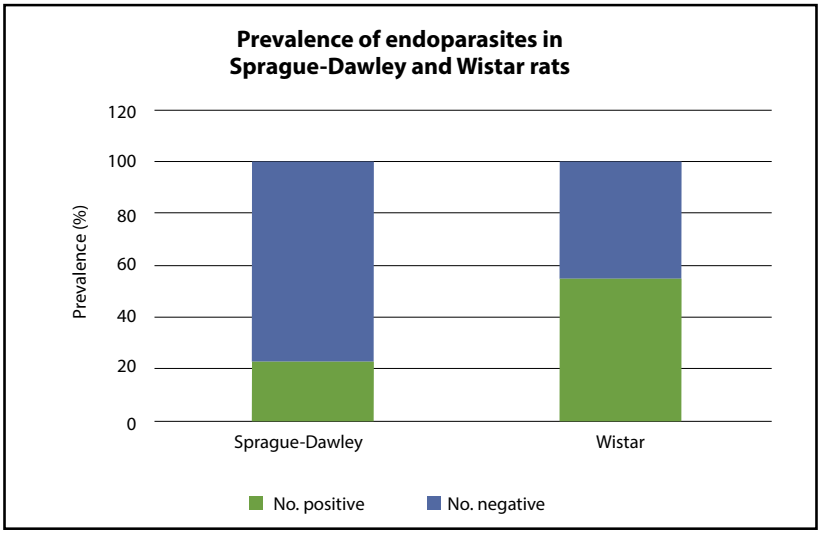


Figure 1. Prevalence of endoparasites in Sprague-Dawley and Wistar Rats.

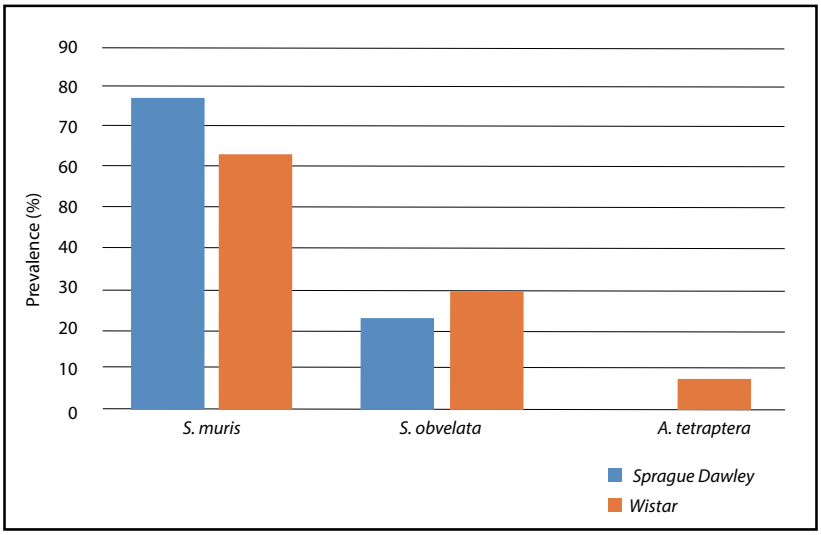
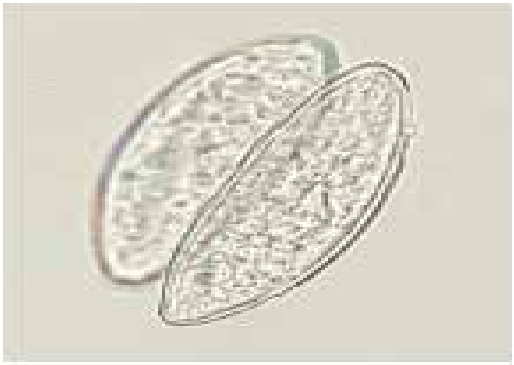


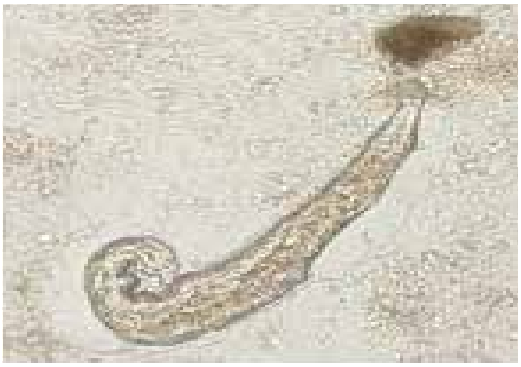
Figure 2. Prevalence of Different Species of Endoparasites in Sprague-Dawley and Wistar Rats.

(a) Aspiculuris tetraptera larva

(b) Aspiculuris tetraptera egg



(c) Syphacia obvelata egg



(d) Syphacia muris larva

Figure 3. Eggs and Larvae of Different Species of Endoparasites Observed Under Light Microscope.

DISCUSSION

It is crucial to conduct laboratory rodent's health monitoring to avoid the absence of pathogenic and non-pathogenic organisms. Even without clinical signs, any presence of parasitic infections in laboratory rodents can be detrimental on animal welfare. This can affect the result of the research besides the possibility of infecting researchers, or anyone involved in the research work (Tanideh *et al.,* 2010). It is also found that laboratory rodents are prone to helminth infection in conventional animal facilities or in the locations where they are positioned before and during experiments (Baker, 1998). Parasite found in infected laboratory rodents can affect the findings of various research, particularly immunological experimental research (Tanideh *et al.,* 2010).

Prevalence of endoparasites was higher in Wistar rats compared to Sprague-Dawley with a significant difference. This finding agrees with a report by Nahmias and O'Reilly (2012) that Sprague-Dawley rats are more difficult to be infected compared to the Wistar strain. Nahmias and O'Reilly (2012)'s study confirmed that these strain and species differences may relate to either differences in the host's immune response to the parasite or to the local environment in the gut. The most prevalent nematode parasites *S. muris* and *S. obvelata* detected in the present study are congruent with Najafi *et al.* (2015)'s study which reported helminths *S. muris*, *S. obvelata* and *A. tetraptera* as the most prevalent helminths in laboratory animals including rodents (1.8-12.7 %). Another study by Tanideh *et al*. (2010) conducted at the animal house of Shiraz

University of Medical Sciences found that the rodents in their study were infected with *S. muris* (83.3 %) and *A. tetraptera* (83.3 %). Oxiuric worms such as *A. tetraptera* and *Synphacia* spp. can cause fecal impaction, colonic intussusception, and rectal prolapse (Medeiros, 2012). There are also limitations in this study that should be acknowledged. Firstly, not all endoparasites in the rodents can be diagnosed by using direct smear as well as fecal floatation techniques. For example, fecal floatation technique cannot detect parasites that do not reside in the gastrointestinal tract, lungs or biliary ducts. Quick-hatching parasite eggs or eggs that are too heavy to float are also unlikely to be detected by fecal floatation (Veterinary Advice Online, 2008). Apart from that, small number of samples could possibly give false-negative results (Vaden *et al.,* 2009).

CONCLUSION

The finding of endoparasites from this study including *S. muris*, *S. obvelata* and *A. tetraptera*, requires more vigilant monitoring in the LAFAM, such as periodical health screening, therapeutic measures, and sterilization of cages and laboratory equipment. Although these measures could be costly and requires cooperation from all users, it would transpire in substantial long-term saving in terms of funding, time and effort.

REFERENCES

1. Anderson L.C., Otto G., Pritchett-Corning K.R. and Whary M.T. (2015). *Laboratory Animal Medicine* (3rd ed). Elsevier.
2. Baker D.G. (1998) Natural pathogens of laboratory mice, rats, and rabbits and their effects on research. Clin Microbiol Rev. 11(2): 231-266.
3. Farrar P.L., Wagner J.E. and Kagiyama N. (1994) *Syphacia* spp. In: Waggie, K., Kagiyama, N., Allen A., Nomura T. (Eds.), *Manual of Microbiologic Monitoring of Laboratory Animals. (2nd ed)*. US. NIH. 219–224.
4. Festing S. and Wilkinson R. (2007) The ethics of animal research. EMBO Rep. 8: 526-530.
5. Franco N.H. (2013). Animal experiments in biomedical research: A historical perspective. ANIM. 3(1)1: 238-273.
6. Medeiros V.B. (2012). Endo and ectoparasites in conventionally maintained rodents laboratory animals. J. Surg. Clin. Res. 3(1): 27-40.
7. Nahmias A.J. and O'Reilly R.J. (2012). Immunology of Human Infection: Part II: Viruses and Parasites; Immunodiagnosis and Prevention of Infectious Diseases. SSBM.
8. Najafi et al. (2015). Intestinal helminths in laboratory mice and rats in four research centers, Tehran, Iran. J Med Microbiol Infec. Dis. 2(4): 1-3.
9. Ooi H.K., Oku Y. and Kamiya M. (1994) *Aspiculuris tetraptera*. In: Waggie K., Kagiyama N., Allen A. and Nomura T. (Eds.), *Manual of Microbiologic Monitoring of Laboratory Animals*. second ed. US. NIH. 173-175.
10. Percy D.H. and Barthold S.W. (2016). *Pathology of Laboratory Rodents and Rabbits* (4th ed). John Wiley & Sons.
11. Pinto R.M., Goncalves L., Noronha D. and Gomes D.C. (2001). Worm burdens in outbred and inbred laboratory rats with morphometric data on *Syphacia muris* (Yamaguti, 1935) Yamaguti, 1941 (Nematoda Oxyuroidea). Mem. Inst. Oswaldo Cruz 96: 133-136.
12. Tanideh N., Sajadi S.M., Mohammadzadeh T. and Mehrbani D. (2010). Helminthic Infections of Laboratory Animals in Animal House of Shiraz University of Medical Sciences and the Potential Risks of Zoonotic Infections for Researchers. Iranian Red Crescent Med. J. 12(2): 151-157.
13. Vaden S.L., Knoll J.S., Jr F.W.K.S. and Tilley L.P. (2009). Blackwell's Five-Minute Veterinary Consult: Laboratory Tests and Diagnostic Procedures: Canine and Feline (5th ed). John Wiley & Sons.
14. Veterinary Advice Online (2008). Fecal flotation for detecting parasite burdens in faces. Retrieved from http://www.pet-informed-veterinary-advice-online.com/fecal-flotation.html