

Original Research Article

Parasitic Infestation in Cockroaches (*Periplaneta americana*) Obtained in Selected
Areas of Metro Manila

Abstract

This study assessed the parasitic infestation in cockroaches obtained in streets and canals of selected areas of Metro Manila. It likewise assessed the diversity of the parasites seen on the external surfaces of the cockroaches collected. Cockroaches were baited along the streets and canals of randomly selected areas of Metro Manila. Parasitic organisms were isolated and identified from the external surfaces of the cockroaches collected. One hundred cockroaches (*Periplaneta americana*) were examined, and 36% of the cockroaches had multiple parasites seen on their external surface. The common parasite observed in the cockroach obtained was the rhabditiform larva (25%). Significant differences on the parasites seen on the cockroaches obtained from the selected areas were observed ($F = 4.03$; $P = 0.02$). The cockroaches obtained in Manila had the highest diversity of parasites seen on the external surface, and those collected in Quezon City had the least parasite diversity although those in Quezon City had the highest parasite load seen in the cockroaches examined.

Keywords: infestation, diversity, cockroach, parasite, external

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25 Introduction

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27 A lot of people felt appalled to see cockroaches wandering in the
28 environment, especially that these organisms are often times associated with places
29 that are dirty and unsanitary. Cockroaches are insects that are distributed
30 worldwide and have been in existence for millions of years. Cockroaches are
31 recognized to be mechanical vectors of disease-causing agents. Studies have
32 indicated that cockroaches are insects that carry parasites that are of medical
33 significance [1, 2], harbor pathogenic microorganisms that include bacteria and
34 fungi [3, 4], and are major sources of indoor allergens causing asthma-related
35 ailments [5]. The risk of acquiring diseases brought about by coming in contact with
36 these mechanical vectors heightens people's concerns. Despite that a number of
37 studies have been done in other countries worldwide, to our knowledge there are
38 neither parasitological studies on cockroaches conducted nor studies on the role of
39 cockroaches as mechanical vectors of diseases in the Philippines. Hence, this study
40 aims to assess the parasites present on the external surfaces of cockroaches in
41 selected areas of Metro Manila. The result of this study is vital, as it provides the
42 baseline information on the microorganisms, particularly parasites inhabiting the
43 external surfaces of the cockroaches, especially those roaming our environment.
44 The information generated may also raise awareness among the general public,
45 particularly on safeguarding public health from the harmful parasites present in
46 cockroaches.

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48 Methods

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50 This study was conducted in three randomly selected areas of Metro Manila, namely
51 Manila, Pasay, and Quezon City. The areas were randomly selected using the fish
52 bowl method, where the areas were written in pieces of paper, rolled and drawn
53 randomly. Cockroaches were collected using empty jars coated with a thin film of
54 Vaseline baited with pieces of bread soaked in water. The collecting jars were placed
55 along the canals of the streets of the randomly selected areas in Metro Manila. Only
56 the adult cockroach with an intact body was brought in the laboratory for
57 immediate processing and morphologically identified using a taxonomic key [6]. The
58 trapped cockroaches were aseptically transferred in sterile bottles containing 2 ml
59 of sterile normal saline solution. The cockroach was washed by vigorously shaking
60 the bottles, and the washings were collected for examination through the
61 concentration method as described by Sia Su et al. [7]. The supernatant was
62 discarded, and the filtrate was centrifuged for 10 min at 3200 rpm. The sediment
63 was collected and examined in Lugol-stained slides through light microscopy at
64 400× to 1000×.

65 The parasite abundance per cockroach was determined by assessing the frequency
66 of occurrence of parasites on the external surface of the cockroach. The parasite
67 community diversity was determined using the Shannon–Wiener diversity index
68 (H), and the parasite evenness was determined using the formula $H/H_{\max}$.

Significant differences on the parasite abundance on the cockroaches across the study areas were determined using ANOVA. Significance was set at $P < 0.05$. All statistical analyses were determined using the GNU PSPP software.

Results

All cockroaches collected in the streets of Metro Manila were taxonomically identified as *Periplaneta americana*. A total of 100 cockroaches were collected using the baiting method. About 56 cockroaches were obtained in Manila, 13 in Pasay, and 31 in Quezon City. Among the total cockroaches examined, about 36% had parasites on the external surface. Those cockroaches examined in Manila, Pasay, and Quezon City had 61.5%, 45.2%, and 25.0% parasites infesting on the external surface of the cockroaches, respectively. Table 1 shows the parasites isolated from the external surface of the cockroaches examined. All cockroaches examined had more than one parasite present on its external surface. Table 2 shows the parasite abundance, diversity, and evenness on the cockroaches in the selected areas of Metro Manila. Significant differences on the parasite abundance on the cockroaches examined across the study areas were observed ($F = 4.03$; $P = 0.02$). Higher parasite community diversity was observed on cockroaches collected in Manila, whereas lower parasite community diversity was observed in Quezon City though the abundance of parasites was seen on the cockroaches examined in Quezon City.

Table 1. Frequency of occurrence of parasites infesting the external surface of *Periplaneta americana* in selected areas of Metro Manila

Parasites	Study Sites					
	Manila		Pasay		Quezon City	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
<i>Ascaris</i> sp.	7	16.3	2	5.0	15	4.8
Rhabditiform larva	14	32.6	36	90.0	293	92.7
Hookworm	1	2.3	1	2.5	0	0.0
<i>Enterobius vermicularis</i>	7	16.3	1	2.5	1	0.3
<i>Trichuris trichiura</i>	12	27.9	0	0.0	5	1.6
Tick	1	2.3	0	0.0	0	0.0
Mite	1	2.3	0	0.0	2	0.6

Table 2. Parasite abundance, diversity, and evenness distribution on cockroaches in selected areas of Metro Manila

Study Sites	Abundance (no. of individuals)	Shannon–Wiener Diversity Index (<i>H</i>)	Evenness ($H/H_{\max}$)
Manila	43	1.50	0.84
Pasay	40	0.48	0.34
Quezon City	316	0.33	0.21

$$H_{\max} = \ln S.$$

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100 Discussion

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102 This was a cross-sectional study, and its scope is limited in assessing the parasite
103 infesting on the external surface of the cockroaches (*P. americana*) obtained in three
104 randomly selected areas of Metro Manila. The most important result of this study is
105 the baseline documentation of the parasites on the external surface of the
106 cockroaches roaming in canals along the streets of Metro Manila. Results have
107 shown that more than one parasite was observed on the cockroaches examined.
108 Among the parasites observed, nematode eggs and larvae, mite, and tick were seen
109 on the cockroaches. Our study corroborates with other studies [1, 2, 8] where
110 parasites that are of public health significance were found on the external surface of
111 cockroaches assessed. A lower overall parasite infestation of 36% on the external
112 surface of the cockroaches we examined was observed compared to those observed
113 in other countries. The variations on the parasite infestation on the cockroaches
114 may be attributed to the differences in the environments where the cockroaches
115 roamed, as different settings and conditions like the presence of human excreta and
116 wastes in the areas where they wandered account for the variation in the parasite
117 carriage rate of the cockroaches [8].

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119 Conclusion

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This study has assessed the parasites infesting on the external surface of cockroaches obtained in the streets of Metro Manila. The occurrence of parasites in the cockroaches examined indicates the need to raise people's awareness that they need to safeguard themselves and their food sources from being contaminated by cockroaches, as it may play an important role in the transmission of parasite-related morbidities. Proper personal hygiene and proper environmental sanitation must always be observed to reduce the possible risks that exposure to the microorganisms harbored by cockroaches may bring in our communities.

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