

Identification of Parasites of Public Health Important from the Body of Cockroach (*Periplaneta Americana*) in Kafin Hausa Area of Jigawa State

Maji, A.¹ and Ahmed, U. A.²

¹Department of Biological Science, Sule Lamido University, Kafin Hausa, Jigawa State, Nigeria. ²Department of Biological Science, Federal University, Gashua, Yobe State, Nigeria.

Corresponding author: umaradamuahmed@gmail.com

Abstract

The study was conducted in Kafin Hausa community, Hadejia Emirate, Jigawa State Nigeria. The study involved trapping and examination of cockroaches collected from toilets, kitchens and soak-away of four distinct quarters households of Kafin Hausa town. This was to identify the parasites in and on the cockroach and also to assess possible role of cockroaches in carrying parasites of medical important. A total of 150 cockroaches were trapped from different sites within the households and all were identified as *Periplaneta americana* species. Out of 150 cockroaches examined in the study, 79 cockroaches were found to harbour parasites from this study. Parasites isolated and identified were *Hookworms* 19(22%), *Entamoeba histolytica* 17(19.3%), *Taenia species* 21(26.5%), *Ascaris lumbricoides* 50(68.8%), *Wuchereria bancroft* 12(15%) and *Schistosoma species* 10(13.10%). All these were obtained from both external and internal body of the cockroaches. Cockroaches collected from the toilets and sock-away were found to have highest parasites load followed by kitchens and bathrooms. However, parasites that were isolated from the internal body were higher than those that were isolated from external body surface. And statistically there was a significant difference, $P < 0.05$ between the external and internal part of cockroaches obtained. Therefore, the study established that cockroach (*P.americana*) carries parasites of public health importance and might transmit the parasites to man and other animals and may be referred to as mechanical vector.

Keywords: Cockroach, Kafin Hausa, Parasites, *Periplanata Americana*, Public Health.

Introduction

Cockroaches have survived on the earth for more than 300 million years virtually without involving change (Tantang *et al.*, 2017). They are considered as one of the most successful groups of animals because of their adaptability in various environmental conditions. There are approximately 2500 species of cockroaches worldwide. Over 3500 species of cockroaches have been identified (Hamu *et al.*, 2014). Thirty of these species are more adapted to human habitation. Synanthropic of these, *Blatella germanica* (German cockroach), *Periplaneta americana* (American cockroach), and *B. orientalis* (The oriental cockroach) are considered the most common pests to humans. Cockroaches have indiscriminate dietary habits. Moreover, adult cockroaches have the ability to survive without food for several weeks. They have the ability to breed all year round in suitable

environmental conditions. These features of cockroaches, together with their nocturnal activity, probably make them widespread.

Several evidences showed that cockroaches are carriers of medically important parasites including helminthes and protozoa (Hamu *et al.*, 2014). Cockroaches are insects that are commonly found in most man-made building, a warm and humid environment especially in the kitchen, toilets, drainage system and even the sewer are the most favourable habitat for cockroaches. The conditions of the cockroach habitat are also very suitable environment for pathogens such as parasites. Cockroaches feed on almost everything especially starchy product, decaying matter, organic substances and even human faeces. As the cockroaches feed on human faeces, enteric pathogens from the faeces will be harboured into the cockroaches' body and these pathogens can be transmitted to human (Yusuf, 2018).

Our preliminary observation showed that there is dearth of research and information on interaction of cockroaches with disease causing organisms while the population of cockroaches is rapidly increasing in human environment.

Materials and Method

Study Area

The study was carried out at Kafin Hausa town of Hadejia Emirate. It lies at latitude 12°14'W and longitude 9°54'E Jigawa State, Nigeria. It has a land area of 1380 Km² and a human population of 271,053 according to the year 2006 Human population census. The study was carried out between April and June 2019. Different households of Kiginawa, Alkalawa, Turawa and Unguwar Zango quarters within the town were the location where the cockroaches were collected. These areas were chosen because of the low sanitary conditions and presence of refuse heaps which attracted flies and cockroaches. Most of the households used pit latrines for defecation since there was no adequate water supply for water closed toilets. Some houses with water closed lacked water for proper use and the toilet usually in a poor sanitary.

Sample Collection

One hundred and fifty adult cockroaches were collected from different parts of the households selected randomly from four different quarters of Kafin Hausa town for the period of survey. Buildings with many families, who shared facilities, kitchens, toilets, bathrooms and living rooms from households in different part of Kafin Hausa community. The cockroaches were caught in the night using nets and sterile hand glove. Each cockroach after collection was put in a sterile container and transported to the laboratory of Biological Science department, Sule Lamido University. Then the cockroaches were killed individually by using chloroform-soaked cotton wool (Brenner, 1995). The identification of the parasites in the laboratory was done according to Cheesbrough (2005).

Isolation of Parasite from the External Surface of the Cockroaches

Isolation of the parasite was done according to adapted method by Etim *et al.* (2013). Two mills of normal saline were added to the clean sterile container with the cockroach and shaken for two minutes (2min.). To detach the parasite on the surface of the cockroaches, 1ml of the washing fluid was then transferred to a centrifuge tube and centrifuged at 2000rpm for 5min. The top fluid was discarded and the deposits stained 1% Lugol's iodine and examined using light microscope at 40 magnification objective lens. Parasites were identify using taxonomical key and counted.

Isolation of Parasite from the Gastrointestinal Tract of the Cockroaches

After the external examination the cockroaches were separately placed in 70% ethanol for 5min (to remove parasites from the external surface) and then washed in sterile saline to remove the alcohol from body the body of the cockroaches. They were allowed to dry at room temperature. The cockroach was then fixed on a dissecting tray, the head severed first followed by the legs, then the abdomen was opened using fine pointed forceps and discarded. The gut and other abdominal organs were removed using fine needles. The intestine was then examined over a black ground for detection of parasites. 2ml of normal saline was added and the intestine macerated. One mill of the macerated was centrifuged at 2000rpm for 5min and the deposits with 1% Lugol's iodine before examination. Ova and cysts of parasites present were identified using taxonomical keys and counted using 40 magnification objective lens of the light microscope.

Data Analysis

The statistical analysis was done using PAST excel software. The differences between the number of external and internal parasites isolated from the cockroaches and the number of cockroaches collected from different locations of households were determined using one way analysis of variance (ANOVA).

Results

A total of 150 cockroaches of *Periplaneta americana* species were collected during the period of survey from April to June from four distinct household quarters (Kiginawa, Turawa, Unguwar Zango and Alkalawa of Kafin Hausa town). All the cockroaches were examined and identified. A total of seven different parasites were found associated with the *P. Americana* as parasites of public health importance were identified and comprised. Table 4.1 shows loads of parasites isolated from the external and internal body of cockroaches where *Ascaris lumbricoides* found with highest number 50(68.8%), followed by *Strongyloides stercoralis* 37 (43.3%), hookworms 19(22.1%), *Wucheraria bancrofti* 12(15%), *Taenia species* 21(26.5%), *Entamoeba histolitica* 17(19.3%), and the *Schistosoma species* has the least number 10 (13.10%) all those were found from external and internal surface of the *P. americana* collected. This were found harboured, two or more different parasites but no

cockroaches that had parasites. Those with the highest percentage of infection rate were cockroaches collected from the toilets and soak-away.

Table 4.1: The parasites of public health importance identified from the body parts of cockroach (*Periplaneta americana*) in Kafin Hausa area of Jigawa State in the year 2019.

Parasites	Internal	%	External	%
<i>Ascaris lumbricoides</i>	24	25.5	26	36.1
<i>Hookworms</i>	13	13.8	6	8.3
<i>Wuchereria bancrofti</i>	5	5.3	7	9.7
<i>Taenia species</i>	8	8.5	13	18.1
<i>Entamoeba histolytica</i>	13	13.8	4	5.5
<i>Schistosoma species</i>	6	6.4	4	5.5
<i>Strongyloides stercoralis</i>	25	26.6	12	16.6
Total	94	100	72	100

Table 4.2: General distribution of cockroaches collected from quarters of Kafin Hausa of Jigawa State in the year 2019

Quarters Name	No. of cockroaches collected	No. of cockroaches examined	No. of infected	%
1. Kiginawa	40	40	21	52.5
2. U. Zango	45	45	23	51.1
3. Turawa	30	30	16	53.33
4. Alkalawa	35	35	19	54.29

Source: Researcher's Report, 2019

Discussion

Seven species of parasite were found associated with *Periplaneta americana*. They include *Ascaris lumbricoides* (61.6%), hookworms (22.1%) *Wuchereria bancrofti* (15%), *Taenia species* (26.6%), *Entamoeba histolytica* (19.3%), *Schistosoma spp* (11.9%) and *Strongyloides stercoralis* (43.2%). Table 4.1 shows percentage of parasites isolated from external and internal body of *P. americana* where *Ascaris lumbricoides* and *Strongyloides stercoralis* were found carried highest percentage in the study and the load of parasite on the internal parts of the cockroaches overweight that of the external. This indicates that $p < 0.05$, meaning there is significant difference between the two parts (external and internal). This agree with finding of Hussain *et al.* (2014) had similarly conducted research on German cockroaches and the research revealed that prevalence of endoparasites was statistically higher significantly than the parasites carried on the external surface by using chi-square test at $p < 0.05$. This marginal disparity could be explained in two ways, it could be that the body

surface of *P. americana* was exposed to the outside environment, so the parasite couldn't be able to obtain nourishment from cockroach body, the parasite could be expelled to the surrounding at any time while the parasites in the internal body have contact to the internal organs they could get nourishment from the body organs. The result of his study also disagrees with finding of Davi and Murray (1991). The study revealed that the high number of parasite eggs and cyst were encountered in the external surface (exoskeleton) of *P. americana* were higher than those found in the gastrointestinal tract. Another research by Etim *et al.* (2014) was in agreement with the findings of this study, which documented 63.3% for external surface and 34.6% for internal organs. This study documented 94.3% for external and 99.9% for internal. The finding of this study also contradicts with findings of Bassam (2013) who worked on prevalence and burden of human intestinal parasite on cockroach's body surfaces and gut. The study revealed that prevalence of parasite in gut of cockroach was either a little higher than or identical numerically to the corresponding prevalence on body surface. For this, the ANOVA test shows that no statistical significant differences between prevalence in gut and body surface of *P. americana* ($F=1.363$, $p=0.243$). This finding also agrees with findings of Tatang *et al.* (2017). Study revealed that cockroaches caught in toilets carried more parasites (31.99%) as compared to those from kitchens (22.63%) and bathrooms (11.14%). Table 4.2 shows general distribution of cockroaches collected and the percentage of infection among four quarters houses this include: Kiginawa, Unguwar zango, Turawa and Alkalawa. Although the number of cockroaches collected were unevenly among the quarters. From the data obtained from the table Alkalawa found with highest percentage of infection of (54.29%) with nineteen number of infected out of thirty five number examined followed by Kiginawa with (52.5%) with twenty one of infected out of forty examined number, then followed by Unguwar zango and Turawa with least number of infection.

Conclusion

Parasites of public health importance from *Periplaneta americana* were identified from the cockroaches collected in the study area. The result of the study revealed that there are many parasites of public health significance carried and harboured by cockroaches in Kafin Hausa town. Unfortunately, the people did not consider presence of cockroach parasitic infections as a serious problem, even though they did not like the sight of cockroaches. They also constitute an important reservoir for pathogens; therefore, the control of cockroaches is important since this will minimize the incidence of parasitic diseases transmitted by cockroaches in the area.

Recommendations

- Personal cleanness would reduce the rate of parasitic infections of cockroaches from our surroundings. Those factors that contribute to the transmission of such infections should be prevented.

- Cockroaches as by mere looking at its habit and habitats prefer to survive in dirty environment such as toilets, bathrooms and other unhygienic sound places, which is why they often called as filthy insects. To remove the infection of this pathogen organism, sanitation activities should be exercised all the times in the surroundings.
- Also habit of emptying bins, drums full of garbage should be practiced.
- Direct habit of removing cockroaches from the environment using insecticide and other chemicals would help in reducing the rate of infestation of cockroaches.
- Moreover, people should be aware with the risk carried by cockroaches.

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