

COCKROACH BIOTA FROM STUDENT'S HOSTELS AT THE UNIVERSITY OF JOS, NIGERIA

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Abstract: A study was carried out to identify the bacterial pathogens and parasites associated with the Cockroach (*Periplaneta americana* L.) a well known domestic pest at the University of Jos student hostels having a population of about 3,000 students. A total of 151 Cockroaches were collected from the toilet environment and examined for bacterial pathogens and parasites using standard culture and microscopy. The study revealed the occurrence of twelve different parasites namely: *Entamoeba histolytica* (29.8%) *Entamoeba coli* (11.3%), *Endolimax nana* (13.2%) *Isospora belli* 16.6%) *Giardia lamblia* (23.8%), *Taenia sp* (2.6%), *Hymenolepis nana* (3.2%), *Ascaris lumbricoides* (9.3%), *Trichuris trichiura* (2.6%), *Enterobius vermicularis* (9.3%) Hookworm (14.6%) and *Strongyloides stercoralis* (9.9%). Also isolated were seven (7) bacterial species: *Staphylococcus sp* (11.4%), *Streptococcus sp* (10.5%), *Escherichia coli* (34.3%) *Salmonella sp* (5.7%) *Shigella sp* (9.5%), *Klebsiella sp* (17.5%), and *Bacillus sp* (4.0%). The occurrence of these parasites/pathogens has obvious implication of a possible out break of gastro-enteritis, thus the need for control measures against the insect.

Key words: *Periplaneta americana*, bacterial pathogens, Jos, Nigeria.

INTRODUCTION

The significance of certain arthropods as vectors of diseases and the need to find solutions to their continued spread of disease between man, animals and the environment cannot be over emphasised. Although Cockroaches are probably the most obnoxious insects known to man, they are not associated with diseases as noted with mosquitoes and fleas (By direct transmission) (Cornwell, 1968). However they harbour a number of pathogens and parasites which are infective to man. These pathogens and parasites are indiscriminately deposited on our foods and equipment as the cockroaches come in contact with them (Cameron 1961; Ragge, 1965; Cornwell 1968; Bell and Adiyodi, 1982; Rust *et al* 1999). Also human contact with food and house dust contaminated with the faeces of cockroaches causes allergic reaction especially those with asthma (Rust *et al* 1999). Cockroaches are also important in the destruction of food and other valuables in the house, libraries and paints.

Since cockroaches abound locally especially as pests, mechanical vectors, as well as intermediate host of some human pathogens and parasites, a survey was undertaken to study the bacterial pathogens and parasites associated with cockroaches and to relate the bacterial/parasite burden to the areas they were collected from, as well as suggest possible control measures where human health is found to be potentially endangered.

MATERIALS AND METHODS

A total of 151 specimens (131 adult cockroaches and 20 Nymphs) were individually collected alive in Petri-dishes from the domestic premises (Toilets and bathrooms) of the University of Jos student hostels. The specimens were subsequently transported to the Microbiology Laboratory and screened for parasites and bacterial pathogens.

Identification of Specimens

The specimens were identified at the Institute of Agricultural Research (IAR) Ahmadu Bello University, Zaria as *Periplaneta Americana* L. Order- Dictyoptera.

Killing and Dissection

The cockroaches were killed by exposure to chloroform for a few minutes in their respective containers. Normal Saline was used to wash the cockroaches individually to remove the parasites on the external body of the insect. The dissection was carried out on a dissection tray using standard Zoological techniques as described by Chapman (1980).

Briefly, after clipping off the wings of the insects near the base, with a small pointed scissors kept hot enough to sear, and a forceps, the dorsum was clipped at the side and posterior edge and laid back exposing the intestinal tract. The intestine was lifted with a teasing needle and a small forceps into a sterile watch glass. The gut was finely macerated into tiny bits by means of the sterile scalpel blade and a fresh smear made of their contents on MacConkey and Blood agar plates using streak plate technique. Also, wet preparations of the gut content of the individual cockroaches were made and examined under the microscope for the presence of parasites. The inoculated Plates were incubated at 37°C for 24 hours to obtain pure colonies of bacterial growth.

Identification of the Parasites

Samples of the wet preparations (From the external body and the gut) were examined microscopically for the presence of parasites. The identification of the parasites was carried out with the aid of the identification keys in Cheesbrough (1998) and Atlas of Medical Helminthology and Protozoology (Jeffery and Leach (1975).

Isolation and Identification of the Bacterial Pathogens

The isolation and identification of bacteria pathogens was carried out only for the intestinal contents of 105 cockroaches. The cultures showing significant bacterial growth on the MacConkey and Blood agar plates were subcultured on to fresh MacConkey and Blood agar plates to obtain pure cultures. The identification of the organisms was done using the method described by Cowan and Steel (1974).

RESULTS

The results show that a number of Protozoa and helminths are associated with the Cockroach. The protozoa especially *Entamoeba histolytica* (29.8%), *Giardia lamblia* (23.8%) and *Endolimax nana* (13.2%) were the most common parasites recovered from the intestinal part. This was followed by the helminths especially the Ova of hookworm (14.6%) and *Ascaris lumbricoides* (9.3%).

From the outer parts of the insect the following Parasites were also recovered: *Entamoeba histolytica* (22.5%), *Giardia lamblia* (19.2%), *Endolimax nana* (8.6%), Hookworm (7.9%) and *Hymenolepis nana* (6.6%).

Overall, the spectrum of parasites was similar for both the outer and inner parts of the Cockroach but the frequency of occurrence was higher in the intestinal parts for all the parasites except *Taenia sp* and *Hymenolepis nana* (Table I).

The bacterial species identified included *Staphylococcus spp*, *Streptococcus spp*, *Escherichia coli*, *Salmonella spp*, *Shigella spp*, *Klebsiella spp* and *Bacillus spp*. (Table 2).

In terms of number and frequency of occurrence from the study of the intestinal parts, *Escherichia coli*, with (34.3%) occurrence was the most common bacterial pathogen followed by *Klebsiella spp* (17.5%), *Staphylococcus spp* (14.4%) *Streptococcus spp* (19.5%), *Shigella spp* (9.5%) and *Bacillus spp* (7.5%). *Salmonella spp* with (5.7%) accounted for the lowest in occurrence. All the bacterial species identified are shown in table 2.

Table 1: Type of Parasite, Location and Frequency of Isolation from the Cockroaches

Parasites	Intestinal parts frequency (%)	Outer parts Frequency (%)
<i>Entamoeba histolytica</i> (cyst)	45 (29.8%)	34 (22.5%)
<i>Entamoeba coli</i> (cyst)	17(11.3%)	17(11.3%)
<i>Endolimax nana</i> (cyst)	20 (13.2%)	13 (8.6%)
<i>Isospora belli</i> (oocyst)	10 (6.6%)	2 (1.3%)
<i>Giardia lamblia</i>	36 (23.8%)	29 (19.2%)
<i>Taenia spp</i> (egg)	4 (2.6%)	6 (4.0%)
<i>Hymenolepis nana</i> (egg)	5 (2.3%)	10 (6.6%)
<i>Ascaris lumbricoides</i> (egg)	14 (9.3%)	9 (6.0%)
<i>Trichuris trichiura</i> (egg)	4 (2.6%)	0 (0.0%)
<i>Enterobius vermicularis</i>	7 (4.6%)	2 (1.3%)
Hookworm Ova	22 (14.6%)	12(7.9%)
<i>Strongyloides Stercoralis</i> (Larvae)	15 (9.9%)	1(0.7%)

Table 2: Bacterial species and Frequency of Isolation from the Intestinal Tracts of Cockroaches

Bacterial species	Frequency of occurrence	Percentages
<i>Staphylococcus</i> species	12	11.4%
<i>Streptococcus</i> species	11	10.5%
<i>Escherichia coli</i>	36	34.3%
<i>Salmonella</i> species	6	5.7%
<i>Shigella</i> species	10	9.5%
<i>Klebsiella</i> species	18	17.5%
<i>Bacillus</i> species	8	7.4%

DISCUSSION

This study has shown that, a number of parasites and bacterial pathogens are associated with cockroaches collected from the University of Jos students' hostels. Similar studies have earlier been carried out by Decoursey and Ottos (1956) who reported the isolation of *Entamoeba histolytica* and certain other protozoans from the cockroaches *Blattella germanica* in Cairo Egypt. Roth and Willis (1960) also reported the occurrence of *Enterobius vermicularis*, *Necator americana* and *Trichuris trichiura* from their investigation into the biotic association of various nematode worms with cockroaches.

The high frequency of occurrence of *Entamoeba histolytica* and *Giardia lamblia* in the intestinal and outer parts of the cockroaches in this survey agrees favourably with the report of WHO (1995) that stated that *Entamoeba histolytica* and *Giardia lamblia* are endemic in many parts of tropical and subtropical Africa and they are transmitted by faecal oral route with infective cyst being ingested in food, water or from hands contaminated with faeces. This may account for their high frequencies of occurrence in domestic arthropod pests.

The occurrence of some of the parasites at high frequencies both in the intestinal and outer parts of the cockroaches is indicative of possible high risk of acquiring these parasites, especially as these pests are found in close association with man while at the same time occurring as normal host for these parasites. Suffice it to say that the presence of only the cysts and ova of *Entamoeba sp* and *Ascaris lumbricoides* respectively and most of the parasites indicates the "passive Carrier" role of cockroaches in the life histories of these parasites and the findings of *Strongyloides stercoralis* larvae shows the insects to be their normal hosts.

Cockroaches are capable of mechanical transmission of bacterial pathogens from dirty places to human food because of their filthiness and indiscriminate movement over food items (Burden, 1976). The isolation of *Staphylococcus sp*, *Streptococcus sp*, *Escherichia coli*, *Salmonella sp*, *Shigella sp*, *Klebsiella, sp* and *Bacillus sp* from the cockroaches examined is in agreement with the report of Rust *et al* (1999); Clark *et al* (1992), Burgess *et al* (1973) and Klowden and Greenberg (1976) which identified that cockroaches are capable of contaminating eggs, feed, water and equipment with bacterial pathogens after feeding on a contaminating source. The high incidence of *Escherichia coli*, *Klebsiella sp*, *Staphylococcus sp*, and *Shigella sp* can be attributed to human population and availability of materials (such as excreta and food stuff) which the cockroaches use as food.

The percentage isolation of *Escherichia coli* (34.3%), *Shigella sp* (9.5%), and *Salmonella sp* (5.7%), is significant and can easily lead to an outbreak of gastro enteritis, Shigellosis, and Salmonellosis respectively. Also to be considered for its significance is the isolation of *Staphylococcus sp* which has been implicated in a number of superficial infections as well as food poisoning (Jawetz *et al* 1984; Brock and Madigan 1988). *Bacillus sp* are also associated with food poisoning, vomiting and diarrhoea, while *Streptococcus sp* and *Klebsiella sp* are associated with Pneumonia like disease, and these can be important considering the cold climatic nature of our immediate environment.

As a result of the above, properly planned control measures should be used in keeping the environment free of cockroaches, Health Education of food handlers and the community on the dangerous nature of cockroaches, maintaining good hygienic state of the toilets as well as preventing faecal contamination of food and water supplies.

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