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A Survey Of Cockroaches (*Dictyoptera Blattodea*) Inhabiting Different Areas Of A Hospital And Pathogens They Harbor In Uyo, Akwa Ibom State. Nigeria.

Etim, Promise Itoro and Bassey, Hasadiah Okon
Department Of Science Technology, Akwa Ibom State Polytechnic, Ikot Osurua. Nigeria
Corresponding author: Etim, Promise Itoro;

ABSTRACT
Cockroach is one of the most important pests in urban communities. This study was conducted to determine the situation of cockroach infestation and the pathogen they harbor in hospitals around the urban area of Uyo, Akwa Ibom State. A total of seven hospitals were visited during the study and sixty-seven cockroaches were collected. Four different species of cockroach were identified: Periplanata americana, Periplanata australasiae, Blatella germanica and Blatta orientalis. The most abundant species in the study area was Periplaneta americana and the location with the highest number of cockroaches was the toilet. The pathogens isolated from these cockroaches were: Salmonella typhimurium, Klebsiella pneumonia, Escherichia coli, Pseudomonas aeroginosa and Enterobacter aerogenes. Thus, it should be ensured that hospital environments are kept clean and tidy to prevent the high rate of cockroach infestation. Elimination of cockroaches in hospitals should be done through eco-friendly measures.

KEYWORDS: *Cockroaches, Infestation, Pathogens*

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I. INTRODUCTION

Cockroaches have been in existence for about 360 million years (Cochran, 1982) and they are one of the important groups of insect pests in urban environments. Cockroaches do not only spoil food but also transfer pathogens and cause allergic reactions and psychological distress (Bremmer, 1995). As a potential mechanical vector of human diseases, many pathogenic organisms have been associated with cockroaches. These include poliomyelitis viruses, bacteria, fungi, protozoa and helminthes (Tatfery, *et al*. 2005).

There are over 3500 species of cockroaches worldwide; of these only several species are commonly associated with humans. Three domiciliary species of important are the German cockroach, the American cockroach *(Periplaneta americana*) and the oriental cockroach (*Blatta orientalis*) (Goddard 2003). Cockroaches are primitive and highly successful winged insects (Jeffery and Sulaimaan, 2012). Cockroach has been detected around hospitals, sickrooms, area of intensive care, surgical section, etc (Dubus and Guerra, 2001). Indeed cockroaches are vectors of pathogenic organism in hospital environment (Cotton and Wasserma, 2000).

In the report by Faulhuber and Karp (1992), nine different molecules were identified in the insect tissues that were toxic to bacteria. Cockroaches secrete their own antimicrobials since they often live in unsanitary and unhygienic environments where they encounter different types of bacteria. Thus, they have developed ways of protecting themselves against micro- organisms (Dowel- Eby, *et al*. 1991).cockroaches in the home environment are health hazard not only because of the risk posed by cockroach antigens to asthmatic patients but also because some of the methods traditionally used to eliminate them may cause additional hazards. Results from a study, of factors that affect asthma in children showed cockroach allergens (the European journal of allergy and clinical immunology, 2005).

Cockroaches have been implicated in the mechanical transmission of *Salmonella* species, *Aspergillus spp, Entamoeba Spp* and *Toxoplasma Spp* (Roth and Willis, 1957). Additionally, in laboratory experiments cockroaches have been shown to harbor the yellow fever virus and the bacterial agents of cholera, pneumonia, Diphtheria, anthrax, tetanus and tuberculosis (Foteder, *et al*. 1991). Different forms of gastroenteritis as well as food poisoning are also the principal diarrhea diseases transmitted by cockroaches and due to the unsanitary conditions that they live in; they are able to transport pathogenic bacteria into food (Koehler and Patterson, 1987).

II. MATERIALS AND METHODS

2.1 Study Area

The study was carried out in Uyo Metropolis; Uyo is the capital of Akwa Ibom State in Nigeria. Seven Hospitals and clinics were randomly selected along Oron road, Nwaniba road and Abak road. In each of the hospitals and clinics visited permission was sought and received to do the study.

2.2 Methods of Sample Collection

For the collection of life cockroaches, sticky tape and onion trap, jar traps with petroleum jelly rubbed on the shoulder area inside the jar were used. These traps were placed on the floor of the hospital wards, toilets, stores and surgical rooms. These traps were laid in the evening hours and they remained overnight and were withdrawn in the morning. The cockroaches were carefully removed from the traps and placed into specimen bottles and taken to the laboratory for the pathogens to be analysed. For collection of dead cockroaches, Rambo insecticide powder was applied on the floor of the designated areas.

2.3 Isolation and Identification of Pathogens

Four media were used to culture the suspected microbes; a general purpose medium (nutrient agar) and three selective media (SS Agar, MacConkay Agar and EMB Agar). Applying pour plate method, 1ml of broth culture growth from peptone water was aseptically introduced into a sterile petri-dish and about 15 ml of nutrient agar was dispensed into plates, swirled and allowed to set before incubation. All the samples were incubated at 37^0C temperature for 20 hours. For selective media, streak plate was applied on the selective media plates after incubation, distinguished colonies were observed and sub- cultured to get a pure stock culture. Biochemical test were carried out to identify the isolates.

2.4 Statistical analysis

Statistical analysis of variance was used for mean separation

III. RESULTS

A total of sixty-seven (67) cockroaches was collected from the seven hospitals visited.

Table 1. The total number of cockroaches collected from selected hospitals in Uyo, Akwa Ibom State, Nigeria

Cockroaches Family/ Species	**Locations Within The Hospital**				
	Canteen	**Toilet**	**Store**	**Wards**	**Total**
Blattidae;					
Periplaneta americana	2	22	5	6	35
Blatta orientalis	0	0	7	1	8
Periplaneta australasiae	3	3	1	6	13
Blattellidae;					
Blattella germanica	11	0	0	0	11
Total	**16**	**25**	**13**	**13**	**67**

There was no significant difference in the number of cockroach species collected from the different sections of the hospital.

Table 2. The total number of each species of cockroaches collected from the different areas of hospital in Uyo, Akwa Ibom State.

Location	**Species of Cockroaches**				
	P. americana	*P. australasiae*	*B. orientalis*	*B. germanica*	Total
Canteen/Kitchens	2	3	0	11	16
Toilets	22	3	0	0	25
Stores	5	1	7	0	13
Wards	6	6	1	0	13
Total	**35**	**13**	**8**	**11**	**67**

Table 3: The different types of bacteria isolated from the digestive tracts of the different cockroaches dissected.

Bacterial Agent	Number
Salmonella typhirium	11
Kiebsiella pneumonia	2
Escherichia coli	3
Pseudomonas aeroginosa	1
Enterobacter aerogenes	7
total	24

Four different types of bacteria were isolated from the digestive tracts of the different cockroaches dissected.

IV. DISCUSSION

From the study, it was observed that cockroaches prefer moist, dirty and filthy places; this corresponded with the findings of Roth and Willis (1957) on cockroach preference to filthy and untidy environment.

Periplanata americana was the most abundant species, this is because they are endemic tropical regions from where they spread to other parts of the world through commerce (Bell and Adiyidi, 1981). The toilet had the highest population of cockroaches compared to other areas of the hospital this might suggest the unhygienic condition the toilet was in.

Five different bacteria were isolated this is in line with the findings of Roth and Willis 1957 who implicated that cockroaches are aid in mechanical transmission of bacteria. Each of the bacterium isolated is able to cause diseases detrimental to human health. *Salmonella typhimirium* causes typhoid fevers, a bacterial diseases that lives in humans (Wain, *et al*. 2015)

Most *E. coli* strains can cause diseases but virulent strains are cause gastroenteritis, urinary tract infections and neonatal meningitis. In some cases, virulent strains are also responsible for bowel necrosis (tissue death) and perforation with progressing to haemolytic uremic syndrome, peritonitis and gram-negative pneumonia, bacterial is characterized by severe abdominal cramps, diarrhaea that typically turns bloody within 24 hours and sometimes fever (Toder, *et al.* 2007)

Kiebsiella pneumonia is a common gram negative, non-motile encapsulated lactose –fermenting, facultative anaerobic rod- shaped bacterium.

Although found as a normal flora of the mouth, skin and intestine. *K. pneumonia* can cause destructive change to human and animal lungs of aspirated (inhaled), specifically to the alveoli resulting in bloody sputum. It can also cause destructive changes to human lungs via inflammation and hemorrhage with cell death (necrosis) (Ryan *et al*. 2004)

Pseudomonas aeroginosa is a common gram negative bacterium that can cause diseases in human. It can in rare circumstances cause commonly acquired pneumonia (Fine *et al.* 1996).

Enterobacter aerogenes is a nosocomid and pathogenic bacteria that causes opportunistic infections like lower respiratory tract infections, urinary tract infection, endocarditis, intra-abdominal infections (Sanders, 1997).

V. CONCLUSION

Cockroaches are mostly abundant in unhygienic environments and also where there is food and water. Cockroaches are prevalent in the tropical regions because the climatic conditions are quite favorable and this enhances their survival, this explains their abundance in the study area. Cockroaches are carriers of bacteria which are harmful and detrimental to human health hence, adequate control measures should be put in place to reduce the rate of cockroach infestation in hospitals. The use of insecticides to eliminate cockroaches in hospitals is recommended but only insecticides that does not pose any threats to patients' health should be used.

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