

ANTS AS VECTORS OF BACTERIA IN HOSPITAL ENVIRONMENTS

A PROJECT REPORT SUBMITTED

BY

AFOLABI OLUFEMI TABITHA

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**BEING A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF
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CERTIFICATION

This is to certify that this project work was carried out by AFOLABI OLUFEMI TABITHA with Matric Number: **HND/23/SLT/FT/0360** in the Department of Science laboratory Technology (SLT), Institute of Applied Science (IAS) and has been read and approved as meeting the requirements for award of Higher National Diploma (Microbiology option) Kwara State Polytechnic Ilorin.

.....
MR. IBRAHIM A.W.

(Project supervisor)

.....
DATE

.....
Miss. AHMED TAWAKALITU.

(Head of Microbiology Unit)

.....
DATE

.....
DR. ABDULKAREEM USMAN.

(Head of Department)

.....
DATE

(External Examiner)

DATE

DEDICATION

I dedicate this project to Almighty God, who has seen me through it all.

Also, to my lovely parent and to my loved ones for their love and support, am very grateful for everything.

ACKNOWLEDGEMENT

My first and deepest appreciation goes to Almighty God, the merciful, the God that has never failed for guiding and protecting me always throughout my journey on campus and for the time fulfillment of His promises concerning my life.

All thanks to my supervisor MR IBRAHIM A.W for his guidance and his advice all this time. I say thanks you sir for the support, TO my H.O.U MR S. AHMED TAWAKALITU, Also to my Head of Department H.O.D in person of DR.ABDULKAREEM USMAN for his encouragement.

My sincere appreciation and deep sense of gratitude is given to no one but my parent, Special thanks to individuals who has contributed to my success, my God bless you all.



ABSTRACT

Ants are increasingly recognized as mechanical vectors of pathogenic bacteria in hospital environments, where their presence poses significant risks to patient safety and infection control. This study investigated the possible pathogenic bacteria species associated with ants collected from various hospital locations and assessed their potential role in the transmission of hospital-acquired infections. Ants were sampled using sterile techniques from wards, emergency rooms, and waste disposal areas, and subjected to microbiological analysis, including culture on Blood and MacConkey agar, Gram staining, and biochemical tests. The results revealed the presence of both Gram-positive and Gram-negative bacteria, including Staphylococcus spp., Bacillus spp., Klebsiella spp., Pseudomonas spp., and coliforms. These organisms are known to cause serious infections and exhibit varying degrees of antimicrobial resistance. The findings emphasize the importance of effective pest control, sanitation, and monitoring strategies in healthcare facilities to mitigate the role of ants in bacterial transmission and reduce the burden of nosocomial infections.



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CHAPTER ONE

2.0 INTRODUCTION

Ants are among the most ubiquitous insects found in various environments, including hospitals, where their presence poses a significant risk to public health. These small but resilient insects have been recognized as potential vectors of bacteria, capable of carrying and disseminating pathogenic microorganisms in healthcare settings. Their attraction to food sources, moisture, and waste materials in hospitals increases the likelihood of bacterial contamination, which may contribute to hospital-acquired infections (HAIs). Understanding the role of ants in bacterial transmission is crucial for implementing effective infection control measures in hospital environments (Emidio *et al.*, 2022).

Hospital environments, despite rigorous cleaning protocols, are often vulnerable to microbial contamination due to the high influx of patients, healthcare workers, and visitors. Ants, being social insects, establish colonies near sources of food and moisture, making hospitals an ideal habitat

for them. They can easily navigate through patient wards, intensive care units, operating rooms, and hospital kitchens, picking up bacteria from contaminated surfaces and transmitting them to sterile areas. This movement facilitates cross-contamination and increases the risk of bacterial infections, particularly among immunocompromised patients (Garboui *et al.*, 2022).

Studies have demonstrated that ants collected from hospital environments harbor a variety of pathogenic bacteria, including *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Klebsiella pneumoniae*. These bacteria are known to cause serious infections such as bloodstream infections, pneumonia, urinary tract infections, and wound infections. The ability of ants to carry antibiotic-resistant bacteria further exacerbates the problem, as these microbes can contribute to the growing challenge of antimicrobial resistance (AMR) in healthcare settings. Hospital-acquired bacterial infections are already difficult to manage, and the presence of ants as potential vectors only adds to this burden (Frick

mann *et al.*, 2024).

The mechanisms by which ants acquire and transmit bacteria are diverse. Ants frequently come into contact with hospital waste, contaminated medical equipment, and patient excretions. Their exoskeletons, legs, and digestive tracts serve as reservoirs for bacterial pathogens, which they can deposit on surfaces through direct contact or excretion. Additionally, their ability to traverse long distances and infiltrate sealed medical supplies allows them to introduce bacteria into sterile environments, potentially compromising the safety of patients undergoing treatment or surgical procedures.

Infections resulting from bacterial transmission by ants pose significant challenges to hospital management. Patients with weakened immune systems, including those in intensive care units and neonatal wards, are particularly susceptible to infections caused by these opportunistic pathogens. When bacteria carried by ants contaminate intravenous catheter

s, surgical instruments, or respiratory devices, they can lead to severe complications, prolonging hospital stays and increasing healthcare costs. The persistence of ants in hospital settings necessitates a comprehensive approach to pest control and hygiene management to mitigate their impact on infection rates (Yu *et al.*, 2022)

Efforts to control ant infestations in hospitals should include both preventive and corrective measures. Proper sanitation practices, such as sealing food sources, managing waste disposal, and eliminating moisture-rich environments, are essential in reducing ant populations. Regular pest control interventions, including the use of insecticides and baiting strategies, can help minimize the presence of ants in critical hospital areas. Furthermore, healthcare workers must be trained to recognize the risks associated with ant infestations and adopt best practices in maintaining a sterile hospital environment (Yu *et al.*, 2022). While chemical pesticides are commonly used for ant control, their application in hospitals requires careful consideration due to potential health hazards for patients and staff.

Alternatives such as biological control methods, integrated pest management (IPM), and non-toxic barriers can provide sustainable solutions for reducing ant populations without compromising patient safety. Additionally, continued research into the microbial load of hospital ants can help identify high-risk areas and inform targeted interventions to prevent bacterial transmission (Emidio *et al.*, 2022).

The role of ants as vectors of bacteria in hospital environments extends beyond direct contamination; they also contribute to the persistence of bacterial reservoirs in hidden and hard-to-reach areas. Ant colonies often nest in wall crevices, under floor tiles, and within electrical equipment, making complete eradication difficult. The presence of these hidden nests means that even after visible ant populations are eliminated, bacterial contamination may persist, necessitating ongoing monitoring and preventive measures (Abazid, 2023).

Public health authorities and hospital infection control teams must work

together to establish guidelines for managing ant infestations in medical facilities. Collaborative efforts between microbiologists, entomologists, and epidemiologists can enhance our understanding of the microbial risks associated with ants and contribute to the development of evidence-based control strategies. Surveillance programs aimed at monitoring ant-borne bacterial contamination can provide valuable data to inform hospital hygiene policies and improve patient safety (Yu *et al.*, 2022)

Ants play a significant but often overlooked role in bacterial transmission within hospital environments. Their ability to carry and disseminate pathogenic bacteria underscores the need for effective pest management and infection control measures. Given the increasing concerns over antimicrobial resistance and hospital-acquired infections, addressing the issue of ants as vectors of bacteria is essential for safeguarding public health. Hospitals must adopt a multidisciplinary approach that integrates entomology, microbiology, and environmental health to minimize the risks posed by these insects and ensure a safer healthcare setting for patient

s and healthcare providers alike (Wiktorczyk-Kapischke *et al.*, 2022).

1.1 Literature review

Ants are increasingly recognized as potential vectors of pathogenic bacteria in hospital environments, posing significant risks for nosocomial infections. Several studies have explored this phenomenon, highlighting the diversity of ant species involved and the range of bacteria they may carry. In a study conducted in a Brazilian hospital, researchers collected 1,659 ants from 14 different species, including *Crematogaster victima*, *Solenopsis saevissima*, and *Tapinoma melanocephalum*. They identified 41 bacterial species on these ants, with 18 also isolated from patient samples. This overlap suggests that ants can act as mechanical vectors for pathogenic and opportunistic bacteria, thereby representing a risk factor for nosocomial infections (Lima, Marques, Rodrigues, and Rebêlo, 2013).

Similarly, research in a hospital in São Paulo, Brazil, found that ants, particularly *Paratrechina* species and *Monomorium floricola*, had a high cap

acity for carrying bacteria. The isolates included 68.8% Gram-positive, spore-producing bacilli (*Bacillus* spp. and *Listeria* spp.), 14.7% Gram-negative bacilli (*Pseudomonas aeruginosa* and *Klebsiella* spp.), and 16.4% Gram-positive cocci (*Streptococcus* spp. and *Staphylococcus aureus*). The study emphasized the need for stringent ant control measures to minimize infection risks in hospital settings (Moreira, Morais, Vieira-da-Motta, Campos-Farinha, and Tonhasca, 2014).

Another investigation focused on the potential of ants to act as vectors of foodborne pathogens. The study revealed that ants could harbor and transfer pathogenic or toxigenic microorganisms, contaminating food, water, and food-contact surfaces in kitchens, leading to foodborne illnesses. This finding underscores the broader public health implications of ant infestations beyond hospital environments (Neetoo and Mahomoodally, 2018).

Further studies have demonstrated that ants in hospital environments

may carry pathogenic microorganisms responsible for hospital-acquired infections (HAIs), which can develop resistance to antimicrobials. This highlights the importance of effective pest control measures to mitigate the risk of HAIs associated with ant-borne bacteria (Oliveira, Sousa, Soares, Nascimento, Madureira, and Fortuna, 2017).

Additionally, research has shown that ants can act as mechanical vectors of pathogenic microorganisms in hospitals. The study found that ants carried various bacteria, including both Gram-positive and Gram-negative species, emphasizing the need for stringent ant control measures to minimize infection risks in hospital settings (dos Santos Lima, Garcia Marques, Souto Rodrigues, and Macário Rebêlo, 2013).

1.2 Statement of problem

- **Increased Risk of Nosocomial Infections** – Ants in hospital environments may carry pathogenic bacteria, increasing the risk of hospital-acquired infections.

- **Antibiotic-Resistant Bacteria Transmission** – Ants can serve as vectors for multidrug-resistant bacteria, worsening antimicrobial resistance in healthcare settings.
- **Compromised Sterile Areas** – The presence of ants in operating rooms, ICUs, and sterile wards can compromise infection control measures.
- **Lack of Awareness and Control Measures** – There is limited research and awareness regarding the role of ants in bacterial transmission within hospitals.
- **Potential Threat to Immunocompromised Patients** – Patients with weakened immune systems are at higher risk of infections due to bacterial-contaminated ants in healthcare facilities.

1.3 Aims

- To investigate the role of ants as vectors of bacteria in hospital

environments by identifying and characterizing bacterial species associated with ants and assessing their potential implications for hospital hygiene and infection control.

1.4 Objectives

- To isolate and identify bacterial species associated with ants collected from different hospital environments.
- To determine the bacterial load carried by ants in various hospital wards and units.
- To assess the antibiotic susceptibility patterns of bacterial isolates from hospital ants.
- To evaluate the potential role of ants in transmitting pathogenic bacteria within hospital settings.
- To recommend possible control measures to minimize the role of ants in bacterial transmission in healthcare facilities.



CHAPTER TWO

2.0 Materials and Methods

2.1 Materials

The materials used in this study included sterile cotton swabs, Petri dishes, nutrient agar, MacConkey agar, sterile distilled water, test tubes, beakers, conical flasks, gloves, face masks, 70% ethanol, forceps, and an incubator. Additional essential materials comprised Gram staining reagents, biochemical test kits for bacterial identification, and a compound microscope. Blood was also used for the preparation of blood agar. The ant samples were collected in sterile sample containers and transported under sterile conditions to avoid contamination.

2.2 Insect Collection

Live ants were collected from various hospitals, including Temitope Hospital (Amilegbe, Ilorin), the Medical Centre at Kwara Polytechnic, the Dia

gnostic Centre at Kwara Polytechnic, Orelope Hospital (Eleko), Royal Care Hospital (Gaa-Akanbi), as well as from emergency rooms and corridors of general hospitals. Sterile forceps were used to gently pick ants from different surfaces such as hospital beds, floors, waste bins, and walls. The ants were immediately transferred into sterile containers containing 0.9% physiological saline to maintain bacterial viability. Each sample was properly labelled with the date, location, and environmental conditions at the point of collection.

2.3 Sampling Site

The sampling was carried out in a hospital environment known for high patient traffic and possible microbial exposure. Specific areas included emergency rooms, general wards, hospital corridors, and waste disposal areas. These locations were selected based on the likelihood of microbial contamination due to constant human activity and organic waste presence.