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# Antibiogram of Staphylococcus Species Isolated From Cow Droppings in Ogun State

*Olowe O. A., *Osisami, T. F., *Owolabi S. L.
Department of Microbiology, School of Science and Technology,
Babcock University Illishan-Remo, Ogun state, Nigeria

**Abstract :- This study was carried out to isolate and determine the antibiogram of Staphylococcus species from Cow droppings in Ogun state. A total of sixty droppings were collected from a livestock farm in Ogere, Ogun state, and thirty-five Staphylococcus species were isolated from the samples collected. Antibiotic susceptibility testing using the disc diffusion method was done using antibiotics such as Ciprofloxacin, Imipenem, Tazobactam, and Amoxicillin and results were interpreted as described by the Clinical Laboratory Standards Institute (CLSI, 2021).**

**The Isolated Staphylococcus species were 100% sensitive to Imipenem while the isolates were 89% resistant to Amoxicillin, 20% resistant to Tazobactam, and 3% resistant to Ciprofloxacin. Cow droppings can pose a public health risk and cause contamination to the environment and also to man because organisms isolated can become pathogenic organisms and so therefore improved farm hygiene and also the use of effective antibiotics to help reduce mortality associated with infectious diseases caused by pathogenic Staphylococci species frow the cow droppings should be practiced.**

***Keywords:-*** *Cow Droppings, Staphylococcus Species, Antibiogram.*

## I. INTRODUCTION

Cow droppings are the undigested residue of the consumed food materials of herbivorous animals mixed of feces and urine. It is an important source of biofertilizer because it contains different minerals such as potassium, and majorly consists of cellulose, hemicelluloses, and lignin and it enhances the minerals of soil and develops the resistance power of plants against pests and plant diseases. Cow dung possesses a wide variety of micro-organisms such as S. species, E. coli, Bacillus, lactobacillus as central endospore-forming Bacillus some cocci, fungi, and yeast such as Saccharomyces (Gupta et al., 2018).

Staphylococci species are Gram-positive, nonmotile, nonspore forming, facultative anaerobic cocci that occur in irregular clusters or pairs. Staphylocci has more than twenty species that are present as a commensal on the skin and mucous membranes of humans and animals with humans as the main reservoir. They are clinically relevant opportunistic pathogens in humans and animals that can cause multiple infections (Pasachova et al., 2019; Ruiz et al.,2021). Coagulase-positive staphylococci (CoPS) such as *S.aureus*, *S.intermedius*, and *S.pseudointermedius* among others are usually pathogenic, on the other hand, the coagulase-negative staphylococci (CoNS) has a larger group of species that have been associated with opportunistic infections (Abdel et al., 2020).

Staphylococcus aureus is known to be one of the most common Staphylococci species to cause infections and is also the leading cause of skin and tissue infections. S.aureus can cause serious infections such as blood infections, bone, and joint infections, and pneumonia. S.epidermidis is a part of the skin microbiota and also has an infection rate as Staphylococcus aureus (Lax et al., 2015). The coagulase test is used to differentiate Staphylococcus aureus from other Staph species because it is the only one that produces the coagulase enzyme.

Staphylococcus species are commonly found in various environments, including the feces of animals. It is not uncommon to isolate Staphylococcus species from cow droppings. However, it is important to note that not all Staphylococcus species are harmful to humans or animals, and some are actually beneficial. Some Staphylococcus species are known to cause infections in both humans and animals, including bovine mastitis, which is an infection of the udder in cows (Pinchuk et al., 2010). Staphylococcus aureus is a particularly pathogenic species that can cause a range of infections in both humans and animals, including skin infections, pneumonia, and sepsis.

The increasing reports of staphylococci infections are a global health and economic problem in the animal production sector. Cow droppings pose a public health risk and cause illness, especially to livestock farmers Antimicrobials are administered medically in animals and humans to help prevent infection and they can also be added to poultry feeds and commercial livestock at low concentrations to help growth promotion, disease prevention, and treatment, however, the overuse of these antibiotics by livestock farmers has contributed to the rapid increase of antimicrobial resistance (AMR) (Cox et al., 2010; Van et al.,2020). Substantial portions of veterinary antibiotics administered are excreted in un-metabolized forms or as active metabolites in the soil and antibiotics administered to animals provide selective advantages for antibiotic resistant bacteria that develops in animal intestines which end up as droppings and eventually in the soil (Muurinen et al., 2017).

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Manures from livestock animals could pose as a reservoir of bacteria carrying Antibiotic resistant genes (ARGs) and mobile genetic elements (Yijun et al.,2018) These manures can be used as fertilizers and can transfer antibiotic resistance genes from the soil to crops, and groundwater and have consequences on human health and so there is a need for control measures on the dependence of livestock farmers on antibiotics for improved productivity especially for developing economies like Nigeria (Chollom et al., 2018)

Antimicrobial resistance is a public health challenge and a growing concern. Resistance to antibiotics in poultry and livestock poses an economic threat to the livestock industry and also causes an increase in zoonotic infections. The improper disposal of cow droppings and also the abuse of antibiotics by livestock farmers is a potential health hazard to the environment and so the aim of this study is to isolate, identify and determine the antimicrobial pattern of staphylococci species from different cow droppings from a livestock farm in Ogere, Ogun state.

## II. MATERIALS AND METHODS

➢ *Sample Collection*

A total of 60 cow droppings were randomly and aseptically collected in sterile sample bags from a livestock farm at Ogere, Ogun state, Nigeria and immediately transported to the microbiology laboratory for further analysis. Isolation of organisms was carried out by using selective media Mannitol salt agar (MSA) using the pour plate technique. Inoculated plates were incubated at 37℃ for 24 hours and the pure isolates were characterized based on morphological appearance.

➢ *Characterization and Identification of Bacterial Isolates*

The bacterial isolates were characterized based on the colony and cellular morphology through Gram-staining. Standard Biochemical tests such as Catalase, oxidase, and urease were carried out to determine bacterial isolates.

➢ *Antibiotic Sensitivity Testing*

Antimicrobial susceptibility testing was determined using the Kirby-Bauer disk-diffusion method using Muller-Hinton Agar plates. The isolates were tested against the following commercial antibiotics Ciprofloxacin (5µg), Imipenem (10µg), Tazobactam, and Amoxicillin/Clavulanic acid (30µg). Bacterial cultures were grown overnight on Nutrient agar and incubated at 37℃. The cultures were inoculated on Muller-Hinton agar plates using a sterile swab stick and the antibiotic disc was placed on the plates using sterile forceps and then incubated at 37℃ for 18-24 hours. The zone of inhibition was measured and resistance, intermediate, or susceptibility was determined based on the Clinical Laboratory Standard Guidelines (CLSI,2021).

## III. RESULTS

➢ *Distribution of Isolates*

A total of 60 randomly selected cow droppings were collected for the purpose of this study Out of the 60 samples collected, 53.3% (n=35) Staphylococci species isolates were obtained from the samples. The isolates were identified by Gram-staining and fermentation of mannitol-on-mannitol salt agar.

➢ *Antibiotic Sensitivity Testing*

An Antibiogram of the isolates was done to ascertain the sensitivity and resistance pattern of the isolates. The antibiogram revealed that Staphylococci species showed resistance to Amoxicillin (89%), Tazobactam (20%), and Ciprofloxacin (3%) whereas they were sensitive to 100% sensitive to Imipenem.

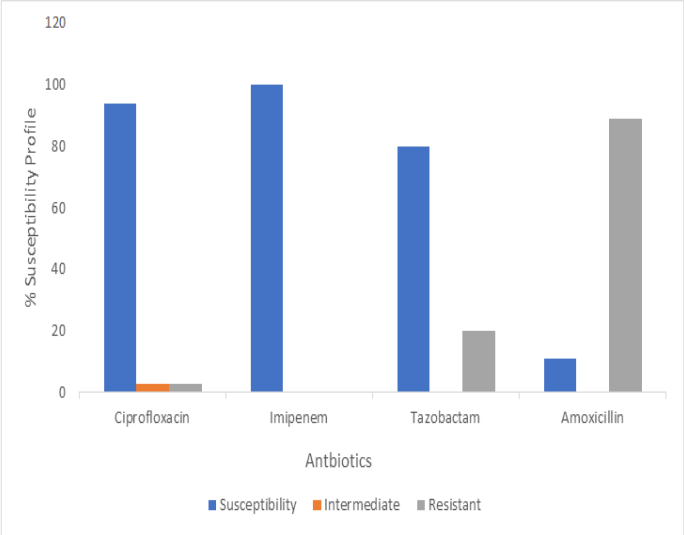


Fig 1: Percentage Distribution of Antibiotic Susceptibility Profile of Staphylococci Species isolated from Cow droppings.

## IV. DISCUSSION

This study was carried out to determine the susceptibility profile of the isolated bacterial pathogens from cow droppings. Staphylococcus species is a commensal and a major opportunistic pathogen that can cause a wide variety of diseases in humans and animals with a high impact on public health and the livestock industry. Out of the 60 samples collected, 35 staphylococci species were isolated. This finding agrees with reports from Obuekwe et al., 2020. Antibiotic resistance has remained a major threat to global health, food and development today. Resistance to antibiotics occurs naturally but the continuous misuse and abuse of antibiotics in humans and animals has accelerated resistance.

In this study, different antibiotics belonging to different classes such as Fluoroquinolones, and Penicillins were used to obtain the antibiogram of the isolates. Staphylococci species were highly resistant to Amoxicillin which is in line with the findings of Bharti and Maneesha, 2015 & Obuekwe et al, 2020. Higher resistance of Staphylococcus species to amoxicillin (100%) from livestock was also observed in a study carried out by Bantawa et al.,2019

One of the major mechanisms of resistance to B-lactam antibiotics is the ability to produce beta-lactamase resulting in resistance to natural penicillins also, it might be a result of the skeletal structure of penicillin which they possess through newly produced penicillin antibiotics. Staphylococci has two mechanisms for resistance to beta-lactam antibiotics, which include the production of beta-lactamases enzyme that hydrolytically destroys beta-lactams, while the other is the expression of penicillin-binding protein 2a which is not susceptible to inhibition by beta-lactam antibiotics.

Resistance gene profiles play an important role in the mediating and transferring of resistance to antibacterial drugs in the bacteria population. They can be localized in discrete transposable elements of DNA called transposons which are mobile and they can be moved from one DNA molecule to another which can lead to the spread of antibiotic resistance in a population which also explains the emergence of multi-resistant strains (Nain et al., 2015; Yijun et al., 2018)

The antibiogram indicated that all the S. species were 100% susceptible to imipenem, while the Staphylococci species were 80% susceptible to Tazobactam. Ciprofloxacin was also highly sensitive to the isolated Staphylococci species which agrees with numerous reports that the use of fluoroquinolones especially ofloxacin and ciprofloxacin to treat infections caused by multidrug-resistant livestock-associated Staphylococcus species is very effective.

The reports obtained from this study showed that Imipenem and Ciprofloxacin were more susceptible to the S. species isolates which prove that these antibiotics should be put into consideration in the treatment of infections caused by multi-drug resistant Staphylococci species.

## V. CONCLUSION

From this study, Staphylococcus species were isolated from cow droppings which could be harmful to the environment as well as the livestock farmers. The antibiogram shows that all the isolates were 100% sensitive to Imipenem and were resistant to amoxicillin. Therefore, the potential of cow droppings as a source of antibiotic resistance should further be studied. Proper disposal of cow droppings and a high level of hygiene practice should be encouraged amongst livestock farmers. Also, the use of antibiotics should be regulated in humans and animals to help curb antimicrobial resistance.

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