

ANTIMICROBIAL SUSCEPTIBILITY OF METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA) IN HORSES IN MAIDUGURI, BORNO STATE, NIGERIA

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ABSTRACT

The aim of this study was to determine the antimicrobial susceptibility pattern of Methicillin-resistant *Staphylococcus aureus* (MRSA) from the available samples at the Department of the Veterinary Medicine University of Maiduguri which were collected from nares of an apparently healthy horse. A total of 92 *S. aureus* isolates were analyzed. 26 isolate ware Resistance on Oxacillin - resistant screening agar base (ORSAB). The high sensitivity of ORSAB *resistant isolates* ware observed in Pefloxacin 26 (100%), Gentamycin 26 (100%), Ciprofloxacin 26 (100%), Seprin 26 (100%), and Streptomycin 26 (100%). Intermediate susceptible in Erythromycin 18 (69) and 16 (62) Rocephin ware. High resistance was recorded against penicillin Ampiclox (Ampicillin / Cloxacillin) 26 (100%), Amoxicillin 26 (100%), Zinnacef (92%).

Keywords: Methicillin, *Staphylococcus Aureus*, Susceptibility, Resistant, Horses, Maiduguri.

I. INTRODUCTION

Staphylococcus aureus is gram-positive bacteria and is considered the most important cause of community-acquired infections and hospital-acquired infections (Lowy, 1998). *Staphylococcus aureus* is known to acquire resistance to newly produced drugs and continues to escape control measures (Ikaegwu, I. J. *et al.*, 2008). Most strains of *S. aureus* that have a wide variety of Antimicrobial resistant genes on their plasmids are known as methicillin-resistant *Staphylococcus aureus* (MRSA) (Ikaegwu, I. J. *et al.*, 2008). Methicillin-resistant *S. aureus* are isolates of *S. aureus* which have gained genes encoding antibiotic resistance to all penicillin class of antibiotics. The widely use of antimicrobial drugs to treat staphylococcal infections has resulted in the emergence of resistant forms of *S. aureus* (Kim, H. *et al.*, 2004). In Denmark, there is a lack of knowledge on *S. aureus* carriage in equine animal species as of 2016 (Islam, M. *et al.* 2017). Danish equine veterinarians have carried out a study and investigated the presence of MRSA CC398 strain in horses and weather constitute a reservoir of these organisms, they have also studied the frequency and genetic diversity of *S. aureus* in horses, including both Methicillin-resistant *S. aureus* (MRSA) and Methicillin-susceptible *S. aureus* (MSSA) after the reports of MRSA CC398 strains in horses in part of European countries (Islam, M *et al.*, 2017). Danish equine veterinarians confirmed that an equine-specific clone of MRSA CC398 strains are present in Horses, and these organisms can be transmitted to veterinarians handling equine clinical cases (Islam *et al.*, 2017). The circulation of MRSA in horses and veterinarians working in close contact with Horses is considered to be public health issue (Parisi *et al.*, 2017). Therefore, the MRSA in Horses represents a potential risk for horse meat consumers and for people who work in contact with horses (Parisi *et al.* 2017). Methicillin-resistant *Staphylococcus aureus* (MRSA) are notorious, as the prognosis and therapeutic outcome of the infections are much worse than those caused by methicillin-sensitive strains (Bhatt *et al.* 2015). A severe form of infection caused by MRSA has been increasingly identified in all fields of clinical veterinary medicine (Soimala *et al.*, 2018). According to the study conducted MRSA were highly susceptible to quinupristin/dalfopristin, tigecycline, linezolid, nitrofurantoin, ampicillin/sulbactam, and vancomycin, but

showed high resistance to commonly used antibiotics such as gentamycin, erythromycin, levofloxacin, SMX-TMP, and tetracycline (Gitau et al. 2018). The prevalence relationships and antimicrobial resistance features of Methicillin-resistant *Staphylococcus aureus* isolated from ocular surfaces of horses before performing surgical procedures were investigated and confirmed that cases of ocular infections caused by MRSA were often associated with deadly outcomes in Horses (Soimala et al., 2018). The MRSA are present in the nostrils of apparently healthy Horses in Maiduguri, Borno state, and there is a need for further investigation in the study area for investigating the antimicrobial susceptibility as well as the molecular characterization (Abdullahi et al., 2021).

Local data on the antibiotic susceptibility patterns of Methicillin-resistant *Staphylococcus aureus* isolates is important for knowing the trends of antimicrobial resistance, treatment regimen, and for establishing preventive and control measures of the infections. This study was conducted to determine the antimicrobial susceptibility pattern of MRSA isolates from the nasal sample of an apparently healthy horse at the Department of the Veterinary Medicine University of Maiduguri in order to provide insight for effective antibiotic usage in Horses.

II. METHODOLOGY

A total of 92 non-repetitive isolates of *Staphylococcus aureus* available at the Department of Veterinary Medicine Laboratory of the University of Maiduguri were used in this study. The samples were collected from nares of an apparently healthy horse. These isolates were identified by conventional phenotypic methods such as colony morphology, Gram's stain, catalase test, and coagulase test, growth on Mannitol salt agar.

IDENTIFICATION OF MRSA

Oxacillin - resistant Screening Agar Base (ORSAB) was used for the detection of methicillin-resistant *S. aureus* from clinical samples. MRSA routine detection methods are typically based on those described for humans, often involving selective enrichment broth and oxacillin-supplemented agar (Brown et al., 2005), MRSA colonies appeared as intense blue colonies on the agar surface.

ANTIBIOTIC SENSITIVITY TEST

All Methicillin resistant *Staphylococcus aureus* isolates were tested for antimicrobial susceptibility by the disc diffusion method Oxoid (Basingstoke, UK) antibiotic disc according to the clinical and laboratory standard institute guidelines (CLSI, 2010). The zones of inhibition were strictly measured and the results were basically interpreted as either Susceptible, Intermediate, or Resistant according to CLSI, 2010. The antibiotics used in this study were listed in table 1.

Table 1: Antibiotic concentrations

Antibiotics	Symbol	Concentration (µg)
Pefloxacin	(PEF)	10
Gentamycin	(CN)	10
Ampiclox	(APX)	30
Zinnacef	(Z)	20
Amoxacillin	(AM)	30
Rocephin	(R)	25
Ciprofloxacin	(CPX)	10
Septtrin	(SXT)	30
Streptomycin	(S)	30
Erythromycin	(E)	10

III. RESULT AND DISCUSSION

Out of 92 isolates under investigation, 26 (28%) were MRSA positive on the ORSAB medium. Out of 26, MRSA isolate 26 (100%) are susceptible to Pefloxacin, Gentamycin, Ciprofloxacin, Septtrin, and Streptomycin. Erythromycin and Rocephin ware Intermediate. Resistance to Ampiclox (Ampicillin / Cloxacillin), Amoxicillin, Zinnacef antibiotics on susceptibility testing (Table 2).

This study was designed to determine the antimicrobial susceptibility pattern of Methicillin-resistant *Staphylococcus aureus* from the available sample at the Department of the Veterinary Medicine University of Maiduguri which were collected from nares of an apparently healthy horse. This study showed 28% isolates were resistant to Oxacillin which closely agreed with the findings conducted in the same study area by Mai-siyama, I. B. et al. 2014 and Abdullahi, B. et al. 2021 who reported 37.9% and 36.0% respectively, however, the former study was conducted in different species of animals. Antimicrobial susceptibility pattern in this study showed 100% were susceptible to Ciprofloxacin and Streptomycin this finding disagreed with 42.2% Ciprofloxacin, 42.2% Streptomycin susceptible reported by Mai-siyama, I. B. et al. 2014, the differences could be due to specie variation. The findings of this study revealed 28% occurrence of MRSA apparently healthy Horses sampled at Maiduguri of which all the MRSA isolates were highly susceptible to Ciprofloxacin (100%) and Gentamycin (100%) this finding agrees with 21% MRSA occurrence and highly susceptible to Ciprofloxacin (100%) and Gentamycin (87.5%) reported by Balami S. B. et al., 2016.

Table 2. Antibiotic sensitivity test of the MRSA isolates.

S/N	ANTIBIOTIS	SUSCEPTIBLE (%)	INTERMEDIATE (%)	RESISTANCE (%)
1	Pefloxacin	26 (100)	0 (0.00)	0 (0.00)
2	Gentamycin	26 (100)	0 (0.00)	0 (0.00)
3	Ampiclox	0 (0.00)	0 (0.00)	26 (100)
4	Zinnacef	2 (8.00)	0 (0.00)	24 (92.0)
5	Amoxicillin	0 (0.00)	0 (0.00)	26 (100)
6	Rocephin	0 (0.00)	16 (62.0)	10 (38.0)
7	Ciprofloxacin	26 (100)	0 (0.00)	0 (0.00)
8	Seprtrin	26 (100)	0 (0.00)	0 (0.00)
9	Streptomycin	26 (100)	0 (0.00)	0 (0.00)
10	Erythromycin	8 (31.0)	18 (69.0)	0 (0.00)

IV. CONCLUSIONS

It is concluded that MRSA are present in the nostrils of apparently healthy Horses in Maiduguri, Borno State with a prevalence of 28.3%. Based on the susceptibility test result from this study, we recommend the use of ciprofloxacin, Gentamycin, Septrin, Streptomycin, or Pefloxacin as an alternative therapy for MRSA infections in Horses in the study area. This study also recommends further surveillance of AMR pathogens as well as molecular study not only in Horses but also in other domesticated animals for better control of these organisms.

V. REFERENCES

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