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Isolation, Identification and Antibiogram Pattern of Bacteria Associated with Postpartum Metritis in Dairy Cattle

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Microbial agents were isolated from forty-three clinical cases of postpartum metritis in dairy cattle from Bikaner, Rajasthan, India and their antibiogram pattern was recorded. *Staphylococcus* species were the most prevalent and *Klebsiella* species were the least prevalent. Maximum percent of uterine isolates were sensitive to Ceftiofur sodium, Ceftriaxone, Cephapirin, Cefoperazone and were resistant to Ampicillin and Amoxycillin. This analysis may help in

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understanding and tracking the types of microorganisms involved and the development of antimicrobial sensitivity and resistance patterns for different categories and generations of antibiotics frequently used in given geographical area related to clinical cases of metritis in dairy cattle.

Keywords: Antibiogram pattern; antibiotics; dairy cattle; metritis; postpartum.

1. INTRODUCTION

Metritis is described as a uterine lining-wide inflammation. Septic puerperal metritis most frequently happens in the first 10 to 14 days following parturition in dairy cattle [1]. It costs farmers a lot of money, especially when it happens to multiparous dairy cattle, because it lowers reproductive performance due to delayed uterine involution, more open days and fewer services per conception [2-4]. Postpartum contamination of the uterus with bacteria is considered as a major cause of infection [5,6]. There are numerous factors that increase the risk of metritis in cows. These variables include the immune reactions, managemental, infection, dietary and metabolic variables. To effectively treat uterine infections and prevent the emergence of drug-resistant strains, the drug sensitivity of uterine isolates is a crucial factor [7]. Therefore, a study was conducted to isolate and identify the typical microorganisms linked to metritis in dairy cattle and analyse their antibiogram patterns.

2. MATERIALS AND METHODS

The present study was conducted on fourty three uterine samples from clinical cases of postpartum metritis in pluriparous (2-5 parity) dairy cattle from Bikaner district of Rajasthan, India, reported at clinics of Veterinary Gynaecology and Obstetrics, College of Veterinary and Animal Science, Bikaner, with the history of dystocia and incomplete expulsion of the placenta along with anorexia, agalactia and mucopurulent genital discharge since 10 to 14 days. Clinical examination revealed that the animals were dull and/or dehydrated with pyrexia. Cases of metritis were identified based on the history and gynaecological examination (mucopurulent discharge expelled through the vagina and/or observed using a vaginal speculum). Out of forty-three cases, nineteen were previously treated in the field and twenty-four were directly reported. Uterine samples were collected in sterile HiMedia hiculture collecting device and immediately transferred to the laboratory on ice for further processing. Using standard techniques, primary and sub cultures of bacterial isolates were performed. Based on morphology, colony characteristics and staining reactions, the most prevalently occurring isolates from each sample were identified according to conventional protocols [8]. Antibiotic discs (HiMedia) were used to test antibiotic sensitivity and resistance patterns for different categories and generations of antibiotics by Kirby-Bauer Disc Diffusion Method (Table 2).

3. RESULTS

The isolates from 43 metritis samples were identified as *Bacteroides spp.* (55.81%), *Escherichia coli* (74.42%), *Fusobacterium necrophorum* (60.47%), *Klebsiella aerogenes* (9.30%), *Peptostreptococcus spp.* (16.28%), *Porphyromonas levii* (32.56%), *Prevotella melaninogenica* (41.86%), *Pseudomonas aeruginosa* (65.12%), *Staphylococcus aureus* (97.67%), *Streptococcus pyogenes* (79.07%), *Trueperella pyogenes* (67.44%), unidentified gram-positive isolates (53.49%), unidentified gram-negative isolates (30.23%) and *Ureaplasma diversum* (39.53%), based on cultural and biochemical properties (Table 1).

These isolates were subjected to antibiogram studies using 11 different antibiotics belonging to different categories and generations. The bacterial isolates showed 100% sensitivity towards Ceftriaxone, Ceftiofur sodium, Cefoperazone and Cephapirin, while Gentamicin, Oxytetracycline, Enrofloxacin, Ciprofloxacin and Levofloxacin were sensitive for 88.37%, 90.70%, 86.05%, 76.74% and 81.40% of isolates, respectively. High resistance was observed towards Ampicillin (81.40%) and Amoxycillin (69.77%) and less resistance was observed towards Gentamicin (11.63%) and Oxytetracycline (9.30%) (Table 2).

Table 1. Bacterial isolates from the uterine samples of clinical cases of postpartum metritis in dairy cattle

S.No.	Causative agent	No. of isolates from 43 samples	% of isolates from 43 samples
1.	*Bacteroides spp.*	24	55.81
2.	*Escherichia coli*	32	74.42
3.	*Fusobacterium necrophorum*	26	60.47
4.	*Klebsiella aerogenes*	4	9.30
5.	*Peptostreptococcus spp.*	7	16.28
6.	*Porphyromonas levii*	14	32.56
7.	*Prevotella melaninogenica*	18	41.86
8.	*Pseudomonas aeruginosa*	28	65.12
9.	*Staphylococcus aureus*	42	97.67
10.	*Streptococcus pyogenes*	34	79.07
11.	*Trueperella pyogenes*	29	67.44
12.	Unidentified gram-positive isolates	23	53.49
13.	Unidentified gram-negative isolates	13	30.23
14.	*Ureaplasma diversum*	17	39.53

Table 2. Drug sensitivity and resistance pattern of bacterial isolates from uterine samples of clinical cases of postpartum metritis in dairy cattle

S.No.	Antibiotics tested	Code	Disc content (mcg)	Number	Sensitive (%)	Number	Resistant (%)
1.	*Ampicillin*	AMP	10	8	18.60	35	81.40
2.	*Amoxycillin*	AMC	10	13	30.23	30	69.77
3.	*Ceftiofur sodium*	CTF	30	43	100.00	0	0.00
4.	*Ceftriaxone*	CTR	30	43	100.00	0	0.00
5.	*Cephapirin*	CEP	30	43	100.00	0	0.00
6.	*Cefoperazone*	CFS	30	43	100.00	0	0.00
7.	*Ciprofloxacin*	CIP	30	33	76.74	10	23.26
8.	*Enrofloxacin*	EX	10	37	86.05	6	13.95
9.	*Gentamicin*	GEN	10	38	88.37	5	11.63
10.	*Levofloxacin*	LE	5	35	81.40	8	18.60
11.	*Oxytetracycline*	O	30	39	90.70	4	9.30

4. DISCUSSION

Following parturition in dairy cows, the uterus invariably becomes contaminated with bacteria. In at least 90% of dairy cows, the presence of aerobic and anaerobic bacteria in the uterine lumen during the first two weeks after delivery can be identified [9]. Although bacterial contamination does not always result in uterine disease, up to 40% of dairy cows may have uterine infections because the uterine lumen is ideal for the development of both aerobic and anaerobic bacteria during the postpartum period [10]. During the first two to three weeks after giving birth, *Trueperella pyogenes*, *Escherichia coli*, *Pseudomonas* spp., *Streptococcus* spp., *Staphylococcus* spp., *Pasteurella multocida*, *Clostridium* spp., *Fusobacterium* spp. and *Bacteroides* spp. were often found in the uterine lumen [11,12]. However, uterine diseases are usually derived from *Escherichia coli*, *Trueperella pyogenes*, *Fusobacterium necrophorum*, *Bacteroides* spp. and *Prevotella* spp. [13]. The commonly reported bacterium types isolated from cows with metritis are *Trueperella pyogenes* and *Escherichia coli* [14]. *Escherichia coli* is the most often isolated bacterium in cows with uterine infections [15]. Because the choice of antibiotics is crucial for the treatment of metritis [16], recent studies have highlighted the significance of bacterial isolation and an antibiogram pattern in the fight against uterine infections [17,15,16]. Antimicrobial resistance in various bacterial species is avoided by antibiotic choice based on pathogen isolation and antibiogram pattern [16]. *Staphylococcus aureus*

has been discovered to be resistant to Ampicillin, Oxacillin and Vancomycin [18].

5. CONCLUSION

The majority of dairy cows experience uterine infections in the first few days after giving birth. Metritis is the most significant uterine infection because it causes infertility and financial loss in dairy cows. However, due to bacterial antibiotic resistance, the most potent antimicrobial drugs differ from one another. In our investigation, uterine samples from cows suffering from postpartum metritis were used to isolate the bacteria. It was found that the effects of antimicrobial medicines varied between cows. Therefore, it was believed that by isolating the agents and choosing the proper antimicrobial drugs, uterine infections might be prevented more successfully.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Drillich M, Wagener K. Pathogenesis of uterine diseases in dairy cattle and implications for fertility. Animal Reproduction. 2018;15:879–885.
2. Noakes DE, Parkinson TJ, England GCW. Vetetrinary Reproduction and Obstetrics, 9th ed. Elsevier, England. 2009;146-153.
3. Toni F, Vincenti L, Ricci A, Schukken YH. Postpartum uterine diseases and their impacts on conception and days open in dairy herds in Italy. Theriogenology. 2015; 84(7):1206-1214.
4. Molina-Coto R, Lucy MC. Uterine inflammation affects the reproductive performance of dairy cows: A review. Agronomia Mesoamericana. 2018; 29(2):449-468.
5. Wagener K, Prunner I, Pothmann H, Drillich M, Ehling-Schulz M. Diversity and health status specific fluctuations of intrauterine microbial communities in postpartum dairy cows. Veterinary Microbiology. 2015;175(2-4):286-293.
6. Ahmed MN, Ynzeel JH, Majeed AF. Bacterial study of vagina in Awassi ewes treated with prostaglandin (PGF2 α) and oxytocin. Al-Anbar Journal of Veterinary Sciences. 2017;10(1):96-99.
7. Gupta AG, Deopurkar RL. Microbial study of gynaecological infection in cattle. Indian Journal of Animal Reproduction. 1993;14 (2):118-119.
8. Cowan ST. Cowan and Steel's manual for the identification of medical bacteria, 2nd ed., Cambridge University Press, Cambridge; 1974.
9. Foldi J, Kulcsar M, Pecsi A, Huyghe B, De-Sa C, Lohuis JACM, Cox P, Huszenicza G. Bacterial complications of postpartum uterine involution in cattle. Animal Reproduction Science. 2006;96(3-4):265-281.
10. Sheldon IM, Williams EJ, Miller AN, Nash DM, Herath S. Uterine diseases in cattle after parturition. Veterinary Journal. 2008;176(1):115-121.
11. LeBlanc SJ. Postpartum uterine disease and dairy herd reproductive performance: A review. Veterinary Journal. 2008; 176(1):102-114.
12. Williams EJ. Drivers of post-partum uterine disease in dairy cattle. Reproduction in Domestic Animals. 2013;48:53-58.
13. Sheldon IM, Owens SE. Postpartum uterine infection and endometritis in dairy cattle. Animal Reproduction. 2017;14 (3):622-629.
14. Takamtha A, Phanaratkitti V, Adirekkiet O, Panyapornwitaya V, Boonyayatra S, Kraeusukol K. Prevalence of isolated bacteria from clinical endometritis uterine and antimicrobial susceptibility in postpartum dairy cows. Chiang Mai Veterinary Journal. 2013;11(3):237-245.
15. Sharma A, Singh M, Kumar P, Sharma A, Kashyap A, Neelam IB, Bala I, Sharma A, Chaudhary N, Sharma P. Bacterial isolation, culture sensitivity test, endometrial cytology of postpartum cows and assessment of their reproductive performance. International Journal of

Current Microbiology and Applied Sciences. 2017;6(9):519-527.

16. Tamai IA, Mohammadzadeh A, Salehi TZ, Mahmoodi P. Genomic characterisation, detection of genes encoding virulence factors and evaluation of antibiotic resistance of *Trueperella pyogenes* isolated from cattle with clinical metritis. Antonie van Leeuwenhoek. 2018;111: 2441-2453.
17. Barman P, Yadav MC, Bangthai A, Kumar H. Antibiogram of bacteria isolated from bovine endometritis. Veterinary Research International. 2013; 1(1):20-24.
18. Moges N, Regassa F, Yilma T, Unakal CG. Isolation and antimicrobial susceptibility of bacteria from dairy cows with clinical endometritis. Journal of Reproduction and Infertility. 2013;4(1):4-8.

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