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Success Story: Control of Bovine Mastitis through Microbiological Diagnosis and AST

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Abstract:

Bovine mastitis is a major constraint in dairy farming, causing reduced milk production, increased treatment costs, and economic losses. This success story describes the effective control of recurrent clinical and subclinical mastitis in a dairy herd of 25 lactating cows at Koradi, Nagpur, through microbiological diagnosis and antimicrobial susceptibility testing (AST). Milk samples from affected cows were subjected to bacterial isolation, identification, and AST, which revealed mastitis-associated bacteria including *Staphylococcus aureus*, *Streptococcus agalactiae*, and *Escherichia coli*, with resistance to several commonly used antibiotics.

Based on laboratory findings, targeted antimicrobial therapy was recommended, along with improved milking hygiene, post-milking teat dipping, regular screening for subclinical mastitis, and judicious antibiotic use. Within 3–4 months, mastitis cases declined from 8–10 to 1–2 cases per month, while average milk yield increased from 9 to 13 litres/cow/day. Treatment costs were reduced by approximately 40%, with a shift from frequent empiric antibiotic use to rational, targeted therapy. This case highlights the importance of microbiological diagnosis and AST-guided treatment in controlling bovine mastitis, improving dairy productivity and profitability, and promoting responsible antimicrobial use to minimise the risk of antimicrobial resistance.

Background

Mastitis is one of the most important diseases affecting dairy cattle, leading to reduced milk production, poor milk quality, increased treatment costs, and economic losses. Many farmers treat mastitis empirically without identifying the causative organism, often resulting in treatment failure and antimicrobial resistance.

Farmer Profile

- Farmer: Mr. Vicky Prakash Dhole
- Location: Rural dairy farm in Maharashtra (Koradi, Nagpur)
- Herd Size: 25 lactating cows
- Major Issue: Recurrent clinical and subclinical mastitis with reduced milk yield

Problem Identified

The farmer observed:

- Swollen udders and abnormal milk secretion in several cows.
- Frequent recurrence of mastitis despite antibiotic treatment.
- Milk yield reduction from 12–14 L/day to 8–10 L/day in affected animals.
- Increased expenditure on veterinary medicines.



Veterinary Microbiology Intervention

Milk samples from affected cows were collected aseptically and analysed in the veterinary microbiology laboratory.

California Mastitis Test (CMT)

The **California Mastitis Test (CMT)** is a simple, rapid, cow-side screening test used to detect **subclinical mastitis** by indirectly estimating the somatic cell content of milk.

Why it is done: Subclinical mastitis may not produce visible changes in the udder or milk. CMT helps identify affected udder quarters so that appropriate milk samples can be selected for microbiological examination.

How it is done: A small quantity of milk from each udder quarter is placed separately in the wells of a CMT paddle. An equal quantity of CMT reagent is added and mixed gently. The reagent reacts with DNA released from somatic cells, producing varying degrees of **gel formation or thickening**. Greater gel formation indicates a higher somatic cell count and a stronger likelihood of mastitis.



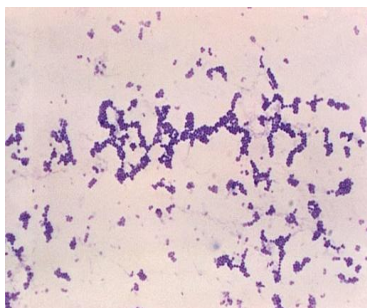
CMT Test

Laboratory Findings

- Isolation of mastitis-causing bacteria such as:
 - Staphylococcus aureus*
 - Streptococcus agalactiae*
 - Escherichia coli*
- Confirmation through cultural and biochemical tests.



Mannitol-fermenting and non-fermenting colonies of *Staphylococcus* spp. on Mannitol Salt Agar



Gram-positive cocci - *Staphylococcus aureus*

Antimicrobial Susceptibility Testing (AST)

The isolates were subjected to AST using the Kirby–Bauer disc diffusion method.

Antimicrobial Susceptibility Testing (AST)

is a laboratory procedure used to determine whether a bacterial isolate is susceptible or resistant to different antimicrobial agents.

Why it is done: In mastitis, empirical or repeated antibiotic treatment may result in treatment failure and contribute to antimicrobial resistance. AST helps veterinarians select an antimicrobial that is likely to be effective against the specific bacterial isolate, thereby promoting **targeted and judicious antimicrobial therapy**.

How it is done: In your study, AST was performed using the **Kirby–Bauer disc diffusion method**. A standardized bacterial suspension is inoculated uniformly onto an agar plate, and antimicrobial discs are placed on the surface. After incubation, the **zones of inhibition** around the discs are measured and interpreted according to appropriate standard guidelines to categorize the isolate as susceptible, intermediate/increased exposure where applicable, or resistant.

In this case, AST demonstrated resistance to several commonly used antimicrobials, and the results were used to guide targeted treatment

Results showed:

Resistance to some commonly used antibiotics. : The sample was resistant to Penicillin G, Streptomycin, Ceftriaxone /Tazobactam, Enrofloxacin, Metronidazole, Chloramphenicol, Amoxicillin, Methicillin, Amikacin, Co-Trimoxazole, Tetracycline

High susceptibility to selected antibiotics i.e., Cephalexin, , Gentamicin & Amikacin, recommended by the laboratory.



In vitro antibiogram of *S.aureus*



Multiple drug resistance of *S.aureus*

Based on AST results:

1. Targeted antibiotic therapy (Cephalexin, , Gentamicin & Amikacin) was initiated.
2. Milking hygiene practices were improved.: Good milking hygiene is essential to prevent the spread of mastitis-causing organisms between

cows and reduce new intramammary infections. The following practices were advised:

- a. Washing hands thoroughly before and during milking and preferably using clean disposable gloves.
- b. Cleaning the udder and teats before milking and drying each cow with a separate clean towel.
- c. Examining the first few streams of milk for abnormalities before milking.

d. Milking healthy cows first and mastitis-affected cows last to minimize transmission.

e. Avoiding contamination of teat ends and maintaining clean, dry bedding and the milking environment.

f. Proper cleaning and disinfection of milking utensils/equipment after every milking.

g. Separating milk from mastitic or treated cows and observing the prescribed milk-withdrawal period after antimicrobial treatment

3. Post-milking teat dipping (iodine-based solution) was adopted. Following each milking, teats were dipped in an approved iodine-based post-milking teat disinfectant to reduce bacterial contamination and prevent new intramammary infections.

4. Regular screening for subclinical mastitis by CMT test was implemented.
5. Judicious use of antibiotics, which showed sensitivity by IM, was encouraged.

Outcomes

After 3–4 months:

Parameter	Before Intervention	After Intervention
Mastitis cases/month	8–10	1–2
Average milk yield/cow/day	9 L	13 L
Treatment cost	High	Reduced by ~40%
Antibiotic use	Frequent	Rational and targeted

Farmer's Statement

"Earlier, we treated mastitis based on trial and error. After the Guidance and Supervision of Dr.Shubhangi Warke, Professor & Head, Department of Veterinary Microbiology, Nagpur Veterinary College, Nagpur, laboratory testing and AST-guided treatment, mastitis cases reduced significantly, milk production increased, and medicine expenses decreased."

Mr. Vicky Prakash Dhoke

Impact

- Enhanced milk production and quality.
- Reduced economic losses.
- Rational use of antimicrobials.
- Lower risk of antimicrobial resistance development.
- Improved farmer awareness regarding laboratory-based disease diagnosis.

Conclusion

This case demonstrates that integration of veterinary microbiology diagnostics and AST can effectively control mastitis, improve dairy profitability, and promote responsible antimicrobial use. Such interventions can serve as a model for sustainable dairy farming.

References:

Please contact the corresponding author.