

## Antibiotic Sensitivity in Dairy Cattle, Evidence from a North Indian Dairy Farm

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Antibiotics remain central to disease management in dairy cattle across North India. From mastitis therapy to post-partum and systemic infections, antimicrobial drugs are routinely used to safeguard herd health and maintain productivity. However, emerging shifts in antibiotic sensitivity patterns are raising concerns about the long-term effectiveness of commonly used drugs in dairy practice. A recent laboratory investigation conducted on milk samples from a North Indian dairy farm provides important insight into this issue and highlights the urgency of responsible antimicrobial use in regional dairy systems.

### Bacterial Isolation and Identification

Raw milk samples collected under sterile conditions were cultured on nutrient agar and incubated at 37°C for 24 hours. Visible bacterial colonies developed in the raw milk sample, whereas the boiled control sample showed no growth, confirming effective microbial reduction through heat treatment. Microscopic examination through Gram staining revealed Gram-positive, rod-shaped bacilli. These organisms are commonly associated with environmental contamination and are frequently implicated in dairy-associated infections, including mastitis.

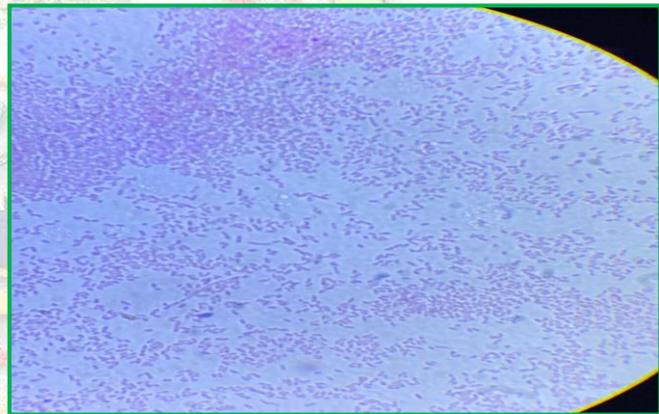


Fig1: showing gram positive bacilli isolated

### Antibiotic Sensitivity Testing: Study Findings

The isolated bacteria were subjected to antibiotic sensitivity testing using the disc diffusion method. The results demonstrated measurable variability in drug response. Azithromycin produced a clear zone of inhibition measuring 20 mm, indicating strong sensitivity. Cephalosporin showed a smaller zone of inhibition measuring 10 mm, suggesting reduced or moderate sensitivity. In contrast, penicillin, norfloxacin, and nitrofurantoin produced no measurable zones of inhibition, indicating resistance. These findings are particularly significant because penicillin and related beta-lactam antibiotics are among the most frequently used antimicrobial agents in dairy cattle across North India. Resistance to such routinely administered drugs suggests the development of adaptive bacterial mechanisms that reduce treatment effectiveness.

**Table: Antibiotic Sensitivity Pattern of Bacterial Isolate**

| Antibiotic            | Zone of Inhibition (mm) | Observation |
|-----------------------|-------------------------|-------------|
| <b>Azithromycin</b>   | 20mm                    | sensitive   |
| <b>Cephalosporin</b>  | 10mm                    | sensitive   |
| <b>Penicillin</b>     | Nil                     | Resistant   |
| <b>Norfloxacin</b>    | Nil                     | Resistant   |
| <b>Nitrofurantoin</b> | Nil                     | Resistant   |

### Interpretation of the Findings

A 20 mm zone of inhibition for azithromycin reflects good antimicrobial activity against the isolated organism. However, the 10 mm zone observed for cephalosporin indicates diminished susceptibility compared to optimal therapeutic standards. The absence of inhibition zones for penicillin, norfloxacin, and nitrofurantoin suggests complete resistance under the study conditions. This pattern indicates selective pressure likely resulting from repeated or empirical antibiotic use. When bacteria are repeatedly exposed to certain antimicrobial classes, susceptible strains are eliminated while resistant variants survive and proliferate.

### Implications for North Indian Dairy Farming

North India's dairy sector is characterized by dense cattle populations, smallholder systems, and frequent therapeutic interventions. Mastitis remains a predominant production disease, often treated empirically without prior culture and sensitivity testing. Over time, such practices may contribute to rising resistance patterns similar to those observed in this study. Reduced antibiotic sensitivity can lead to prolonged infections, increased recurrence rates, higher veterinary expenditure, and decreased milk yield. Additionally, ineffective therapy increases the risk of repeated drug administration, potentially contributing to antibiotic residues in milk.

### The Broader Significance

The findings from this study reflect a larger agricultural and public health concern. Antimicrobial resistance is a shared challenge between veterinary and human medicine. When commonly used antibiotics lose effectiveness in dairy cattle, treatment options become limited, and the economic sustainability of farms may be compromised. Routine monitoring of antibiotic sensitivity patterns within regional dairy herds can help guide rational drug selection and preserve antimicrobial efficacy.

### Conclusion

The study demonstrates that Gram-positive bacilli isolated from raw milk in a North Indian dairy setting exhibited strong sensitivity to azithromycin, reduced sensitivity to cephalosporin, and resistance to penicillin, norfloxacin, and nitrofurantoin. These findings highlight the evolving nature of antimicrobial responsiveness in dairy-associated bacteria. For North Indian dairy farming systems, preserving antibiotic effectiveness requires informed therapeutic decisions, improved diagnostic support, and responsible antimicrobial stewardship. Sustaining milk productivity in the region will depend not only on herd management but also on safeguarding the efficacy of essential veterinary medicines.

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