
SCREENING OF CATTLE MILK FOR THE PRESENCE OF ANTIBIOTIC RESIDUES IN SELECTED DISTRICTS OF KARNATAKA

Vinu David P.

Assistant Professor,

Dept. of Clinical Veterinary Medicine, Veterinary College, Pookode- 673576.

Corresponding author: vinu@kvasu.ac.in

ABSTRACT

A total of 120 milch cows reared in organized and unorganized sectors were screened for the presence of antibiotic residues in milk at Bangalore Rural, Kolar and Chickballapur districts by non-probability sampling. Epidemiological data with respect to average daily milk production, stage of lactation, milking hygiene, history of drug administration, class of antibiotic administered and route of administration were collected from the animals under study. A total of 102 animals with antibiotic residues in milk had a history of antibiotic administration. Beta-lactam antibiotic was found to be the most common class antibiotic administered and a combination of both parenteral and intramammary route was the most common route responsible for the excretion of antibiotic in milk. Milk samples collected were screened for the presence of antibiotic residues by three methods namely Microbial Drug Residue Test (MDRT), Microbiological method and

ELISA.

Keywords: Cattle Milk, Epidemiological data, Beta-lactam, Parenteral and intramammary route.

INTRODUCTION

India is the leading producer of milk in the world and has produced 155.5 million tones of milk for the year 2015-2016. The presence of antibiotic residues in milk is a potential health hazard as these residues are considered undesirable for public health. Antibiotic contamination in milk supplies raises concern on two counts. Main concern in this area is centered on penicillin allergy in already sensitized individuals. A second potential risk to human health is through the emergence of bacterial resistance (Allison, 1985). The antibiotics commonly used in veterinary medicine belong to one of the six major groups viz., Aminoglycosides, Penicillins and Cephalosporins (β -Lactams), Macrolides, Quinolones and Tetracyclines.

The amount of antibiotic excreted into milk usually averages about 50 per cent of the total dose administered. It is therefore difficult to know the exact amount of antibiotic residue in milk at different milking subsequent to treatment. The concentration of antibiotic in milk decreases rapidly during successive milkings usually at an exponential rate (Mullan, 2003).

MATERIALS AND METHODS

A total of 120 milch cows reared in organized and unorganized sectors were screened for antibiotic residues in milk at Bangalore Rural, Kolar and Chickballapur districts by non-probability sampling. Epidemiological data with respect to average daily milk production, stage of lactation, milking hygiene, history of

drug administration, class of antibiotic administered and route of administration were collected from the animals under study. Route of antibiotic administration include parenteral, intramammary, intrauterine and combination of parenteral and intramammary routes. Milk samples collected were screened for the presence of antibiotic residues by three methods namely Microbial Drug Residue Test (MDRT), Microbiological method and ELISA. MDRT method developed by National Dairy Research Institute was used effectively for targeting the detection of antibiotic residues in milk and milk products within 2.30-3.00 hours at or above Maximum Residue Limit levels as recommended by the codex/ European Union (Neugen diagnostics). For Microbiological method Antibiotic Assay

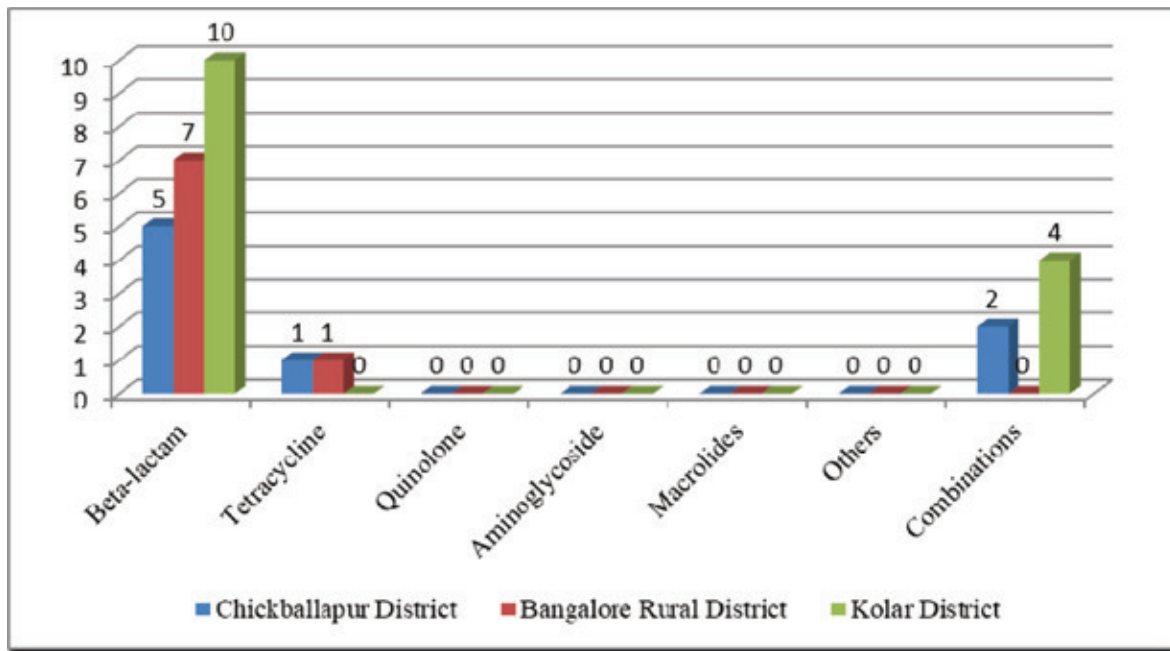


Fig. 1. Class of antibiotic administered to animals positive for antibiotic residues in milk

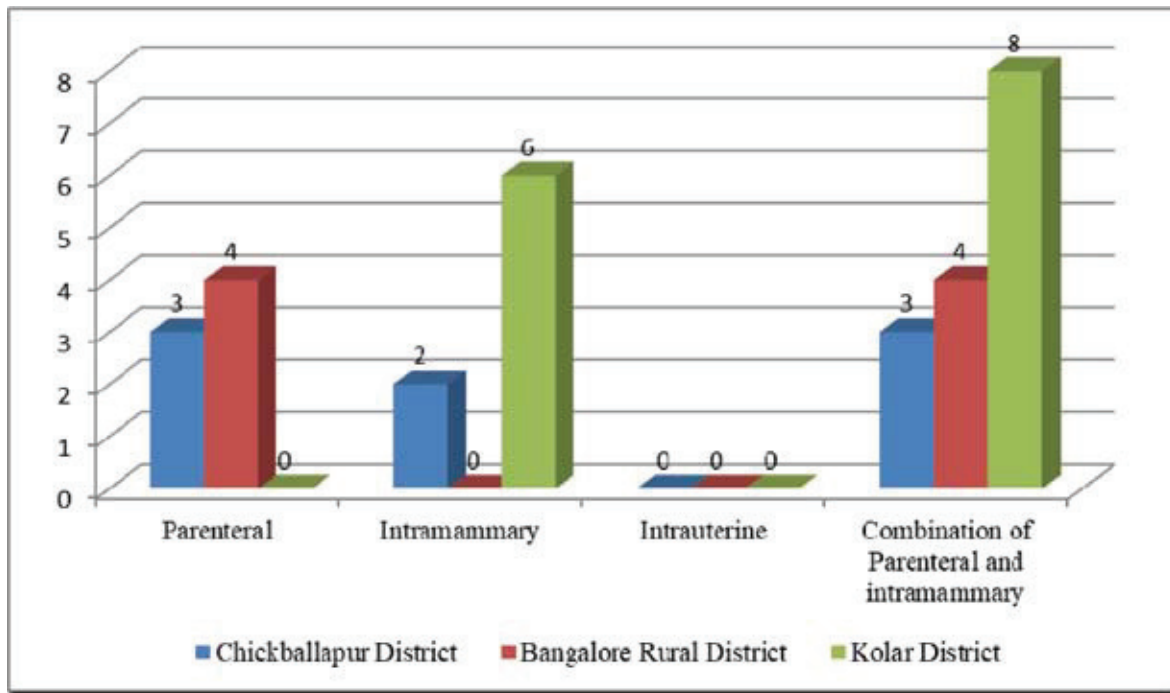


Fig. 2. Route of antibiotic administered in case of animals positive for antibiotic residues in milk

Medium No. 4 agar plates were inoculated with 200 µl of Nutrient broth with *Bacillus stearothermophilus* organism over which milk samples were placed in paper discs under sterile conditions (Popelka *et al.*, 2003). ELISA kits commercially marketed by Randox laboratories were used for this study.

RESULTS AND DISCUSSION

A total of 120 animals (40 from each district) were screened for the presence of antibiotic residues in cattle milk by the tests mentioned in the materials and methods and their epidemiological data was recorded. Out of the 120 samples screened, MDRT revealed 32 positive samples, microbiological method 29 samples and

ELISA 26 samples.

Average daily milk production:

Mean ± SE of average daily milk production in litres for all the cattle positive for antibiotic residues in milk from Chickballapur, Bangalore Rural and Kolar districts was 9.25 ± 0.76 litres.

Knappstein *et al.* (2004) reported that only milk yield had a significant influence on the excretion of antibiotic residues (cefquinome) in milk whereas milking frequency had no significant influence. Limited and contradicting information is available on the influence of milking frequency on excretion of antibiotic residues in milk.

Cannon *et al.* (1962) found variation in penicillin excretion in milk between individual cows after intramuscular and intravenous administration but no correlation could be established with milk production.

Stage of lactation:

Among the animals positive for antibiotic residues in milk, 12 (34.3%) were in 0-70 day stage of lactation, 7 (20%) of animals in 70-140 day of lactation and 16 (45.7%) in 140-305 day stage of lactation. Karzis *et al.* (2007) conducted a study on the influence of withdrawal period of antibiotics by stage of lactation and parity. There was a moderate negative correlation between stage of lactation and withdrawal period.

While there was no significant difference in withdrawal period between infected and non-infected udder halves, there was a weak positive correlation between withdrawal period and stage of lactation as reported by Petzer *et al.* (2008).

In this study no correlation could be observed between stage of lactation and presence of antibiotics in milk since animals in all stages of lactation were seen excreting antibiotics in milk.

Milking hygiene:

In animals positive for antibiotic residues in milk 32 (91.4%) dairy farmers had followed all clean milking practices.

Singh and Gupta (2015) conducted a study to know the level of knowledge and adoption of clean milk production (CMP) practices among dairy farmers. The results of the study revealed that 55.84 per cent of the dairy farmers had medium level of knowledge in various aspects of CMP, followed by 33 and 20 per cents of them having low and high level of knowledge, respectively.

Clean milk production practices is an area of utmost importance in reducing the incidence of diseases in cattle but in this work no significant influence of this parameter on antibiotic residue excretion was observed.

History of drug administration

Among the animals found positive for the presence of antibiotic residues in milk by any one of the tests employed, 30 (85.7%) cases had a history of antibiotic administration and 5 (14.3%) cases had no history of antibiotic administration. One case in Chickballapur district and two each in Bangalore Rural and Kolar districts were positive for antibiotic residues without the history of antibiotic administration.

The possibility of antibiotics in milk even without antibiotic administration could be attributed to the study made by Allison (1985) who cited various reasons for the failure of antibiotic residue testing in milk samples like presence of natural bacterial inhibitors, contamination of milk with teat dips, dairy disinfectants and other similar substances.

Class of antibiotic administered

Beta-lactam class of antibiotic was the most common drug (62.9%) found as antibiotic residue in milk (Fig.1). This finding is in complete agreement with the observations of Podal *et al.* (2015) who reported that β -lactam antibiotics, including the penicillins, cephalosporins, carbapenems and others, make up the largest share of antibiotics used in most countries and penicillins are the most commonly used antibiotic for the treatment of bovine mastitis. The study conducted by Edima *et al.* (2012) confirmed the contamination of 27.08% of milk samples collected in Ngaoundere region with antibiotic residues. Antibiotics of the beta-lactam and/or tetracycline group may be the source of contamination in 53.85% of positive milk samples.

Route of antibiotic administered

In case of animals positive for antibiotic residues in milk a combination of

parenteral and intramammary route was the most common route (42.9%) of antibiotic administration (Fig.2). The observations in the present study were in agreement with those of Fejzic *et al.* (2014) who opined that parenterally injected antibiotics were excreted much faster through milk, while residues were found for the longest period and in higher concentrations with intramammary application. Significantly higher concentration of cefoperazone was found in milk from quarters with subclinical mastitis than from quarters with clinical mastitis at 16 to 24 hours after intramammary administration. The transfer from treated quarters to non-treated quarters has been described for a number of antibiotics. Transfer of penicillin to untreated quarters was confirmed by later investigations in cows with or without clinical symptoms of mastitis (Zurich *et al.*, 1993).

SUMMARY

This study summarize that there was no significant difference between animals screened and animals positive for antibiotic residues in milk with respect to various epidemiological factors like average daily milk production, stage of lactation and milking hygiene in cows reared in organized and unorganized sectors. Majority of the animals found positive for the presence of antibiotic residues in milk by any one of the

tests employed had a history of antibiotic administration. Antibiotic commonly used was found to be Betalactam group and a combination of both parenteral and intramammary route is equally responsible for antibiotic residue excretion in milk.

ACKNOWLEDGEMENT

I hereby acknowledge the staff and facilities provided at Veterinary College, Bangalore for the study conducted.

REFERENCES

- Allison, J.R.D. 1985. Antibiotic residues in milk: *Brit. Vet. J.* **141**: 121-124.
- Cannon, R.Y., Hawkins, E. and Wiggins, A.M. 1962. Duration of secretion of bacteriostatic drugs in milk: penicillin, following oral and parenteral administration. *J. Dairy Sci.* **45**: 769-773.
- Edima, H.C., Tofaing, J. T., Ngonue, L.T. and Ndjouenkeu, R. 2012. Assessment of antibiotic residues in cow milk produced in Ngaoundere. *Int. J. Biol. Pharm. Allied Sci.* **1(11)**:1530-1538.
- Fejzic, N., Begagic, M., Haracic, S.S. and Smajlovic, M. 2014. Beta-lactam antibiotic residues in cow's milk: comparison of efficacy of three screening tests used in Bosnia and Herzegovina. *Bosn. J. Basic Med. Sci.* **14(3)**: 155-159.
- Karzis, J., Donkin, E. and Petzer, I.M. 2007. Intramammary antibiotics in dairy goats: effects of stage of lactation, parity and milk volume on withdrawal periods, and the effect of treatment on milk compositional quality. *Onderstepoort J. Vet. Res.* **74**: 243-249.
- Knappstein, K., Suhren, G., Walte, H.G., Slaghuis, B.A., Ferwerda, R.T., and Zonneveld, V. 2004. Prevention of antibiotic residues. Appropriate management of antibiotic treatment of cows in automatic milking systems. Report D12, EU project "Implications of the introduction of automatic milking on dairy farms" QLK5-2000-31006. <http://www.automaticmilking.nl>.
- Mullan, W.M.A. 2003. Inhibitors in milk [On-line]. Available from: <https://www.dairyscience.info/index.php/inhibitors-in-milk/51-inhibitors-in-milk.html>. Accessed: 23 September 2015.
- Petzer, I.M., Donkin, E.F., Preez, E.D., Karzis, J., Schans, T.J.V., Watermeyer, J.C. and Reenen, R.V. 2008. Intramammary antibiotic withdrawal periods for dairy goats compared to those for dairy cattle. *Onderstepoort J. Vet. Res.* **75**: 255-260.

- Podal, A.R., Malapure, C.D., Dimple, V.D., Kamdi, B.P. 2015. Occurrence, public health implications and detection of antibacterial drug residues in cow milk. *Environ. We. Int. J. Sci. Tech.* **10**: 7-28.
- Popelka, P., Nagy, J., Popelka, P., Sokol, J., Hajurka, J., Cabadaj, R., Marcincak, S. and Bugarsky, A., 2003. Comparison of various methods for Penicillin residue detection in cow milk after intramammary and parenteral treatment. *Bull. Vet. Inst. Pulawy.* **47**: 203-209.
- Singh, V., and Gupta, J. 2015. Analysis of knowledge and adoption level of the dairy farmers regarding clean milk production (CMP) Practices. *Asian J. Dairy Food Res.* **4(3)**: 180-186.
- Zurich, L.Z., Sanmartin, B.N., Borie, C.P., and Hermosilla, R.R. 1993. Evolución de concentraciones de cefradina y cefoperazona en leche bovina normal y mastítica. *Avances en. Ciencias. Veterinarias.* **8**: 24-28.

