

Certain Epidemiological Aspects of Antibiotic Residues in Cattle Milk at Selected Districts of Karnataka

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ABSTRACT: A total of one hundred and twenty 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 age, parity, cattle breed, type of farming, housing, flooring, medical service, managemental practices like feeding and water source were collected from the animals under study. No significant difference was observed between animals screened and animals positive for antibiotic residues in milk with respect to various factors like age, parity, cattle breed, type of farming, housing practices, flooring, feeding and water source.

KEYWORDS: Selected districts of Karnataka, Epidemiological aspects, Antibiotic residues.

I. INTRODUCTION

India is the leading producer of milk in the world and has produced 155.5 MT of milk for the year 2015-2016. Milk is consumed all over the world and it's important to guarantee the quality of milk for food safety. The presence of antibiotic residues in milk is a potential health hazard as these residues are considered undesirable for public health. Pressure to reduce the level of antibiotic contamination in milk supplies arises 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 *e.g.* Gentamicin, Penicillins and Cephalosporins (β -Lactams) *e.g.* Cloxacillin, Macrolides *e.g.* Erythromycin, Quinolones *e.g.* Enrofloxacin and Tetracyclines *e.g.* Tetracycline.

The amount of antibiotic excreted into milk may vary from 8 to 80 per cent of the administered dose and usually averages about 50 per cent. It is therefore difficult to know the exact amount of antibiotic residue in milk at different milking subsequent to treatment. Generally, the concentration of antibiotic in milk decreases rapidly during successive milking, usually at an exponential rate (Mullan, 2003). A survey on the use of antibiotics among dairy animals in Bangalore and surrounding areas showed that the major drug used for the treatment of mastitis in the area were beta-lactams alone or in combination with streptomycin (Unnikrishnan *et al.*, 2005).

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II. RELATED WORK

Sterner(1993) stated the importance of preventive herd health management and the role of veterinary medical service with proper drug usage as important criteria for preventing violative drug residues in milk. Radostitset *al.* (2006) found that the incidence of mastitis increased with the age of the animal. Karziset *al.* (2007) opined that the withdrawal period of an antibiotic was affected by stage of lactation and parity. In various trials conducted after the use of Beta-lactams, withdrawal periods increased with increasing parity.

Joshi and Gokhale (2006) opined that subclinical mastitis was found to be more important in India (varying from 10–50% in cows and 5–20% in buffaloes) than clinical mastitis (1–10%). The incidence was highest in Holsteins and Jerseys rather than local cattle and buffaloes. Eicher *etal.* (2013) reported that housing of cattle on rubber flooring when compared to concrete flooring yielded more milk fat and milk protein along with improved hoof health, locomotion, immune function and stress relief.

III. METHODOLOGY

A total of one hundred and twenty 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 age, parity, cattle breed, type of farming, housing, flooring, medical service, managerial practices like feeding and water source were collected from the animals under study. Epidemiological data regarding age of animals screened was classified into 0-5 years, 6-10 years and 11-15 years. Data on parity was classified into three groups namely 0-2, 3-4 and 5-6. Different breeds of cattle like cross bred Holstein, cross bred Jersey and Non-descript were assessed based on their breed characteristics. Different types of cattle rearing like intensive, semi-intensive and free range systems were observed and data recorded. Different housing practices like housing cattle in separate shed/owner's residence/ temporary shelter etc. were recorded. Different types of flooring in cattle sheds (stone/ wooden/ mud/ rubber mat) were recorded. Feeding pattern of cattle with either concentrate/ roughage or both was noted.

Milk samples collected were screened for the presence of antibiotic residues by three methods namely Microbial Drug Residue Test (MDRT), Microbiological method and ELISA.

IV. RESULTS & DISCUSSION

A total of 120 animals (40 from each district) were screened for the presence of antibiotic residues in cattle milk by various tests and their epidemiological data was recorded.

1. Age

Mean \pm SE age of animals screened in Chickballapur, Bangalore Rural and Kolar districts were found to be 4.67 ± 0.36 , 6.00 ± 0.26 and 6.75 ± 0.28 , respectively. The overall Mean \pm SE age of animals in all the three districts was found to be 5.80 ± 0.19 . Mean \pm SE age of animals positive for presence of antibiotics in milk by various tests in Chickballapur, Bangalore Rural and Kolar districts were found to be 3.33 ± 0.54 , 6.10 ± 0.52 and 6.06 ± 0.45 , respectively. The overall Mean \pm SE age of all animals positive for antibiotics was found to be 5.37 ± 0.35 . Majority of the animals screened in this study were in the age band of 6-10 years (55.8%) and majority of animals positive for antibiotic residues in milk fell in the age band of 0-5 years (Table 1).

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Table 1. Age group of animals under study for detection of antibiotic residues in milk

District	Age of animals screened			Age of animals positive for antibiotics in milk			Mean± SE age of animals screened	Mean± SE age of animals positive for antibiotics
	0-5 years	6-10 years	11-15 years	0-5 years	6-10 years	11-15 years		
Chikballapur	25	15	0	7	2	0	4.67± 0.36	3.33 ± 0.54
Bangalore Rural	13	27	0	5	5	0	6.75 ± 0.28	6.10 ± 0.52
Kolar	15	25	0	7	9	0	6.00 ± 0.26	6.06 ± 0.45
Total	53	67	0	19	16	0	5.80 ± 0.19	5.37 ± 0.35

Dohoo and Martin (1984) observed similar age patterns for all disease conditions using *Chi-square* or quadratic regression analyses. Linear increase with age was observed for diseases like milk fever, mastitis, cystic ovaries and foot and leg problems. Quadratic relationship with age was observed for ketosis, mastitis requiring systemic therapy, subclinical mastitis, respiratory diseases and traumatic reticulo-peritonitis.

2. Parity

Mean ± SE parity of animals screened in Chickballapur, Bangalore Rural and Kolar districts were found to be 2.07 ± 0.18, 2.42 ± 0.20 and 2.20 ± 0.17, respectively. The overall Mean ± SE parity of animals in all the three districts was found to be 2.23 ± 0.10. Mean ± SE parity of animals positive for antibiotic residues in milk by various tests in Chickballapur, Bangalore rural and Kolar districts were found to be 1.33 ± 0.16, 2.00 ± 0.21 and 2.12 ± 0.35, respectively. The overall Mean ± SE parity of animals positive for an antibiotic in all the three districts was found to be 1.88 ± 0.18. Majority of the milk samples positive for antibiotic residues were obtained from animals in the 0-2 parity group (Table 2).

Table 2. Parity of animals screened for detecting antibiotic residues in milk

District	Parity of animals screened			Parity of animals positive for antibiotics in milk			Mean± SE parity of animals screened	Mean± SE parity of animals positive for antibiotics
	0-2	2-4	4-6	0-2	2-4	4-6		
Chikballapur	24	14	2	9	0	0	2.07 ± 0.18	1.33 ± 0.16
Bangalore Rural	25	14	1	8	2	0	2.42 ± 0.20	2.00 ± 0.21
Kolar	26	12	2	12	2	2	2.20 ± 0.17	2.12 ± 0.35
Total	75	40	5	29	4	2	2.23 ± 0.10	1.88 ± 0.18

Radostitset *al.* (2006) had observed increase in incidence of clinical mastitis in cows as parity increases. This increases the use of antibiotics and chance of subsequent contamination of milk.

3. Cattle breed

Majority of the animals screened from all the three districts were crossbred Holstein Friesian (86.7%) followed by crossbred Jersey (12.5%) and Non-descript (0.8%). In Bangalore Rural district 95% of animals screened were cross bred Holstein Friesian followed by 85% in Chickballapur and 80% in Kolar districts. Only one Non-descript animal (0.8%) could be screened and it was from Chickballapur district.

Out of the 35 animals positive for antibiotic residues in milk, 29 (82.9%) were cross bred Holstein Friesian and the rest 6 (17.1%) were cross bred Jersey. One hundred per cent of animals positive for antibiotics in Bangalore Rural district were cross bred Holstein Friesian (Table 3).

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Table 3. Breed of animals used to assess antibiotic residues in milk

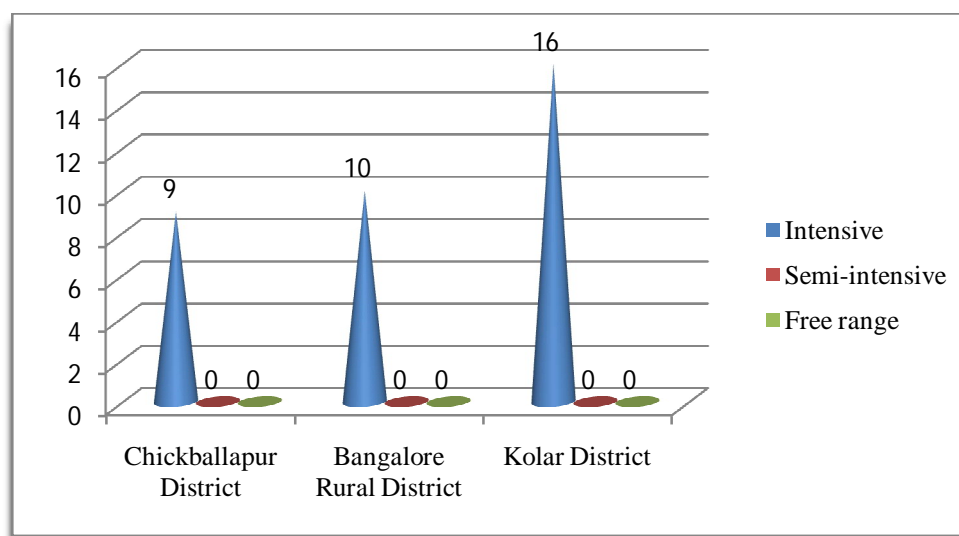
District	Breed of animals screened			Breed of animals positive for antibiotics in milk			Percentage of cross bred H.F animals screened	Percentage of cross bred H.F animals positive for antibiotics
	Cross bred H.F	Cross bred Jersey	N.D	Cross bred H.F	Cross bred Jersey	N.D		
Chikballapur	34	5	1	8	1	0	85	88.9
Bangalore Rural	38	2	0	10	0	0	95	100
Kolar	32	8	0	11	5	0	80	68.8
Total	104	15	1	29	6	0	86.7	82.9

Kurjogi and Kaliwal (2014) reported a higher probability of antibiotic usage in Holstein Friesian due to higher incidence of diseases like Mastitis in that breed.

4. Farming

Type of farming adopted by 98.33% farmers in all the three districts was of intensive type and the remaining 1.67% was of semi-intensive type. In Bangalore rural and Kolar districts all the farmers screened (100%) including those with animals positive for the presence of antibiotics in milk had intensive type of farming (Fig. 1). Sudershan and Bhat (1995) opined that intensive method of dairy farming has resulted in increased incidence of infectious diseases and subsequently in the usage of modern antibiotics to combat them. Introduction of newer breed of animals and a shift from traditional dairy practices were seen in this type of farming.

Fig. 1. Type of farming adopted by farmers with antibiotic residue positive milk samples



5. Housing practices

It was observed that 90.83% of the farmers housed their cattle in separate sheds whereas 6.67% housed their cattle in their own residence and the rest 2.5% in temporary shelter. Majority of animals positive for antibiotic residues in milk (91.4%) were housed in a separate shed (Fig. 2). Bochantin and Bewley (2016) substantiated the importance of

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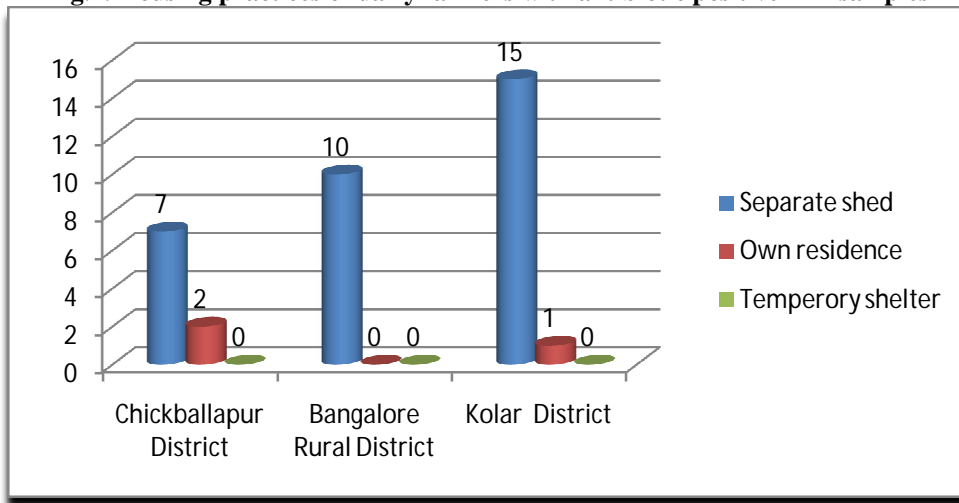
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management like housing and cleanliness of the milking parlor in reducing the spread of mastitis-causing pathogens. Housing and bedding should be kept clean and dry to reduce the incidence of diseases like mastitis.

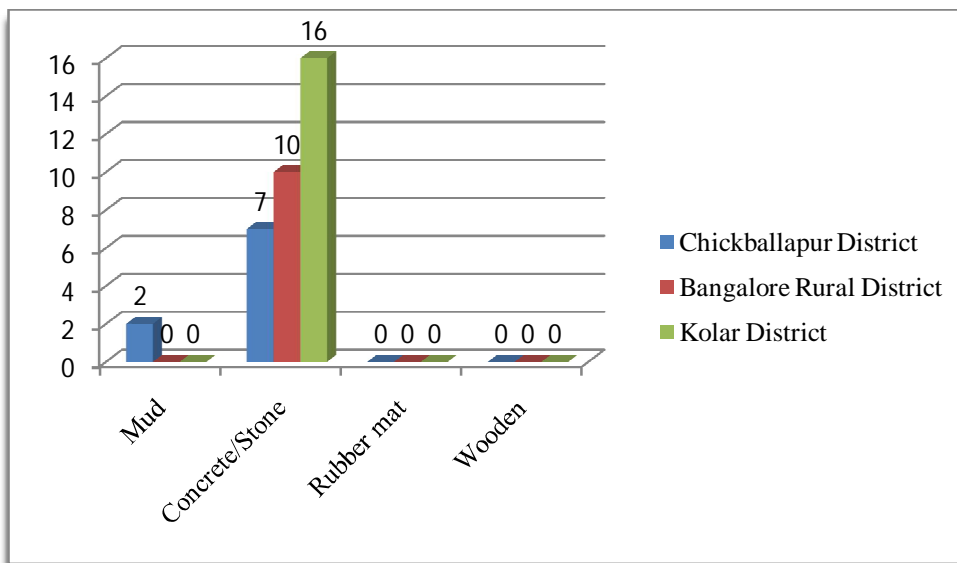
Fig.2. Housing practices of dairy farmers with antibiotic positive milksamples



6. Flooring

Type of flooring used in cattle sheds in the 3 districts of Karnataka under study was of Stone in 97.5% cases screened. In case of animals positive for antibiotic residues in milk 94.3% of animals were housed on stone floor and the rest 5.7% was on mud floor (Fig. 3). Radostitset *al.* (2006) observed the presence of antibiotic residues in milk of cattle housed in concrete/stone floors and attributed it to high incidence of mastitis.

Fig. 3. Type of flooring in cattle sheds positive for antibiotic residues in milk



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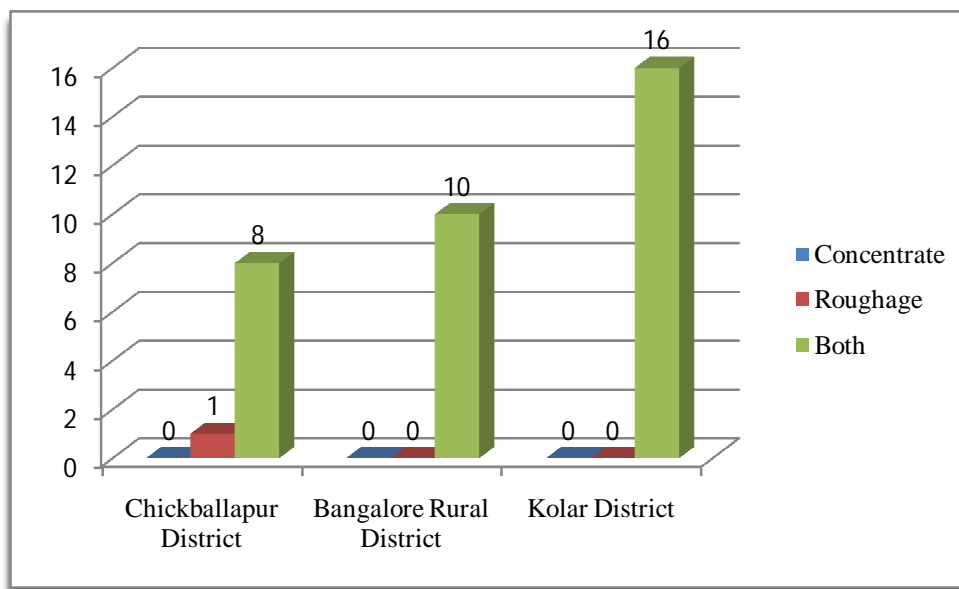
7. Medical Service

Veterinarian provided medical service to all the dairy farmers whose cows were screened for antibiotic presence in milk including those animals positive for antibiotic residues.

8. Feeding regime

Feeding regime of majority of cattle (95.8%) screened for antibiotic residues comprised of both concentrate and roughage. Animals positive for antibiotic residues in milk (97.1%) were fed on both concentrate and roughage diets. Looper (2012) noted that increasing a cow's resistance to mastitis causing pathogens on the teat-end is an important component of immunity in the dairy cow. Nutrition is involved in maintaining immunity and inadequate energy or deficiencies affect resistance.

Fig. 4. Feeding regime of dairy cattle positive for antibiotic residues in milk



9. Water Source

Groundwater was the source of water for all the cattle from which milk samples were collected for screening antibiotic residues in all the three districts of Karnataka including those animals positive for antibiotic residues. Kishore *et al.* (2016) opined that improved access to groundwater irrigation was the main factor that shifted the economy from draught to dairying.

V. SUMMARY

This article summarizes the influence of various epidemiological factors on antibiotic excretion in milk. No significant difference was observed between animals screened and animals positive for antibiotic residues in milk. Many other factors like administration of antibiotics, their type, route of administration, withdrawal period, milk yield, milking frequency, stage of lactation and milking hygiene may have a greater influence on antibiotic excretion in milk. Antibiotic excretion through milk can be reduced to a great extent by following strict withdrawal periods.

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REFERENCES

1. ALLISON, J. R. D., 1985. Antibiotic residues in milk. *Brit. Vet. J.*, 141, 121-124.
2. BOCHANTIN, K. and BEWLEY, J. M., 2016. The importance of mastitis management practices in maintaining milk quality in the United States. *J. Anim. Sci.*, 94(5), 19-20.
3. DOHOO, I. R. and MARTIN, S. W., 1984. Disease, production and culling in Holstein-Friesian cows- Age, season and sire effects. *Preventive Veterinary Medicine*, 2(5):655-670.
4. EICHER, S. D., LAY, D. C., ARTHINGTON, J. D. and SCHUTZ, M. M., 2013. Effects of rubber flooring during the first two lactations on production, locomotion, hoof health, immune function and stress. *J. Dairy Sci.*, 96: 3639-3651.
5. JOSHI, S. and GOKHALE, S., 2006. Status of mastitis as an emerging disease in improved and periurban dairy farms in India. *Ann. N.Y. Acad. Sci.*, 1081: 74-83.
6. 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 Journal of Veterinary Research*, 74, 243-249.
7. KISHORE, A., BIRTHAL, P. S., JOSHI, P. K., SHAH, T. and SAINI, A., 2016. Patterns and drivers of dairy development in India: Insights from analysis of household and district-level data. *Agricultural Economics Research Review*, 29(1): 1-14.
8. KURJOGI, M. M. and KALIWAL, B. B., 2014. Epidemiology of Bovine Mastitis in Cows of Dharwad District. *International Scholarly Research Notices*, 2014: 1-9.
9. LOOPER, M., 2012. Reducing somatic cell count in dairy cattle.
10. <https://www.uaex.edu/publications/PDF/FSA-4002.pdf>. (Accessed 25 November 2016).
11. 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.
12. RADOSTITS, O. M., GAY, C. C., HINCHCLIFF, K. W. and CONSTABLE, P. C., 2006.
13. *Veterinary Medicine: A text book of the diseases of cattle, sheep, goats, pigs and horses*. 10th Ed. Saunders & Co. London. p.185.
14. STERNER, K.E., 1993. The Pasteurized milk ordinance. *Veterinary Clinician of North America: Food Animal Practice*. 9(3): 597-607.
15. SUDERSHAN, R. V. and BHAT, R. V., 1995. A survey on veterinary drug use and residues in milk in Hyderabad. *Food Addit. Contam.*, 12(5): 645-650.
16. UNNIKRISHNAN, V., BHAVADASAN, M. K., SURENDRANATH, B. and CHANDRAM., 2005. Chemical residues and contaminants in milk: A review. *Indian J. Anim. Sci.*, 75(5), 592-598.