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RESEARCH NOTE

Antimicrobial Drug Residues in Infant Foods and Bovine Milk

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Abstract

Liquid Chromatographic analysis was done to determine the antimicrobial drug residue in baby foods and bovine milk. Different baby foods and bovine milk samples were subjected to analysis of the antimicrobial drug residues. Bovine milk, Dexolac-1, Dexolac-2, first food, Nestogen, Lactogen-2, Cerelac-1, Cerelac-2 and Nutricia Infacare were analysed for chloramphenicol and sulfamethazine residues. While milk collected from different parts of country were analysed for albendazole, fenbendazole and diminazene residue. The results in this study indicated that Bovine milk and baby foods which were analysed for antimicrobial drug residue had their quantities and were safe to use.

Keywords: Antimicrobials, Baby foods, Bovine milk, Chloramphenicol, Sulfamethazine.

Antimicrobials are vital for the treatment of bacterial infection in both human and animals. Several diseases like pneumonia, tuberculosis and meningitis caused by bacteria are cured by the use of antibiotics, thus saving the life of millions of people throughout the globe. Antimicrobial drugs are aslo added to animal feed at the level of 1-50g/ton to increase the growth rate of swine, poultry and calves (Baynes *et al*. 1999). In addition to this sub therapeutic purpose, antibiotics are added to feeds at 50-200g/ton for the control of diseases in cattle, swine and poultry. The antibiotics most commonly used are chlortetracycline, oxytetracycline, bacitracin, tylosin, penicillin, streptomycin and flavomycin (Kartz, 1988). Further there are approximately 30 compounds which can be used as antimicrobial agents in food products. (Branen, 1983). For sustainable live stock production and in controlling of animal infection that could spread to humans, antimicrobials have played an important role (Yates, 2008).

The prolonged ingestion of contaminated food has resulted in conferring microbial resistance to antibiotics (Tripathi, 1994). However, commercially available infant milk substitutes and weaning foods contain additives like flavours which may cause allergic reaction to infants (less than 12 months age) (Flajs, 2006).

Therapeutic, sub therapeutic and some time judicious use of antibiotics may result in their excretion in the form of different metabolites through different routes. Excretion through milk is one of pathway for these residues. The withholding period of these antibiotic residues in milk is around 3-7 days and if consumed during this period may cause serious problem. Ensuring food safety is of paramount importance, especially for infants, as they are in the state of growth and development and may be more vulnerable to the effects of these residues. Therefore, to assess the exposure of infants to the antibiotic residues, it is necessary to develop and regularly improve analytical procedures to facilitate the accurate and reproducible quantification of these substances in foods marketed for infant consumption.

MATERIALS AND METHODS

Research was carried out in Food Research and Analytical Centre New Delhi. Different baby foods and bovine milk were subjected to analyze the antimicrobial drug residues. Twenty one (21) samples of Bovine milk, Dexolac-1, Dexolac-2, first food, Nestogen, Lactogen-2, Cerelac-1, Cerelac-2 and Nutricia Infacare which are all popular brands available were purchased from the market and were analysed for chloramphenicol, sulfamethazine residues. Besides milk samples were collected from different parts of country, Baby food Samples were collected from the local market of Delhi, where as Bovine milk samples were collected from Rajasthan, Haryana, Punjab, Karnataka, Orissa, Gujarat, Bihar and Delhi. Around 24 samples of bovine milk were collected. A bovine milk sample from each state was also collected in triplicates by an independent autonomous organization and were analysed for albendazole, fenbendazole and diminazene residue. The antimicrobial drug residues were examined by the procedure developed by (Adesiyun and Webb, 1997; Aliu and Odeaard, 1984; Garica *et al*. 1991, and Movassagh and Karami 2010. For Chloramphenicol and Diminazene, HPLC-grade acetonitrile was used. 10g of sample was taken from each lot. Detector used was UV-VIS with wavelength of 278nm. Column used was ODS RP C_{18}. Injection volume was 20µl. For Sulfamethazine HPLC-grade Chloroform was used. 10g of sample was taken from each lot. Detector used was UV-VIS with wavelength of 254nm. Column used was ODS RP C_{18}. Injection volume was 20µl. For Albendazole and Fenbendazole HPLC-grade methanol was used. 1g of sample was taken from each lot. Detector used was US-VIS with wavelength of 295nm. Column used was ODS RP C_{18}. Injection volume was 20µl.

RESULTS AND DISCUSSION

Albendazole an antihelmenthic drug is used for the treatment of parasitic infections caused by gastrointestinal round worms, lung worms, tape worm and fluke in domestic animals (Navratilova, 2008). Its concentration in the milk of UP was found 6.053 ppb, while the same drug was found 1.463, 9.609, 2.230, 0.463, 2.234.0.010, 0.027 and 0.056 ppb (Table 1) in milk of Rajasthan, Haryana, Punjab, Karnataka, Orissa, Gujarat, Bihar and Delhi respectively. However, MRL of albendazole in milk is found to be 100 ppb. Fenbendazole concentration in milk of UP was found to be 6.007 ppb. In Rajasthan, Haryana, Punjab, Karnataka, Orissa, Gujarat, Bihar and Delhi was found 2.880, 4.143, 23.647, 1.372, and 3.221. 0.000, 0.003 and 0.031 ppb (Table 1) of fenbendazole respectively. However maximum permissible limit quantified by HPLC in milk is 400 ppb (Table 1).

Table 1: Veterinary drug residue level in Bovine milk collected from different parts of India

States	Albendazole (ppb)	Fenbendazole (ppb)	Diminazene (ppb)
Utter Pradesh	6.053	6.007	9.866
Rajasthan	1.463	2.880	18.767
Haryana	9.609	23.647	44.576
Punjab	2.230	4.143	22.276
Karnataka	0.463	1.372	30.630
Orissa	2.234	3.221	5.471
Gujarat	0.010	0.000	0.483
Bihar	0.027	0.003	0.318
Delhi	0.056	0.031	0.087

Antibiotics and other antimicrobial drug residues are added to animal feeds at the level of 1-50g/ton to increase the growth rate of calves and other growing animals. In addition to this sub therapeutic or nutritional purpose, antibiotics are added to feeds at 50-200g/ton for control of disease in cattle. These antibiotics enter into the blood stream of the animals, act against the pathogens of target and after all the excess antibiotics have to excrete from the body. There are certain possible route of excretion, such as urine, faeces and milk. When animal are treated with certain antibiotics, the antibiotic may come into milk. If this infected milk is collected and utilized for the preparation of the baby food, there is a chance of these antibiotics getting into the final product even after high temperature treatment. Albendazole may

cause various side effects like neutropenia (low White blood cell count), thrombocytopenia (Low platelet count) and hepatitis can occur during prolonged therapy, but some are reversible by discontinuing the drugs. It may cause sour throat, abdominal pain, loss of appetite, unusual fatigue, skin rashes and itching. Less common effects are nausea, vomiting, dizziness, stomach upset, diarrhea, headache, alopecia thinning or loss of hair. Fenbendazole is a high effective, broad spectrum antihelmenthic of the banzimidazole classes of drugs. The widespread use of this agent in cattle increases the risk of residues appearing in the milk of treated animals posing health threat to consumer. Diminazene has been used in clinical traits as early cases of human sleeping sickness. Chloramphenicol being a broad spectrum antibiotic, its action works through interference with or inhibition of protein synthesis. Chloramphenicol is toxic to infants as it inhabits transpeptidation. Chloramphenicol is irritant and may cause gastric irritation, pain and abscess formation. Sulfamethazine has bacteriostatic action. It is capable of causing hypersensitivity reaction. These are unpredictable and unrelated to dose. The whole range of reaction from rashes to anaphylactic shock can be produced. The result of this study indicates that baby foods and bovine milk which were analysed for antimicrobial drug residue were safe to use. It simply indicates that there is no chance of any harm by using these products.

Concentration of Diminazene concentration in milk of Utter Pradesh Rajasthan, Haryana, Punjab, Karnataka, Orissa, Gujarat, Bihar and Delhi was found 9.866, 18.767, 44.576, 22.276, 30.630, 5.471, 0.483, 0.318, 0.087 ppb respectively (Table 1). Chloramphenicol a broad spectrum antibiotic can result in bone marrow depression called aplasia (Li *et al*. 2001; Yunis, 1969). Its concentration in milk was found to be 6.096 ppb. However in Dexolac-1 its concentration was found to be 2.613 ppb. In Dexolac-2, first food, Nestogen, Lactogen-2, Cerelac-1, Cerelac-2 and Nutricia Infacare the concentration was found to be 4.230, 4.728, 4.852, 2.737, 6.842, 0.000, 0.000 ppb respectively (Table 2). The concentration found in milk or baby foods is less than the maximum residual limit which does not affect infants while taking baby foods. Sulfamethazine in milk was found to be 0.000 ppb. However, its concentration in Dexolac-1, Dexolac-2, first food, Nestogen, Lactogen-2, Cerelac-1, Cerelac-2 and Nutricia Infacare was found to be 1.963, 2.665, 2.065, 2.011, 0.000, 1.925, 2.324, 0.000 ppb (Table 2) respectively. The MRL was found to be 100 ppb.

Table 2: Antimicrobial drug residue level of milk and infant milk formulae available in Indian market

Product	Chloramphenicol (ppb)	Sulfamethazine (ppb)
Milk	6.096	0.000
Dexolac-1	2.613	1.963
Dexolac-2	4.230	2.665
First Food	4.728	2.065
Nestogen	4.852	2.011
Lactogen-2	2.737	0.000
Cerelac-1	6.842	1.925
Cerelac-2	0.000	2.324
Nutricia Infacare	0.000	0.000

CONCLUSION

Antimicrobial resistance has been a major public health concern for many years now, and the problem continues to grow as the resistance appears not only in bacteria, but in fungi, viruses and parasites. No simple solution exists to deal with anti microbial resistance and more scientific study is required on the myriad aspects of resistance acquisition. However, existing data suggests that control strategies can reduce the incidence of resistant bacteria and the judicious use of antibiotics is an important component of comprehensive programs designed to reduce anti microbial drug resistance and their by maintain this important public health issues on the radar screen of physician and the public. Keeping the above concern into the account, different baby foods and bovine milk samples were subjected to analysis of the antimicrobial drug residues. Dexolac-1, Dexolac-2, First Food Nitrogen, Lactogen-2, Cerelac-1, Cerelac-2 all popular brands were purchased from local market and analysed

for chloramphenicol and sulfamethazine residues. Bovine milk was collected from different parts of country by independent autonomous organization and was analysed for Albendazole, Fenbendazole and Diminazene residues. Standard operating procedures were used for chromatographic studies. It was found that residues of different drugs were mostly absent in one or other products or found far below than the maximum residual limits. The findings indicated that all the products subjected under study were safe and do not pose any kind of health hazards.

REFERENCES

Adesiyun, A.A. and Webb, L.A. 1997. Prevalence of antimicrobial residues in preprocessed and processed cow's milk in Trinidad, *Journal of Food Safety,* **16**: 301-310.

Aliu, Y.O., Odegaad. S and Sogen, E. (1984). Diminazene/ Berenil: Bioavailibilty and disposition in dairy goats. *Acta Vetarinary Scandinarica,* **25**: 593-596.

Baynes, R.E., Lyman, R., Auderson, K.L. and Browice, C.F. 1999. Antibiotics in Food. *Journal of Food Protection,* **62**: 177-180.

Branen, A.L. and Daridson, P.M. 1983. Introduction to use of antimicrobials. In: Eds. Antimicrobials in Foods. Masucel Dekker, inc. New York, pp. 1-9.

Flajs, V.C. 2006. Performance characteristics of an analytical procedure for determining chloramphenicol resideues in muscle tissue by gas chromatography. *Biomedical Chromatography,* **20**(1): 982-992.

Garica, J.J., Blos Fernandes, F. and Torrado, J.J. 1991. Quantative determination of albendezole and it main metabolites in plasma. *Journal of Chromatography*, **3:** 265-271.

Katz, S.E. 1988. Antibiotic/ Antimicrobial residues in milk. *Journal of Food Protection,* **44:** 8-11.

Li, L.T., Chung-wang, Y.J. and Shih, Y.C. 2002. Determination and confirmation of chloramphenicol residues in swine muscle and liver. *Journal of Food Science,* **67**: 21-28.

Movassagh, M.H. and Karami, A.R. 2010. Determination of Antibiotic Residues in Bovine Milk in Tabriz, Iran**,** *Global Veterinaria,* 5(3): 195-197.

Navratilova, P. 2008. Screening methods used for the detection of veterinary drug residues in raw cow milk-a review. *Czech Journal of Food Science*, **26:** 393-401.

Tripathi, K.D. 1994. Antimicrobial drugs. In: Essential of medical Pharmocology 4th edition. Jay per Medical Publisher (p) Ltd. New Delhi, pp. 671-686.

Yates A.B. 2008. Management of patients with a history of allergy to beta-lactam antibiotics. *American Journal of Medicine,* **121**(7): 572-576.

Yunis, A.A. 1969. Drug induced bone marrow injury. *Advances in Internal Medicine,* **15**: 357-376.