

# Cross-sectional survey on prescribing patterns for food animal medications in Bangladesh

## Abstract

The aim of this study was to examine current prescribing patterns for food animal medications among veterinary hospitals in Bangladesh. We analyzed veterinary practice records and extracted data regarding medications prescribed for 626 cattle and 374 goats. Anthelmintics were the medications most often prescribed (465 patients [46.50%]), followed by antibiotics (425 patients [42.50%]) and nutritional supplements (140 patients [14.00%]). Sulfa drugs were the most commonly prescribed antibiotics (143 patients [33.65%]). Our results indicate that medication choice is not generally based on sensitivity testing. Following published guidelines for medication use will lead to more appropriate use of pharmaceuticals in the animal health care sector.

**Keywords:** antibiotics, anthelmintics, cattle, goats, Bangladesh

Volume 3 Issue 4 - 2016

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**Received:** June 18, 2016 | **Published:** June 30, 2016

## Introduction

Since Alexander Fleming discovered penicillin in 1928, antimicrobials have made a phenomenal contribution to the health and wellbeing of livestock throughout the world.<sup>1</sup> Medicines have been widely used to prevent and treat animal diseases and to promote growth in livestock. Approximately 6000 tons of veterinary antibiotics are used annually in China.<sup>2</sup> However, the type and dose of medications used must be carefully considered. Unnecessary use of veterinary pharmaceuticals may result in the emergence and spread of resistant bacteria and may affect humans, animals, and the environment.<sup>3</sup> The role of veterinarians is evolving from that of task-oriented therapy providers to that of advice-oriented consultants. The approach to livestock health in the last three decades has shifted from treatment of clinical illness to prevention of disease. Antibiotics are used to treat disease, and nutritional products and anthelmintics are also used for prevention.<sup>4</sup> In Bangladesh recent study found that 70.33% of the medications prescribed for human patients in Bangladesh were antibiotics.<sup>5</sup> Veterinarians in Bangladesh may prescribe drugs without performing clinical tests because of the unavailability of local diagnostic facilities. The use of medications in a country can often be monitored using national data on import or sales of antimicrobials through pharmacies, veterinarians, or farm records. However, across-sectional study may be appropriate as an area-wide target study. The aim of this hospital-based survey is to analyze for the first time the most commonly prescribed veterinary medicines in Naogaon, a district of Rajshahi Division in northern Bangladesh, located at 24.90°N and 88.75°E.

## Materials and methods

### Study population and design

We gathered data on veterinary prescribing practices in Bangladesh using a cross-sectional hospital-based survey. Veterinary hospitals

in the Atrai upazila in the Naogaon District were selected for the study because of their proximity to the location of the undergraduate internship program conducted from Chittagong Veterinary and Animal Sciences University, Bangladesh. The upazila livestock officer and veterinary surgeon acted as area resource officers for preventive, therapeutic, and extension services, similar to those of other veterinary hospitals in Bangladesh, regulated by the Department of Livestock Services under the ministry of Fisheries and Livestock.

### Data collection

In Bangladesh, all veterinarians are required to maintain records of drug administration. Data recorded include species and ages of patients and categories of pharmaceuticals: anthelmintics, nutritional supplements, antimicrobials, and others. Subgroups of anthelmintics and nutritional supplements (vitamins, minerals, and amino acids) were not recorded separately because of insufficient data.

Antimicrobials comprised the most diverse group and included three main subgroups: aminoglycoside (gentamicin);  $\beta$ -lactamase, consisting of amoxicillin and penicillin, and sulfa drugs, including sulfadimidine (S1), sulfadiazine/sulfadimidine/sulfapyridine combination (S2), and sulfanilamide (S3). A combination of penicillin and streptomycin was included as a separate subgroup because of the availability of a trade preparation of this drug combination; oxytetracycline was also a subgroup. The group "others" included hormonal products, astringents and fluid replacement products.

### Data analysis

Data were collected in spreadsheets (Excel 2007; Microsoft, Redmond, Washington) and analyzed using statistics software (STAT/IC-13.0), (Stata Corp, 4905, Lakeway Drive, College station, TX 77845, USA). Descriptive statistical analysis was used to measure the means and P values.  $P < 0.05$  was considered statistically significant.

## Results

Anthelmintics were the drugs most often prescribed in cattle and goats combined. Antibiotics were prescribed significantly more often for goats than for cattle ( $P < 0.05$ ). Nutritional supplements were the category least often prescribed for either species; they were prescribed significantly more often for cattle than for goats ( $P < 0.05$ ) because of the tradition of fattening beef for the Eidal-Adha festival. The frequency of use of the drugs in the “Others” category was also significantly higher in cattle than in goats ( $P < 0.05$ ; Table 1).

**Table 1** Frequency distributions of pharmaceutical categories prescribed for cattle and goats

Species	Total, N(%)	Antibiotics, n(%)	Anthelmintics, n(%)	Nutritional, n(%)	Others, n(%)
Cattle	626 (62.60)	200 (47.06)	342 (73.55)	108 (77.14)	127 (56.19)
Goats	374 (37.40)	225 (52.94)	123 (26.45)	32 (22.86)	99 (43.81)
Total	1000 (100.0)	425 (100.0)	465 (100.0)	140 (100.0)	226 (100.0)

**Table 2** Frequency distributions of antibiotics prescribed for cattle and goats

Species	Total, N	Aminoglycosides, n(%)	$\beta$ -Lactamase, n(%)	Combined (aminoglycosides+ $\beta$ -lactamase), n(%)	Sulfadruugs n(%)	Oxytetracycline n(%)
Cattle	200	53 (26.5)	29 (14.5)	27 (13.5)	66 (33.0)	25 (12.5)
Goats	225	67(29.78)	23 (10.22)	28 (12.44)	77 (34.22)	30 (13.33)
Total	425	120 (28.23)	52 (12.24)	55 (12.94)	143 (33.65)	55 (12.94)

## Discussion

### Use of antimicrobials

An emerging challenge for the new generation of practitioners is antimicrobial resistance; drugs prescribed must be monitored for effectiveness and therapeutic success. Thousands of tons of drugs, especially antibiotics, are excreted by animals each year.<sup>3</sup> Prescribed medicines, their metabolites, and degradation products of human and veterinary medical compounds are introduced into the environment by multiple routes.<sup>3</sup> The rational use of antimicrobials is welcomed, but unnecessary use is always disappointing. A 2007 study conducted in 17 major dairy-producing states by the U.S. Department of Agriculture National Animal Health Monitoring System reported that penicillin G/dihydrostreptomycin combination and cephalixin were the two antibiotics most commonly used for dry cow therapy. More than 42% of cows treated for lameness received tetracycline, 27.2% received cephalosporin, and 19.5% were treated with  $\beta$ -lactamase antibiotics.<sup>6</sup> In another study of veterinary practices in Switzerland, penicillins and cephalosporins were the most frequently prescribed antibiotics (37%), followed by aminoglycosides (18%), tetracycline (14%), and sulfonamides (11%);<sup>7</sup> these percentages are lower than those found in our survey. In a cross-sectional survey of antimicrobial prescribing patterns in companion animal practices in the United Kingdom, only 3.5% of clinicians reported that their practices had antimicrobial use policies. Penicillins (51.1%) were most commonly prescribed; of these, amoxicillin comprised 4.1%. In three clinical scenarios, oxytetracycline (1.2%), first-generation cephalosporins (0.5%), and second and third-generation cephalosporins (12.5%) were most commonly prescribed; an aminoglycoside (gentamicin) was prescribed in only 0.2% of cases.<sup>8</sup> Our survey found no records of

Sulfa drugs were the most frequently prescribed antibiotics. In cattle, S1 drugs were prescribed for 44(66.67%) animals, S2 drugs for 12(18.18%), and S3 drugs for 10(15.15%). In goats, S1 drugs were prescribed for 32(41.56%) animals, S2 for 30(38.96%), and S3 for 15(19.48%). Of the  $\beta$ -lactamase antibiotics, penicillin was prescribed more frequently (22[75.86%] cattle, 9[39.13%] goats) than was amoxicillin (7[24.14%] cattle, 14[60.87%] goats). The frequency of use of other groups of antimicrobials is illustrated in Table 2.

cephalosporin use. Although cephalosporins are regularly prescribed in urban areas of Bangladesh, their use in rural areas is limited because of their comparatively high price (\$2/g) and the preference of the residents, in some cases, for low-cost treatment regardless of treatment outcome.

### Use of antihelminthic

Livestock production under the smallholder system is hindered by many factors, including parasitism. The economic loss caused by gastrointestinal parasites in food animals in Pakistan has been estimated to be US\$ 0.47 (cattle) and US\$ 0.41 (buffalo) per animal per day. One study found that after anthelmintics were prescribed, daily milk production increased by 0.71liters (cattle) and 0.89liters (buffalo); milk fat percentage increased by 0.37 (cattle) and 0.42 (buffalo).<sup>9</sup> Cattle and horses are now commonly treated prophylactically with anthelmintic drugs every 2months (sheep and goats, every1 to 2months) during the grazing season.<sup>10</sup> A study of animal healthcare providers in the Thal area of Pakistan found that veterinary officers had the highest level of awareness of parasitic infections in sheep and goats and prescribed anthelmintics according to a predefined schedule. Farmers, on the other hand, had the lowest level of knowledge of parasitic infections.<sup>11</sup> The use of suboptimal doses of an anthelmintic contributes to widespread acquired resistance to that drug in helminthes.<sup>12</sup> Injudicious anthelmintic treatment can also enhance the dissemination of microbial pathogens.<sup>13</sup> Our results clearly show that anthelmintics were the most commonly prescribed pharmaceuticals, possibly because of general awareness of the detrimental effects of parasites on animal health and production. The choice of anthelmintic should be based on knowledge of parasite biology, epidemiology, drug sensitivity, and a sound history of husbandry.<sup>14</sup>

## Conclusion

This study provides objective data on overall prescription patterns by hospital-based veterinarians in Bangladesh. Although we did not gather complete data regarding dosing schedules, our results indicate that regular deworming schedules are commonly used. Sulfa drugs and an aminoglycoside (gentamicin) were the most commonly prescribed drugs for treatment of infectious disease. Prescription patterns could be improved by accurate identification of the infectious organism and adherence to recognized published guidelines. Integration of parasite control with nutrition planning and a holistic vision will potentially reduce the use of drugs and protect animal welfare, ecological balance, and farmers' incomes, with no adverse effects other than injudicious use of medicines.

## Acknowledgements

We thank Laurie Anne Walden, DVM (Charlotte, NC, USA) for providing English-language editing of this article. Special thanks to the veterinary surgeon and Upazila livestock officer of Atrai for their kind cooperation and contribution during data extraction.

## Conflict of interest

Author declares that there is no conflict of interest.

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