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Antibiotic misuse by farmers in Ngoma subcounty Nakaseke district, Uganda

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Abstract

A cross-sectional study was done in Ngoma sub-county, Nakaseke district to assess the extent of antibiotic abuse by farmers and the associated precipitating factors. Simple random sampling without replacement was used to select farms and drug shops. Single visits were made and respondents interviewed using semi-structured questionnaires. Drug shops were the main source of antibiotics to farmers (80.6%). Tetracycline was the most used drug (65.5%) followed by Penicillin (21.9%). Most farmers (90.2%) were ignorant of the drug withdrawal period phenomena and 55.3% were not informed about the same by the veterinary practitioners during therapeutic intervention. Veterinary practitioners did not follow up treatment cases (59.7% of farmers). This could have been partially responsible for consumption of milk within the withdrawal period and incomplete treatment regimen. The drug shops were mainly operated by unqualified persons. Antibiotics were not administered at right doses. Economic factors influenced antibiotic misuse. To prevent unauthorized people from dispensing drugs, let alone in absence of proper prescriptions, farmers needed to be sensitized on the importance of rational drug use. Relevant laws should be enforced. There was a need to carry out more studies like this in order to ascertain the magnitude of drug abuse in the livestock sector nation-wide.

Key words: Antibiotic misuse, livestock farmers, Uganda

Introduction

The effectiveness of drugs is undercut by misuse in both humans and animals. Since 1990, there has been a rise in drug-resistant bacteria mostly as a consequence of the overuse of antibiotics. Rational use of medicines requires that "patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community" **(1)**. Drug abuse/misuse is defined as the self-administration of drugs for non-medical reasons, in quantities and frequencies which may impart inability of the recipient to function effectively resulting in physical, social and emotional harm **(2)** or the unspecified use of a drug for purposes in which they are not prescribed for **(3)**. Thus, drug abuse or misuse is part of irrational drug use. WHO estimates that more than half of all medicines are prescribed, dispensed or sold inappropriately, and that half of all patients fail to use them correctly **(4)**, which leads to inefficiency of the medicines, treatment failure, rapid development of drug resistance, increase of toxicity risk and wastage of money **(5)**.

In majority of developing countries, antibiotics can be purchased without prescription from hospital pharmacies, patent medicine stalls, roadside stalls and hawkers even when this practice is illegal **(6, 7, 8, 9)**. This problem is compounded by the fact that there is lack of compliance in monitoring pharmacies and drug shops, which leads to distribution of sub-standard drugs to patients/farmers as well as the profit motive of the doctors/animal health workers **(8, 10, 11)**. Irrational use of medicines is a widespread hazard in human health and equally important in livestock sector as a major problem worldwide and results in wastage of scarce resources.

Modern livestock production systems use antibiotics and other antimicrobials to prevent or treat diseases and to improve growth. Drugs have improved weight and feed utilization in broiler chickens and turkeys, pigs, calves, beef cattle and replacement dairy heifers **(12)**. Unfortunately, this intensive, non-therapeutic use of antibiotics in agriculture leads to the development of antibiotic resistance, particularly in gut bacteria, such as Enterococci **(13, 14)**. Antibiotic resistance can increase with continued and widespread use of antibiotics to improve growth of livestock **(15)**. These microbes, especially the multi-resistant food-borne pathogens may infect people or their resistance genes may spread to other bacteria that can infect humans **(16, 17, 18, 19, 20, 21)**. In the livestock industry, the over use of drugs for treatment is encouraged by clients who tend to influence veterinary surgeons in terms of decision making, for instance, the animal owners may demand for injection even when it is not necessary **(22)**. Product characteristics, dose, treatment

interval and duration influence the selection pressure for antimicrobial drug resistance **(23)**.

In Uganda veterinary practice, before the study, was characterized by various illegal practices such as treatment of animals by unqualified people, dispensing of drugs by people other than veterinary surgeons and pharmacists, and not adhering to withdrawal periods of drugs among others. This was partly attributed to failure to implement regulations, such as those under Food and Drug Act of Uganda and Veterinary Surgeons Act **(24, 25)**. In addition, there was lack of documented information about rational drug use and factors that could lead to or precipitate drug misuse in the livestock health sector as per guidelines for responsible and prudent use of antimicrobial agents in Veterinary Medicine (Terrestrial Animal Health Code Section 3-9-3) **(26)**. It was against the above background that this study was done to assess the extent of antibiotic misuse in Nakaseke district, one of the regions in the cattle corridor of Uganda; and to document factors leading to antibiotic misuse.

Materials and methods

The study was carried out in Ngoma sub-county in Nakaseke district, formerly part of Luweero district, which is found in central Uganda (Fig 1). Nakaseke has 22,427 households, 69% of whom own cattle **(27)**. The people in Ngoma sub-county largely depend on animal rearing and most of the animal products, especially milk, from this area are sold to the markets found in locations beyond the district and processed by agro-based industries.

A sampling list/frame of 320 (N) farms was designed from the information given by the veterinary officer in-charge of Ngoma sub-county and the sample size (n) was calculated using the formula; $n = 4PQ / L^2$ **(28)** at a 95%CI, 5% error margin (L), prevalence of drug misuse (P) was assumed to be 50%, and Q=(1-P). Using this formula, the calculated sample size (n= 384) was greater than the sampling frame (N) and therefore an adjustment factor was used to calculate a new sample size ($n_{1=}$ 175) using the formulae; $n_1 = 1/(1/n + 1/N)$ **(29)**. A simple random sampling method without replacement was used; however, only 163 farmers volunteered to answer the questionnaire. Single visits to farms and selected drug shops were made, where respondents were interviewed and their responses recorded in semi-structured questionnaires.

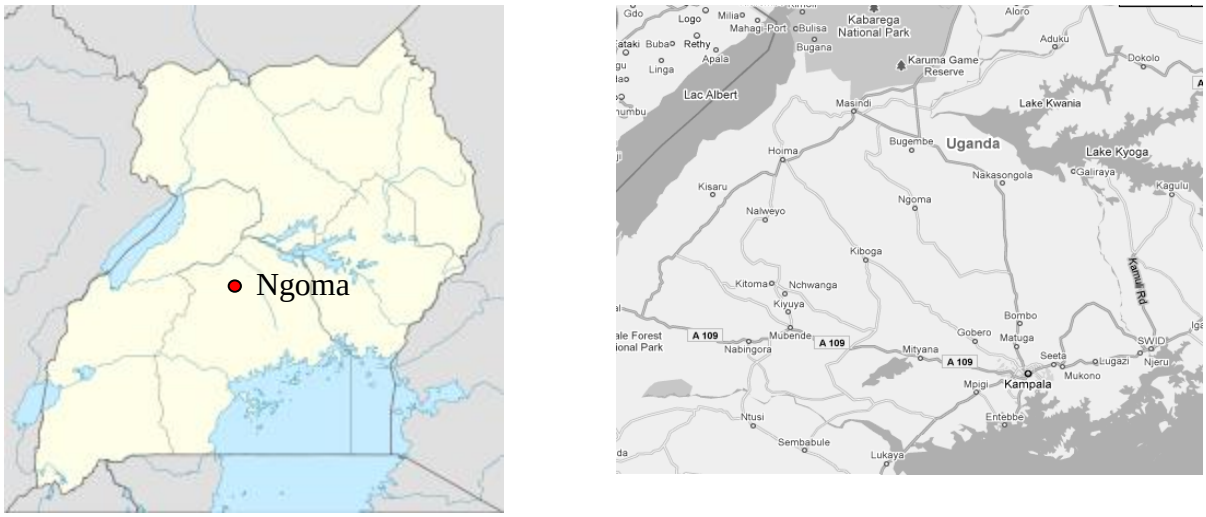

Figure 1: Map of Uganda showing the location of the study area (Ngoma) shown by the red dot http://www.traveljournals.net/explore/uganda/map/m2428312/nakaseke.html

Questionnaires were used to collect data that included caliber of extension service providers, drug sources, distance from drug shops, antibiotics commonly used, reasons for drug choices, animal weight estimation methods, routes of administration for drugs, dose rates, duration of therapy, knowledge and adherence to withdraw periods, diseases occurrence, conditions managed using antibiotics and farmers comments about current drug use. Drug shops were also visited to get information about the owners and/or the operators; qualifications of the attendants/supervisors; the recommended dose rates and withdrawal periods for the drugs commonly used by the farmers.

The information collected was summarized and entered into Microsoft excel and analyzed using the SPSS (version 16.0, Apache Software Foundation, copyright 2008) which enabled final data processing and analysis. Data was analysed using descriptive statistics and presented graphic or tabular form. Relationships between various factors studied were statistically analysed using a Chi-test at $p<0.05$ confidence level.

Results

The distances from the nearest drug shop ranged from one to 22km, with an average of 9.21± 5.7 km; and majority (64.7%) were beyond 5 km from the nearest drug shop. There was a significant relationship between distance and reason for drug shop choice (95% CI, $\chi^2 = 97.370$, p=0.004).

The study revealed that 66.4% of the farmers in Ngoma had access to extension services while 33.6% did not, especially in times of need for unspecific reasons. The extension services were mainly accessed from veterinary officers (50.4%), then animal husbandry officers (10.9%), and veterinary assistants (3.4%); while the qualification of service providers often used was not known in 35.3% of the farms. Details of drug source distance, access to extension services and caliber of providers were as shown in Figure 1. The study also revealed that 97.4% of the farmers occasionally treated the animals themselves when encountered with emergency medical cases and only 2.6% endeavored to find a veterinary surgeon or other professional worker to handle the case ($\chi 2$ =110.464, p=0.000 at 95% CI, p=0.005).

From Figure 2, it shows that farmers had various sources of the drugs used but 80.6% obtained them from drug shops, 10.2% from veterinarians in most cases who were in charge of those farms, 5.0% from fellow farmers and 4.2% from drug sales promoters who used to move from farm to farm encouraging farmers to purchase even if there was no immediate need for them. Reasons why farmers opted for a given source of drug together with the caliber of drug shop attendants; majority of whom were animal husbandry officers, were summarized as shown in Figure 2.

The most frequently used antibiotics for managing animal health were the Tetracycline family (65.5%) and Penicillins (21.9%). In addition, 86.6% of the farmers had reasons why they chose a given class of antibiotics for therapy while 13.4% had none. Majority of farmers chose a given drug depending on its effectiveness (42%), cost (41.2%), while others went for the common or available drug (16.8%). Chemoprophylaxis was practiced by 26.8% of farmers; majority (73.2%) of whom did not know the exact antibiotic used, while 13.4%, 12.6% and 0.8% used Oxytetracycline, Penstreptomycin; and Sulfonamides respectively.

For administration of proper dose of the drug, the weight of the animal is taken into account. From this study, all the farmers (100%) visually estimated the weight and used the intramuscular route used for administration of the antibiotics. Details of treatment regime and drug withdrawal adherence among the farmers were as shown in Figure 3. The dosage of 10% Tetracycline administered ranged from 5 mls/100kg – 25 mls/100kg, which represented 82.3% of the farmers under-dosing their animals. The frequency of drug administration was twice a week on most farms (53.8%); once a day on 26.9% of the farms; once a week on 17.6% of the farms while 1.7% was uncertain about the dosage regimes.

There was variation in therapy duration, where 19.3% of the farmers administered antibiotics for less than three days, 26.9% for 3 to 6 days, and 10.1% for a period above 6 days while 43.7% actually continued with therapy until they deemed that the animal had recovered. Majority of the farmers (68.1%) never took notice of the drug expiry dates. Only 6.7% of the farmers claimed to have knowledge on drug withdrawal period although 44.5% reported having received advice on drug withdrawal periods by the service providers. Regarding the utilization of milk during treatment, many of these farms (61.3%) sold it to the dairies; 20.2% sold the milk to dairies as well as for home consumption; 13.4% used it for home consumption only; while 5.9% adhered to withdrawal period but gave it to calves.

The five most common diseases/symptoms as reported by the farmers were theileriosis, trypanosomiasis, helminthosis, foot and mouth disease and cough. All the five diseases were reported by majority (76.2%) of the farmers while 23.8% encountered theileriosis, trypanosomosis and helminthosis only. Greenish-brown diarrhoea with foul smell (most likely due to salmonellosis, paratuberculosis, enterotoxigenic *E.coli* and *clostridium perfringens* among bacterial causes) was reported to have been experienced on 71.6% of the farms. On the other hand, greenish-brown diarrhoea but without foul smell and watery diarrhoea were reported on 15.4% and 13% of the farms respectively.

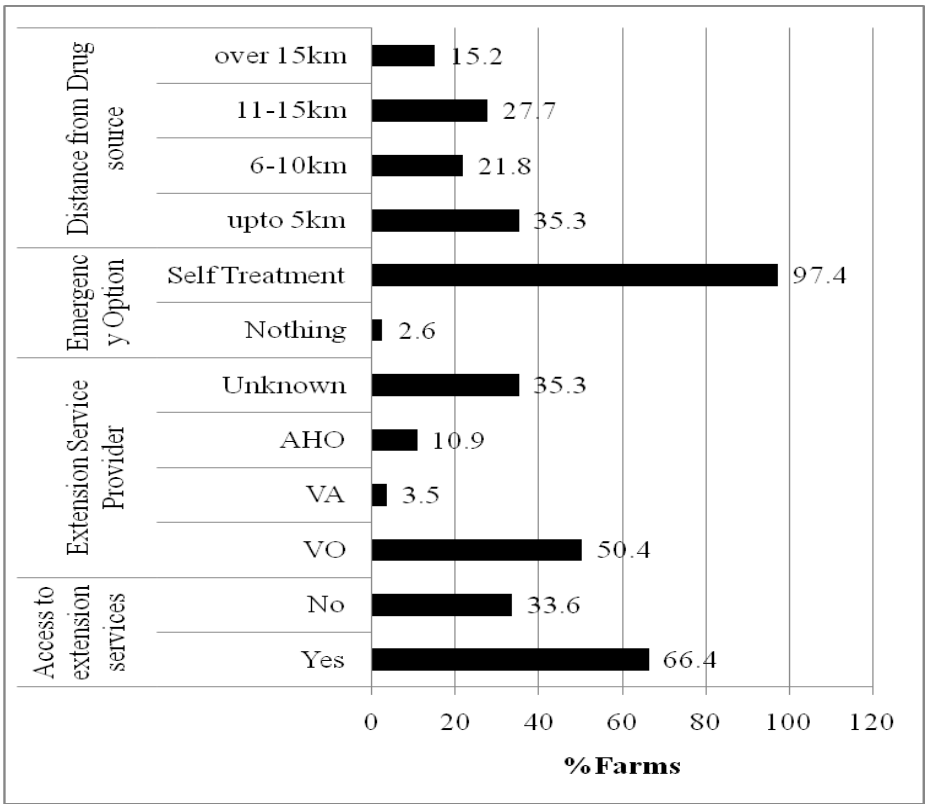

Figure 1: Drug source distance, access to extension services and caliber of providers (VO – Veterinary Officer; VA – Veterinary Assistant; AHO – Animal Husbandary Officer)

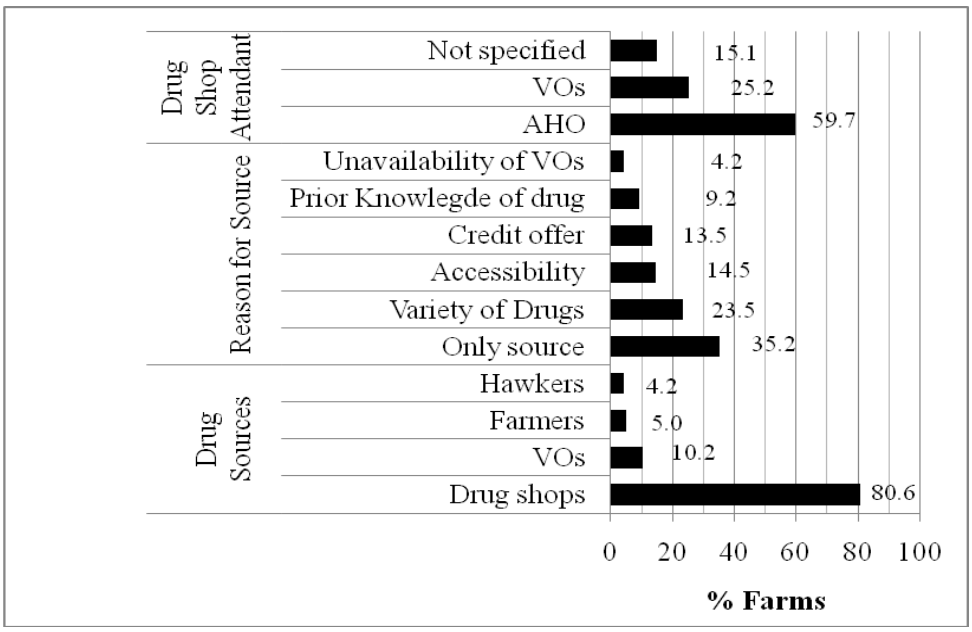

Figure 2: Sources of drugs; reasons for acquisition from such; and caliber of drug shop operators (VO – Veterinary Officer; VA – Veterinary Assistant; AHO – Animal Husbandary Officer)

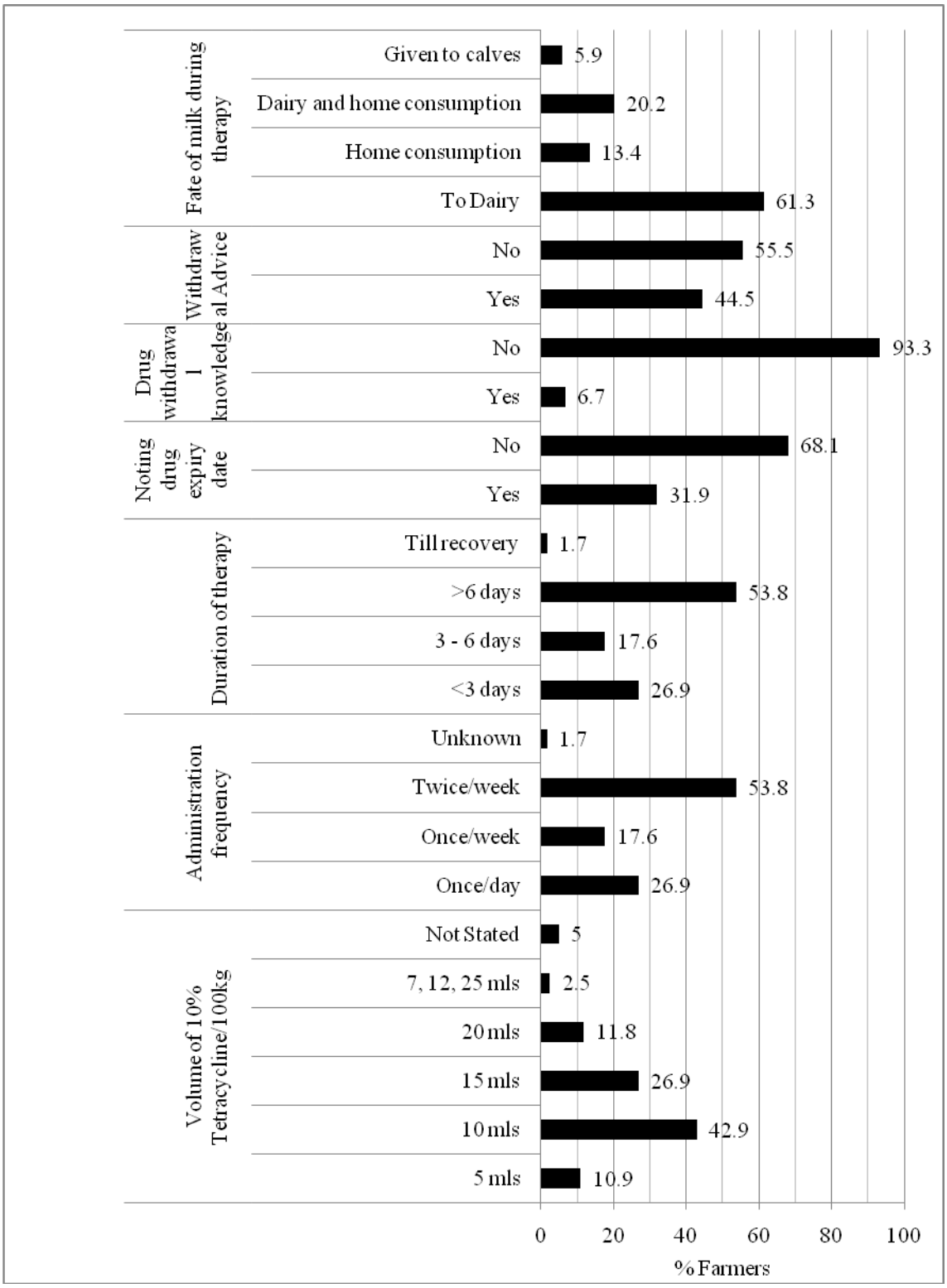

Figure 3: Treatment regimen and drug withdrawal adherence among the farmers

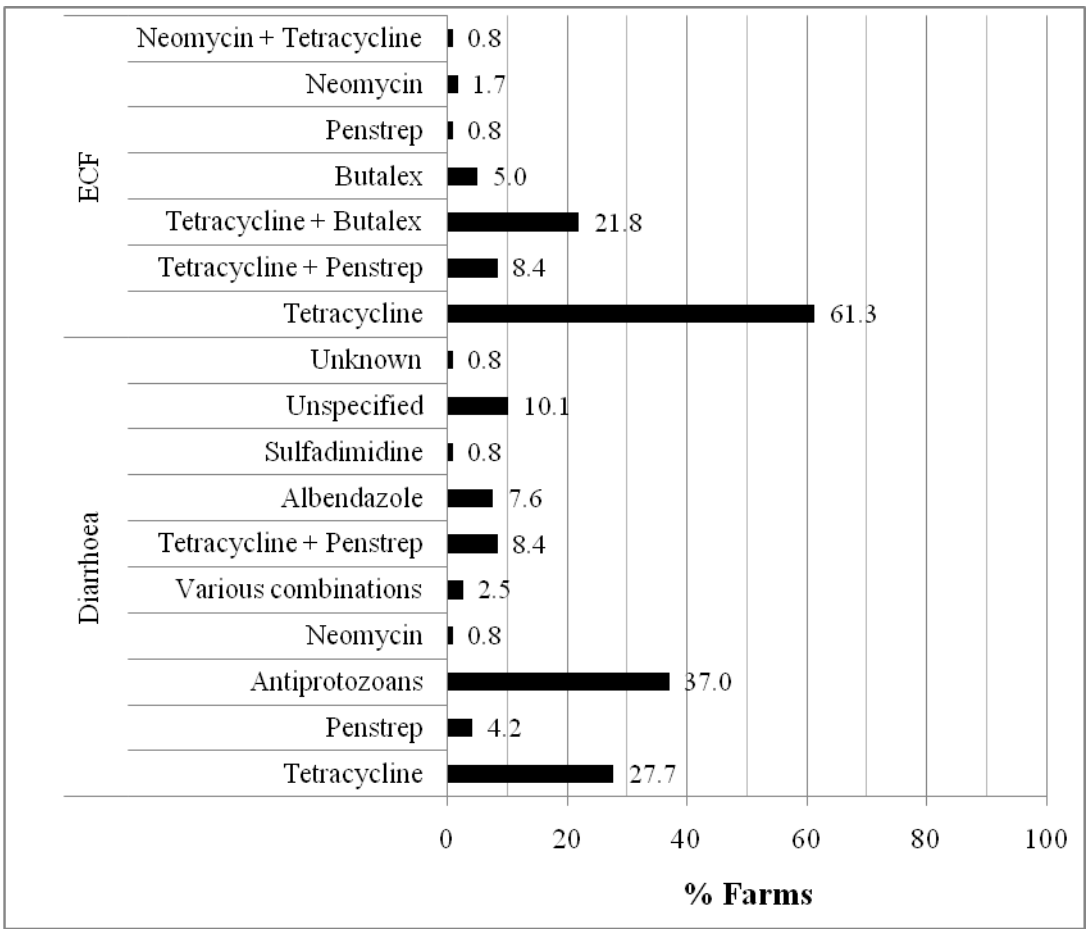

Figure 4: Frequency of use of antibiotics in management of diarrhoea and ECF

Discussion

In this study, some information pertaining to the use of antibiotics for management of veterinary health conditions as well as the factors leading to the misuse of antibiotics in Ngoma sub-county was established. The study revealed that farmers in Ngoma sub-county were involved in drug misuse, such as drug administration to sick animals until they were thought to have recovered. Similarly, a study on the use of veterinary drugs by Maasai pastoralists revealed that they administered drugs in the absence of veterinary supervision, obtained their supplies mainly from local village shops or informal traders and generally gave the drugs at dosage rates above the recommended standard dose, although the latter was contrary to our findings **(30)**. In Nigeria, in addition to unsupervised drug administration, under-dosing and incomplete treatments were the practices that lead to misuse of veterinary drugs, which is a similar situation in Uganda **(31)**.

Farmers' access to extension services had a significant relationship with farmers' options in case of emergent medical cases ($p=0.005$). The reported high proportion (33%) of the farmers that did not access extension services may have led to misdiagnosis of animal health condition by farmers and subsequent administrations of drugs that are not indicated for the treatment of some medical condition(s) encountered thus, drug misuse.

The distance from drug source influenced farmers' choices in deciding on where to buy drugs from. There was a significant relationship between drug source and farm distance from drugs shops

(p=0.004). This could be so because some farmers bought or shared drugs from fellow farmers who operated illegal drug shops on their farms. Needless to say, the illegal drug shops and premises where the drugs were stored were neither inspected nor licensed by National drugs authority (NDA) and may therefore not be in proper condition for purposes of storage, which could adversely affect the quality of the drugs.

The operation of illegal drug shops could be due to economic reasons where farmers seek to earn extra income by selling drugs to fellow farmers. This was further evidenced by a statistical association between treatment follow up and half payment or treatment on credit (p=0.05). This association implied that most of the treatments were not monitored because of economic reasons which could result into farmers giving supplementary medication in case clinical signs persist after intervention by the animal health worker, thus precipitating antibiotic abuse with possibility of drug interaction and toxicity. Acquisition of drugs from sales promoters encouraged use of expired drugs since the farmer was likely to keep it until needed or when the entire content were used up. It was also likely to be used for management of diseases for which it was not prescribed for.

Hitet® (oxytetracycline hydrochloride) was the commonest tetracycline in drug shops and used on farms. This drug was indicated for various bacterial and protozoan diseases at a dosage rate of 1-2mls/30kg; and the withdrawal periods for slaughter and milk consumption were 7 days and 48 hours respectively. Considering the dose-weight relationship, there was no difference between the Tetracycline dose given to an animal weighing 100kg and those that were heavier. This could be due to the fact that all the farmers visually estimated the animal weight which was a poor, unreliable and inconsistent method. From this study, some farmers administered up to 25mls to 100kg animals compared to the recommended dosage, which should have been 6.66mls for 100kg animal. This means that administering 25mls to 100kg animal would be 3.75 times higher than the recommended dose. Similarly elsewhere overdosing was reported among the Maasai pastoralists **(30)**. Hence, with the high doses administered; coupled with not observing the withdrawal periods, the problem of drug residues in the animal products was a likely public health hazard.

Multiple factors responsible for irrational drug use among farmers in Ngoma sub-county were established, with economic factors having an upper hand, followed by the failure of veterinary practitioners to accomplish their roles. Failure of some farmers to access veterinary extension services when needed probably contributed to the misuse as some of them resorted to treatment of sick animals by themselves. Many developing countries lack quality compliance in monitoring pharmacies and drug shops. This lead to distribution of sub-standard drugs; purchase of antibiotics without prescription, even when this practice was illegal; and self administrations **(6, 7, 8, 30, 32)**. Lack of treatment follow-up of cases by the veterinarian was contrary to what was expected. It is an obligation of veterinarians to actively promote disease prevention efforts, to treat as conservatively as possible, and to explain the potential consequences associated with antimicrobial treatment to animal owners and managers, including the possibility of promoting selection of resistant bacteria **(33)**.

To counteract drug misuse in management of animal health, the government of Uganda, through the National Drug Authority (NDA), should enforce the laws to prevent unauthorized people from dispensing drugs without prescriptions from veterinary surgeons **(34)**. The veterinary professionals should obligate rational drug use and sensitize farmers about issues related to conservative antimicrobial drug use and antimicrobial resistance. Eventually, the veterinary practitioners/farmers should balance ethical obligations regarding the perceived benefit to their clients/patients versus the perceived risk to public health. There was also need for such studies to be carried out all over Uganda so as to ascertain the magnitude of drug abuse in the livestock sector and there by draw-up plans to mitigate drug misuse in the veterinary health sector.

Acknowledgement

The veterinary officer in-charge of Ngoma sub-county, the farmers and drug shop owners and attendants who volunteered to participate in the study area are greatly acknowledged.

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