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A survey of the usage and storage practices of veterinary medicines among communal cattle farmers in the Kabbe South Constituency, Zambezi region

Oscar Madzingira and Sikabongo Simasiku*

Department of Animal Health, University of Namibia, P. Bag 1096, Ngweze, Katima Mulilo

Abstract

Veterinary medicines are an indispensable tool for animal disease control and prevention. Misuse, improper handling and storage can render them less effective. A cross-sectional study was carried out on 60 cattle farmers in the Kabbe South Constituency of the Zambezi region in Namibia. The objective of the study was to find out the usage and storage practices of veterinary medicines. Selected farmers were interviewed using semi-structured questionnaires. Results of the study showed that the majority of respondents were males (78.3%, n=47) with at least primary school level education. Overall, farmers acquired and used 13 different types of veterinary medicines from licensed shops and pharmacies (73.4%, n=44), the state veterinary office (23.3%, n=14) and from unregistered veterinary medicine agents (3.3%, n=2). The medicines comprised of antibiotics (n=4); vaccines (n=3); ectoparasiticide/anthelmintic (n=2), ectoparasiticides (n=1), anthelmintics (n=1) and vitamins (n=2). Although 36.7% (n=22) of the farmers owned or had access to a refrigerator, the majority (86.7%, n=52) did not maintain the cold chain. Most of the respondents (93.3%, n=56) self-diagnosed animal diseases and decided on the treatment without consulting a veterinarian. Oxytetracycline was the most commonly used veterinary medicine and was used at less than the recommended dose of 1ml/10kg by most respondents (83.3%, n=50). Although farmers sourced veterinary medicines from licensed retailers, the break in the cold chain and the under dosing of medicines may impair effectiveness. Self-diagnosis and treatment of animal diseases promote misuse and development of antibiotic-resistant bacteria in cattle which may render antibiotics on the market less effective. The training of all stakeholders along the veterinary medicine value chain in the region is recommended.

Keywords: Veterinary medicine, communal, antibiotics, cattle, Zambezi region.

1. Introduction

Veterinary medicines are the mainstay of animal health and welfare worldwide. They have been used for centuries to diagnose, treat, prevent and control animal diseases. Livestock production depends on

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veterinary medicines to improve production (Smith, 2013). They are also essential for meeting the ever-increasing global demand for safe food. Outbreaks of infectious diseases such as contagious bovine pleuropneumonia (CBPP) and rinderpest in the 19th century accelerated the discovery and use of veterinary medicines. Many years later, the control of these and other animal diseases such as Foot-and-Mouth disease is still dependent on vaccines. Vaccines are a cost-effective way of preventing the transmission of diseases (Roth, 2011).

In the Zambezi region, like in many African countries, communal cattle live at the edge of or in protected areas (Songorwa, 1999). As a result, they come into direct and indirect contact with wild animals including African buffalo, the natural reservoirs of many cattle pathogens (Jori et al. 2011; Jori & Etter, 2016) including Foot-and-Mouth disease, which has resulted in persistent disease challenges. Disease challenges at the interface are exacerbated by limited veterinary services (Mngomezulu-Dube, Green and Chimonyo, 2018).

The most common classes of veterinary medicines include antibiotics, anti-inflammatories, analgesics, vaccines, antihelmintics and ectoparasiticides. Proper storage of veterinary medicines and maintenance of the cold chain is crucial to maintaining efficacy (Roth, 1999) and in preventing treatment failure. It is the collective responsibility of all players in the medicine chain including farmers to implement procedures that ensure the maintenance of the effectiveness of medicines and avoid negative public health effects such as antimicrobial resistance (Spellberg et al. 2016). For veterinary medicines to be effective in preventing and treating animal diseases, the correct drug, dosage rate, route and frequency of administration should be used (Madsen, 2011). To ensure efficacy, veterinary medicines should be protected from temperature changes, direct sunlight and moisture variations. Vaccines need to be stored at 2-8^{o}C (Sheikh et al., 1995; VMD, 2015) or following the manufacturer's recommendations as indicated on the medicine label (VMD, 2014). Inappropriate handling, storage and use of vaccines may result in limited, no effect or even adverse effects on human and animal health (CDC, 2015). The end of the cold chain is considered as a critical stage in the maintenance of the efficacy of a vaccine because domestic refrigerators that are not suitable for appropriate storage of vaccines are often used (Martin-de-Nicholas & McColloster, 2014).

Under-dosing, overdosing, and failure to follow administration instructions of veterinary medicines may result in adverse effects in animals or humans. For example, failure to observe specified withdrawal periods may result in allergies and deaths in humans that consume contaminated animal products (Beyene and Tesega, 2014; Smith, 2013) or initiate antimicrobial resistance in common bacterial populations (Spellberg et al. 2016). Antibiotic-resistant microorganisms in animals can be transferred to humans through food (Wegener, 2012). Although most work on antimicrobial resistance has been primarily on antibiotics, available evidence shows that resistance to anti-parasitics is of emerging concern to animal production and health (OIE, 2018).

All veterinary medicines used on animals in Namibia must be registered with the Medicines Regulatory Council (MRC). The sale or administration of unregistered medicines is prohibited by law (MRSCA, 2003). However, some antimicrobials, anti-parasitic drugs and vaccines are permitted by law to be sold over the counter to laypersons as has been reported in many other countries (Smith, 2013). To the best of our knowledge, there is no documented study on the usage, handling and storage practices of veterinary medicines by communal livestock farmers in Namibia. Therefore, the objectives of the study were to find out the spectrum of veterinary medicines used by farmers, their usage and storage practices compared to standard practices.

Materials and methods

Study area

This study was carried out in the communal areas of the Kabbe South constituency of the Zambezi region in Namibia. Kabbe South constituency has an estimated population of 8073 and 529 households that are involved in livestock farming (NSA, 2011). It is located about 72km from Katima Mulilo town in the eastern part of the Zambezi region. Part of the constituency is prone to flooding during the rainy season. Kabbe South is one of the major cattle-farming areas of the Zambezi region. Cattle are reared on communal grazing land and frequently come into contact with wild animals such as buffalo, zebra, springbok, elephants and hippopotamus.

Study design

In this cross-sectional survey, a total of 60 cattle farmers were purposively selected for the questionnaire study from six randomly selected areas of Kabbe South (Ngoma, Lusese, Invilivinzi, Kabula, Itomba and Sundwa).

Data collection

Between August and September 2017, sixty livestock farmers in the study areas were interviewed in vernacular using pre-tested semi-structured questionnaires. Prior authorization from the headman of each area and the consent of each participating farmer was sought before conducting the interviews. The questionnaire consisted of three sections. Section A was designed to gather demographic data including age, gender and level of education. Section B focused on the sources, storage and handling practices of veterinary medicines, while Section C was designed to collect information on the usage practices of veterinary medicines. Medicine storage areas were inspected, and pictures were taken with the prior consent of the participants.

Data analysis

Data from the questionnaire was captured and analysed in Microsoft Excel 2010. Frequencies and proportions were used to describe responses by participants.

Results

Demographic profile

The majority of respondents (91.7%) were above the age of 36 years and were males (78.3%, n=47). The educational profile of the respondents is shown in Figure 2.

In this study, farmers purchased or sourced veterinary medicines from registered pharmacies and shops (73.4%, n=44) in Katima Mulilo, the state veterinary office (23.3%, n=14) and unregistered mobile agents (3.3%, n=2). The different classes of medicines that were purchased and used by the farmers are indicated in Table 1. Thirteen different types of veterinary medicines falling into five broad classes, that is, antibiotics (n=4), vitamins (n=2), ectoparasiticide/anthelmintic (n=2), ectoparasiticide (n=1), anthelmintic (n=1),

vaccines (23.1%, n=3) and one chemical (potassium permanganate) were stored for use in cattle. Long-acting oxytetracycline (83.3%, n=50) was the most common medicine kept by the farmers.

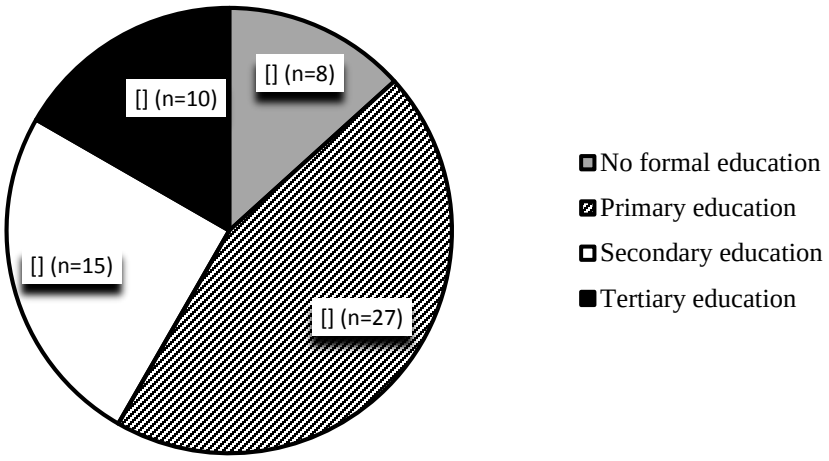

Figure 2: The level of education of respondents

Sources and classes of veterinary medicines used

. Other common medicines in possession of farmers were short-acting oxytetracycline (n=7), Pasteurella vaccine (n=7) and a combined anthrax, botulism and blackleg vaccine (n=6). On two separate households, expired antibiotic (short-acting oxytetracycline) and vitamin A were kept respectively. All veterinary medicines in the possession of farmers were registered as per Namibian law. Concerning the effectiveness of veterinary medicines, most of the farmers (85%, n =51) reported that veterinary medicines were effective, 13.3% (n = 8) stated that the medicines were ineffective and 1.7% (n =1) were not sure. About 33.3% (n = 20) of the farmers used medicinal plants and potassium permanganate to treat livestock diseases.**Table 1**: Veterinary medicines kept and used by the farmers.

Veterinary medicine	Class	Numbers of farmers	Frequency (%)
Swamycin LA (Oxytetracycline)	Antibiotic	50	83.3
Swamycin SA (Oxytetracycline)	Antibiotic	7	11.7
Hitet (Oxytetracycline)	Antibiotic	2	3.3
Oxyvet (Oxytetracycline)	Antibiotic	1	1.7
Vitamin A	Vitamin	1	0.6
Vitol (Vitamin A, D, E)	Vitamin	2	3.3
Closamectin	Ectoparasiticide/anthelmintic	1	1.7
Dectomax	Ectoparasiticide/anthelmintic	1	1.7
Delete All	Ectoparasiticide	2	3.3
Valbazen (Albendazole)	Anthelmintic	2	3.3
Pasteurella	Vaccine	7	11.7
Black quarter vaccine	Vaccine	2	3.3
Supavax	Vaccine	6	10
Potassium permanganate	Chemical	3	5

SA: short-acting; LA: Long-acting; Supavax: anthrax, blackleg and botulism vaccine

Veterinary medicine administration

Table 2 shows the dose of oxytetracycline that was administered by farmers to adult cattle (300 kg) and calves (100kg). Results show that the majority of farmers 83.3 % (n=50) injected 1-19 ml of oxytetracycline to adult cattle, while about 10% (n=6) administered 31ml to greater than 41ml of oxytetracycline. Most of the farmers (70%) administered 5-7ml of oxytetracycline intramuscularly to calves. In all ages, oxytetracycline antibiotics were used to treat gallsickness (25%, n=15), footrot (33.3%, n=20), lumpy skin disease (6.7%, n=4) and other unspecified conditions of cattle (30%, n=18).

Table 2: Volume of oxytetracycline administered to adult cattle (300kg) and calves (100kg).

Adult bovines			Calves		
Volume administered	No. of farmers	Percent (%)	Volume administered	No. of farmers	Percent (%)
1-10ml	30	50.0	1-4ml	14	23.3
11-19ml	20	33.3	5-7ml	42	70.0
20-30ml	4	6.7	8-9ml	2	3.3
31-40ml	2	3.3	10ml and above	2	3.3
41ml and above	4	6.7			
Total	60	100		60	100

Knowledge of veterinary medicine label information

Most of the respondents (71.6%, n=43) were knowledgeable with regards to the role of the veterinary medicine label. They were able to state at least one function of the medicine label, while 28.3% (n=17) did not know the purpose of the veterinary medicine label. Among the knowledgeable respondents, 20% (n=12) stated that the medicine label shows the expiry date; 8.3% (n=5) mentioned that the medicine label gives the name of the medicine, while the majority (43.3%, n=26) identified the role of the medicine label as one of giving directions for administering the medicine.

Veterinary medicine storage practices

Of the interviewed farmers, the majority (63.3%, n=38) did not own or have access to a refrigerator and as a result, stored veterinary medicines outside the refrigerator. A more significant proportion of farmers that owned or had access to a refrigerator (63.6%, n=14), did not use the refrigerators for storing veterinary medicines. Farmers who did not own or have access to refrigerators kept veterinary medicines in places such as open cupboards, under the bed and in open areas in the house. A vaccine against pasteurellosis was found stored in an open cupboard in one household, while a combination vaccine (anthrax, black quarter and botulism) was stored on the refrigerator door shelf.

Diagnosis and treatment of animal diseases

About 93.3% (n=56) of the farmers in the study self-diagnosed and self-treated cattle diseases. The remainder made use of veterinarians and animal health technicians for disease diagnosis. The source of information for the diagnosis of animal diseases was reported as previous experience (41.7%, n=25), advice from a veterinarian or animal health technician (45%, n=27) and literature sources (13.3%, n=8).

Discussion

In this study, only the medicines that are permitted by law for sale over the counter as per the Medicines and Related Substances Act (2003) and that are targeted at the common conditions and diseases affecting cattle in the Zambezi region were kept by the farmers. Among antibiotics, long-acting oxytetracycline was commonly used by the farmers as has been reported by other studies (Kigozi and Higenyi, 2017; Vougat Ngom et al. 2017; Mainda et al. 2015; Sekyere, 2014). Oxytetracycline was the antibiotic of choice because it is long-acting and has a broad spectrum. Over-reliance on this antibiotic can promote the development of antibiotic-resistant bacteria which may limit its future effectiveness, mainly because the drug was also under dosed in both adult cattle and calves. However, a study among pastoralists in Cameroon found a higher percentage (86%) of usage of the recommended dose of oxytetracycline (Vougat Ngom et al. 2017). The farmers used mostly inactivated vaccines (anthrax, botulism, blackleg, pasteurellosis) that are relatively heat stable (Pickering, Wallace and Rodewald, 2006) and easier to store. The use of potassium permanganate against cattle diarrhoea was somewhat surprising because this chemical has never been reported as effective against diarrhoea in the literature.

The majority of farmers in this study purchased veterinary medicines from reliable veterinary medicine retailers that are regulated according to the Medicines and Related Substances Act (2003), and its regulations. Only a small proportion of the respondents purchased veterinary medicines from unregistered agents, who often sell medicines of unreliable quality and efficacy (Abiola, 2001; Têko-Agbo et al. 2003; Abiola, 2005). However, none of the licensed veterinary medicine retailers provided farmers with ice packs or encouraged farmers to maintain the cold chain for heat-labile products such as vaccines, which has the potential of reducing the efficacy of medicines (WHO, 2002) especially under the prevailing high ambient temperatures in the study area. The prescribed storage temperature for most vaccines is from 2-8 ℃ (CDC, 2015). Some farmers with domestic refrigerators did not use them for medicine storage, perhaps due to a lack of knowledge. A deteriorated vaccine that was found in a functional refrigerator was considered to be indicative of poor storage practices by the farmer. The storage of the vaccine on the door shelf, the regular opening of the fridge and the widely reported shortcomings of the domestic refrigerator as a medicine store (CDC, 2015; Yakum et al., 2015) may have contributed to the deterioration. The expired vials of veterinary medicines that were found on two households point to the possibility of use of expired medicines on cattle despite farmers' indications to the contrary. It is commendable that some farmers stored medicines in darkand cooler places away from sunlight and high temperatures. However, all farmers did not keep medicines in secure places as set out in the WHO guidelines for the storage of medicines (Snow, 2003), thus exposing them to potential abuse and misuse.

The self-diagnosis of animal disease that was prevalent among the respondents was attributed to limited access to veterinary services. Therefore, the potential for treatment failure, animal or production losses and the development of antimicrobial drug-resistant parasites and pathogens existed (Vougat Ngom et al. 2017). In Namibia, the relatively large number of non-prescription antibiotics and anti-parasitic medicines that are easily accessible to farmers make it easier to acquire veterinary medicines, as has also been reported in other countries (Chauhan et al. 2018; Redding et al. 2013). The rate of antibiotic use without consulting a veterinarian has been reported to be as high as 87% among rural farmers (Sudershan et al. 1995), which is higher than determined by this study.

It is worrying that greater than 50% of the farmers did not know the information contained on the veterinary medicine label. This may explain the under-dosing, poor storage practices and the lack of knowledge on drug withdrawal periods that was observed in this study. This is in contrast to the 82% and

88% of farmers that were reported to have this knowledge in Cameroon (Vougat Ngom et al. 2017) and Malaysia (Sadiq et al. 2018) respectively.

Results of this study showed that the cold chain for veterinary medicines was not maintained from the point of purchase to the point of administration. Some practices that can reduce the effectiveness of veterinary medicines and promote the development of antibiotic resistance were identified.

It is recommended that state veterinary officials provide regular and accessible services to the study area to facilitate effective animal disease reporting, treatment, prevention and control. Veterinary medicine retailers and farmers need to be trained on veterinary medicine handling, storage and administration. Farmers should consider administering vaccines to animals without delay after purchase or making use of solar-powered refrigerators. The use of alternative non-prescription antibiotics such as sulphonamides should be considered to prevent over-reliance on long-acting oxytetracycline antibiotics.

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Disclosure of conflict of interest

The authors declare no conflict of interest

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