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Sudda, Martha

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ANIMAL HEALTH MANAGEMENT PRACTICES IN ZERO GRAZING DAIRY UNITS IN ARUSHA CITY, TANZANIA

Sudda MM[1], Kusiluka LJM[2] and N Kassim[1*]

Martha Sudda

*Corresponding author email: neema.kassim@nm-aist.ac.tz

[1]The School of Life Sciences and Engineering, Nelson Mandela African Institution of Science and Technology, P. O. Box 447 Arusha, Tanzania

[2]Mzumbe University (Chuo Kikuu Mzumbe), The Office of Vice Chancellor, P. O. Box 1, Mzumbe, Morogoro, Tanzania

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ABSTRACT

This study aimed at investigating the animal health management practices in zero grazing dairy units. A questionnaire was used to assess the veterinary practices including the administration of antibiotics and other veterinary inputs to promote growth, prevent and treat diseases. Sixty-five (65) respondents were involved in the study. All the respondents (100%) reported that they did not use growth promoters while 98.5% reported the use of prophylactic vaccines. No withdrawal periods were observed for all the prophylactic vaccines given to animals as instructed by Ward Livestock Officers that the vaccines were not harmful to the health of consumers. Of the 65 respondents, 95.4% (62) reported the use of therapeutic antibiotics. The withdrawal period for therapeutic antibiotics ranged from 1 to 3 days as reported by 60% of the respondents while 24.6% (16) reported the withdrawal period of between 4 to 7 days, 4.6% did not observe withdrawal periods and 6.2% depended on the instructions from the veterinarians. Of the respondents, 53.8% attended animal health management training and 59.6% kept no records for any health interventions made to their animals. Based on the observational findings, majority (84.6%) of the cow's enclosures were of poor hygiene. Warm water was used by 87.7% of the respondents to wash the udders prior to milking, 93.8% used towels to drain water from the udder(s) and100% of farmers lubricated the teats with udder salve prior to milking. Poor hygiene of the enclosures and washing the udders instead of teats only may predispose animals to infectious disease and this may lead to increased use of antibiotics, which may result into emergence of antibiotic resistance. It is, therefore, recommended that farmers should be trained on best animal health management practices such as teat washing, removal of manure from the animal pens as preventive measures for infectious diseases as well as improving the health and productivity of their animals.

Key words: Animal health, management practices, zero grazing, zoonotic infections, antibiotic resistance

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INTRODUCTION

Dairy farming in Tanzania is an important sector that boosts the economy at both the national and household levels and, provides employment opportunities for different groups of people at different stages along the food value chain [1]. Animal health management including provision of good quality nutritious feed, clean water, comfortable clean environment and reliable veterinary services are essential for increased animal productivity due to reduced animal morbidity and mortality, and for safeguarding public health by reducing exposure to zoonotic pathogens [2]. However, animal health management practices in subsistence farming are highly constrained by low level of education among farmers, infrequent veterinary services and poor farming facilities as a result of inadequate operational capital [3, 4]. Particularly, poor hygiene of the animals and the environment is considered one of the leading predisposing factors for infectious diseases in dairy farms [5]. Infectious diseases in dairy animals lead to reduced animal productivity, food insecurity, loss of trade and decreased economic gains from the enterprises [6]. Occurrence of infectious diseases in dairy cows necessitates the use of antibiotics for prevention and treatment of diseases [7]. Increased use of antibiotics in food animals results in antibiotic residues in both tissues and products of animals [8] and, the residues may enter the human body through consumption of animal food products. Such residues, regardless of how low the concentration is, could systemically affect the consumer's organ systems and progressively lead to diseases and sometimes death [9]. Among the common effects of residues include food intoxication, allergy, carcinogenicity, teratogenicity and emergence of antibiotic resistance [10]. Bacteria that have been exposed to antibiotics in animal tissues and products may be less susceptible to similar antibiotics intended for human use, and when they enter the human body through consumption of contaminated food, they may lead to human infections that are not responsive to treatment [7]. In the food industry, antibiotic residues in milk make processing of products such as yoghurt and cheese manufacturing by microbial starter difficult leading to financial and competiveness losses [11]. Therefore, appropriate animal health management practices are of great importance to both animal and human health and, increasing productivity of animals that are a source of income at household and national level. This paper aimed at investigating the existing animal health management practices for animals in zero grazed dairy units in Arusha, Tanzania.

MATERIALS AND METHODS

Study site and sampling

This study was conducted in Arusha City, Tanzania. The city, which is the headquarters of the Arusha region, is situated in north-eastern corner of Tanzania between 2^{o}S and 6^{o}S latitudes, and between 35^{o} and 38^{o} East of the Greenwich [12]. Arusha has a total of 252,554 improved dairy cows [13] and is the second region after Shinyanga in terms of cattle numbers, contributing to 12% of milk produced in Tanzania [14]. The study involved 10 wards namely; Sombetini, Baraa, Engutoto, Moshono, Moivaro, Kimandolu, Sinoni, Lemara, Daraja II and Themi where some of the residents practice dairy cattle keeping as their main economic activity. The wards were selected randomly using the R software. A questionnaire was administered to the person who takes care of the animals during household visits so as to gather information on animal health management

practices. The study households were selected randomly from the list of dairy keeping households provided to the authors by the Ward Livestock Officers. All the households included in the study had at least one lactating animal.

Sample size

The sample size was determined using the prevalence rate of 90% from a previous study [15] and the formula which is $N= (Z_{\alpha/2})^2 \times P(1-P)/d^2$; where; N is the required sample size, Z_{α}, the normal deviation at 5% which is 1.96, P, the estimated prevalence which is 90% and d^2, the precision of estimate considered as 0.05 [16]. According to the formula, a total of 66 respondents were selected for the study. However, only 65 respondents were interviewed because one of them dropped out during the last stages of the survey.

Data analysis

The data were processed using the Statistical Package for Social Science (SPSS) version 20 and descriptive statistics was used to compute the frequencies. Chi-square test was used to compare statistical significance at probability $p<0.05$.

RESULTS AND DISCUSSION

Demographic and socio-economic status

Most of the dairy farmers were married couples (86.2%) followed by widows (10.8%) and unmarried persons (3.1%). More than half of the respondents (52.3%) were smallholder livestock keepers while others reported to be employed in the government and/or non-governmental organizations (4.6%) and commercial businesses (10.8%). The results revealed that dairy farming was one of the economic activities that supported the livelihood of families in the study area with more than half of the households depending exclusively on it. The results are in agreement with other reports [3], that 36.9% of the farmers depended exclusively on livestock keeping in Temeke, Tanzania. Majority of the respondents had basic primary education (61.5%), followed by those who did not attend formal school (15.4%) and very few had secondary, college or university education. The level of education has been reported [17] to have an impact on the adoption of technologies and best management practices for improving the health of animals. Low education level has also been associated with imprudent use of antibiotics [18]. Since most of the antibiotics are labelled in English, farmers with basic education may not be able to read and understand readily the manufacturer's instructions due to the fact that *Maasai* or *Kiarusha* or *Meru* are their native languages followed by Kiswahili as the second language of communication. The demographic characteristics of the respondents are summarized in Table 1.

Herd size and cow's identity

The largest herd size (1.5%) was found to have 22 cows whereas the smallest herds (73.8%) contained one to five cows. Breeds of animals mostly kept included Friesian (41.5%), Friesian and Ayrshire crosses (41.5%), Ayrshire (12.3%), Friesian and Jersey crosses (1.5%), Jersey (1.5%) and Charolais (1.5%) (Table 2). These findings are in agreement with those of previous workers [19] who reported that modern dairy farmers keep an average of four cows that are improved for higher productivity and better yields.

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Zero grazing system is highly demanding in terms of inputs and resources so as to sustain production and hence, the small herd sizes.

Use of growth promoters, prophylactic and therapeutic antibiotics

The study revealed that growth promoters were not used in dairy units in Arusha City. The common feeds given to animals were grass, maize bran, sunflower seed cakes and cereal residues from breweries. On the other hand, 98.5% of the respondents reported to use prophylactic vaccines. Of the prophylactic vaccines used, 96.9% were provided annually against anthrax by the government under the disease control programme and administered by the Ward Livestock Extension Officers. However, all of the beneficiaries of the government disease control programme did not know the types of vaccines and other diseases for which the vaccines were intended. Of the respondents, 1.5% used *Aloe vera* and *Azadirachta indica* herbal extracts weekly to prevent occurrence of all types of animal diseases. In this case, the husband or wife usually prepares 500 ml of extracts, mixes it with 40 litres of water and then administers the mixture to the animals as a drench. There was no withdrawal period observed after the mixture was administered to the animals. *Aloe vera* and *Azadirachta indica* have been considered to be effective in treatment of a wide range of diseases and ailments in both human and animals [20,21]. All prophylactic veterinary products were considered not harmful to human health as informed by the Livestock Extension Officers, hence, no withdrawal period was observed by the studied farming households. Use of antibiotics can be minimized by ensuring general hygiene and sanitation of the cows and the environment, thereby reducing the favourable conditions for multiplication of most of the disease-causing agents including parasites and vectors [22]. In this study, animals were housed in pens with poor sanitation and this could be one of the reasons for increased use of antibiotics to prevent and/or treat diseases. Increased use of prophylactic antibiotics can induce mutation in microorganisms and lead to emergence of antibiotic resistant strains [23].

Majority of the dairy farmers (95.4%) reported the use of antibiotics for the treatment of animal diseases. Most of the respondents (78.5%) relied on veterinarians to attend to their sick animals. Similar findings were reported in a previous work that reported that more than half (54%) of the respondents relied on veterinarians to treat the animals [24]. Relying on experts in treating diseases could probably reduce misuse of antibiotics which, in turn, could reduce the chances of developing antibiotic resistant bacterial strains [25]. Although veterinarians were commonly involved in treating the cows, sometimes veterinarians were not available and farmers treated their cows themselves. Where a veterinarian was not consulted to attend to the sick animals, 12.3% of the farmers relied on their own experience to determine the dose, 3.1% depended on instructions from the dealers of veterinary inputs and 1.5% followed the instructions on the labels of the containers and/or leaflets. In Tanzania, sometimes antibiotics are sold in unauthorized outlets without any prescriptions or some of the inexperienced workers in veterinary input shops prescribed incorrectly leading to improper treatment of the animals [26]. In addition, there is a possibility that the agro dealers are not qualified and hence, they may provide wrong advice or instructions as well as wrong choice of antibiotic and treatment regime [27].

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Antibiotics were mainly administered through injection (78.5%), orally (1.5%) and both injection and oral routes (13.8%). Eighty per cent of dairy farmers were ignorant of the antibiotics used to treat their animals but trusted the veterinarian who attended to the animals. The common antibiotics mentioned by 10% of the respondents included tetracycline (10.8%), oxytetracycline (1.5%), alamycin (1.5%), penstreptomycin (1.5%) and sulfamethoxazole (1.5%). The doses of the antibiotics used ranged from 1 to 30 millilitres depending on the weight of the animal as estimated by farmers. The withdrawal periods for antibiotics ranged from 1 to 3 days as reported by 60% of the respondents. Of the respondents, 24.6% reported the withdrawal period of between 4 to 7 days. Some (4.6%) farmers observed no withdrawal period because milk was not produced when the cows were sick while 6.2% farmers depended on the instruction from the veterinarian. The results on the use of veterinary products and antibiotics are summarized in the Table 3.

Professional training and record keeping

Among the 65 respondents, 53.8% of them had attended animal health management training while 46.2% had not. Of the respondents who attended training, 12.3% attended formal training organized by the Livestock Training Agency based at Tengeru, Arusha and 41.5% attended informal training organized by Savings and Credit Cooperative Societies (SACCOS) and women's social groups. In terms of health management practices, there was no difference ($p=0.166$, $\times^2=1.86$) between trained and untrained farmers, which suggests that either the untrained ones learnt from the trained farmers or the training skills were not adopted. Lack of knowledge on animal health by dairy farmers has also been reported by other researchers [3, 19]. In terms of record keeping, more than half, 56.9% of all the respondents did not keep any animal health records while 43.1% kept records. Lack of records may lead to some inconsistency in the disease management schedules resulting into mismanagement of sick cases [28]. Keeping veterinary records helps the animal health experts to trace the history of interventions made on the animals including treatment [29].

Observational Findings

Onsite observations revealed that 84.6% of the animal houses were not cleaned prior to milking while 15.4% were cleaned. Dirty animal pens usually harbour bacteria from the environment and human faeces that carry infectious microbes which can cause infections to animals [30]. A clean environment reduces the rate of transmission of infectious diseases [31] and lessens the use of antibiotics. All cow's udders were washed with water only prior to milking the cows. Washing the udder must be followed by thorough drying to avoid contamination of the teats as a result of contaminated water draining to the teat ends causing mastitis [32]. Washing the teats before milking results in substantial decrease in microbial load in the milk [33]. The teats may be washed with water or sanitizers although sanitizers are more efficient in reducing microbial load in milk than water alone [34]. Majority of the respondents (87.7%) used warm water while 12.3% used cold water for washing the udder prior to milking. The use of cold water was associated with the belief that warm water predisposes animals to mastitis. The use of water could be associated with contamination of the udder in case the water used is contaminated [34]. Microbial contamination of the udder may lead to infections of the teats [35]. The frequency of contamination and the prevalence of diseases increase the

use of antibiotics that may cause emergence of antibiotic resistant bacterial strains [23]. To minimize contamination, the water should be boiled and then cooled before washing the teats and if possible a teat sanitizing agent may be added, followed by proper drying to avoid contaminating the milk [36]. After washing the udder, 93.8% used towels while 6.2% used hands to dry the udder. After washing and drying, 100% of the udders were lubricated with the udder salve before milking. Drying the udder using a towel or air drying has proven inefficient in reduction of microbial load compared to washing and towel drying the teats only [32]. In herds that had more than one milking cow, a single towel was used to dry the udder of all the cows. In such cases, there is a high chance of cross contamination especially if one or more cows have an infected udder or teats. To avoid cross infections, towels should not be shared among the milking cows.

CONCLUSION

It can be concluded from this study that dairy farming is an important economic activity for smallholder farmers in Arusha City, Tanzania. Most of the farmers had limited training on animal husbandry and health management which may have resulted in low milk productivity caused by diseases. In line with other studies which have reported sub-optimal productivity in zero grazing units in the study area, findings from this study call for the need to train farmers on animal production and health management practices in order to improve productivity of the herd.

Consent of Co-Authors
All authors consent to the submitted version of this manuscript.

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Table 1: Demographic characteristics of respondents in the study households

Title	Response	Frequency	Percentage
Marital status	Married	56	86.2
	Widow	7	10.8
	Unmarried	2	3.1
Occupation	Peasant and livestock keeper	34	52.3
	Livestock keeper	20	30.8
	Commercial business	7	10.8
	Employed in government or company	3	4.6
	Peasant, livestock keeper and commercial business	1	1.5
Education	Not attended formal education	10	15.4
	Primary school	40	61.5
	Secondary school	5	7.7
	College	5	7.7
	University	5	7.7

Table 2: Herd size and breeds kept in the study herds

Title	Herd size	Frequency	Percentage
Number of cattle	1 to 5	48	73.8
	6 to 10	12	18.5
	11 to 15	2	3.1
	16 to 20	2	3.1
	More than 20	1	1.5
Breed of the cows	Friesian	27	41.5
	Friesian and Ayrshire crosses	27	41.5
	Ayrshire	8	12.8
	Jersey	1	1.5
	Friesian and Jersey crosses	1	1.5
	Charolais	1	1.5

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Table 3: Use of growth promoters, prophylactic and therapeutic antibiotics in the study herds

Issue	Response	Frequency	Percentage
Use of growth promoters	No	65	100
Use of prophylactic antibiotics	Yes	64	98.5
	No	1	1.5
Who administers prophylaxis	Livestock officer	63	96.9
	Husband/wife	1	1.5
Common prophylactic products	I don't know	63	96.9
	Aloe vera and *Azadirachta indica*	1	1.5
Levels prophylaxis administered	I don't know	63	96.9
	500ml/40 litres water	`1	1.5
How prophylactic products are administered	Injection	63	96.9
	Feeds	1	1.5
Often prophylactic products are administered	Annually	63	96.9
	Weekly	1	1.5
Withdrawal period for after administering prophylaxis	No	64	98.5
Use of therapeutic antibiotics	Yes	62	95.4
	No	3	4.6
Who administer therapeutic antibiotics	Veterinary officer	51	78.5
	Neighbours	5	7.7
	Husband/wife	3	4.6
	Veterinary officer and husband/wife	3	4.6
Common therapeutic antibiotics	Tetracycline	7	10.8
	Penstreptomycin and alamycin	1	1.5
	Sulfamethaxazole-trimethoprim	1	1.5
	Oxytetracycline and penstreptomycin	1	1.5
How therapeutic products are administered	Injection	51	78.5
	Injection and orally	9	13.8
	Orally	1	1.5
How often therapeutic products are administered	When sick	62	95.4
Withdrawal period after administration of medicine	1 to 3 days	39	60
	4 to 7 days	16	24.6
	As instructed by doctor	4	6.2
	When sick no milk	3	4.6

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