



Veterinary health management in Azorean bovine dairy farms

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Abstract

Aim of study: To describe veterinary services and farm management practices in cattle dairy farms in São Miguel Island in the Azores and to identify weak points for improvement.

Area of study: São Miguel Island, Azores (Portugal).

Material and methods: A questionnaire survey was sent to all veterinarians who work in São Miguel Island. It asked about veterinary activity and perceptions of veterinarians working on dairy farms. The van der Waerden test was used to compare the degree of implementation of measures in farms between cooperative veterinarians and private veterinarians.

Main results: The overall questionnaire response rate was 67% (20/30). The percentage of veterinarians dedicated to bovine medicine as the main service was 55.6%. Overall, between 40% and 60% of veterinarians implemented a variety of Veterinary Herd Health Medicine (VHHM) programs such as mastitis control, breeding assessment and postpartum management, and the average implementation score of these VHHM, on a 1 to 5 scale, was 2.8 (95% confidence interval: 2.0-3.5). However, other VHHM programs such as biosecurity or hygiene procedures were implemented at a lower rate, ranging between 20% and 30%, and this needs to be improved.

Research highlights: Veterinary practitioners in São Miguel Island, Azores still focus their activity more on individual bovine medicine than in VHHM programs; besides, there is room for improvement in the implementation of some of these programs, such as reproduction, hoof health, nutrition, hygiene and biosecurity. This may be a similar situation to that of other regions in the world with a similar production structure.

Additional key words: herd health; individual medicine; practitioner; veterinary profession; dairy cattle; herd assessment.

Abbreviations used: CI (confidence interval); CV (cooperative veterinarians); IS (implementation score); PV (private veterinarians); SEM (standard error of the mean); VHHM (veterinary herd health management);

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Supplementary material (Annex; Tables S1-S3) accompanies the paper on SJAR's website.

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Introduction

Azores is an archipelago with 9 islands located in the Atlantic Ocean, with a dairy cattle sector employing 17.6% of the active population and producing 30% of the Portuguese milk supply. As in other European and worldwide countries (Barkema *et al.*, 2015), the dairy sector has changed greatly in recent decades, with a reduction in the number of farms, an increase in herd size and an intensification of management systems. Cattle veterinarian services in São Miguel Island in the Azores are traditionally provided by professionals working at producers' organizations with partial public support (cooperative veterinarians; CV) and those working in the private sector and linked to animal nutrition firms (private veterinarians; PV). Similar organizational veterinary structures are observed in other Azores islands, in the north of mainland Portugal and other regions worldwide. The role of veterinarians has also inevitably changed (Svensson *et al.*, 2018; Weyl-Feinstein *et al.*, 2021). In addition to clinical services, practitioners are expected to advise on herd nutrition, housing, animal welfare, farm management and disease prevention. Veterinary herd health management (VHHM) programs are aimed at preventing herd health problems and enhancing productivity and economic efficiency (Svensson *et al.*, 2018), and has been demanded by Azorean producers (Medeiros *et al.*, 2021). The focus on health and prevention of disease at the herd level has become a priority and has partially replaced individual cow-oriented medicine (Derks *et al.*, 2013). The dairy cattle veterinary professionals in Azores are adapting to covering both types of demanded services. The present study aimed at understanding the extent to which veterinarians have achieved this objective by analyzing their response to a questionnaire survey addressing implemented veterinary practices and commonly encountered farm management problems in São Miguel Island dairy farms.

Material and methods

Questionnaire and veterinarians

The survey, carried out between July 2019 to December 2020, targeted every veterinarian working on dairy farms on São Miguel Island, Azores, including 22 veterinarians registered with the National Professional Register System working in cooperatives (CV), 7 veterinarians employed by animal nutrition companies (PV) and one additional PV with his own practice. The questionnaire used was a modified version of the one employed in a previous study (O'Shaughnessy *et al.*, 2013). The structured questionnaire addressed six topics (Annex [suppl]): veterinary experience, dedication to ambulatory clinical work, implementation of herd health programs such as mastitis control, biosecurity and hygiene, disease prevention and further

recommendations. The questionnaires were anonymously processed and included 26 closed, binary questions with 5 associated tables to express the degree of implementation of specific practices employing an implementation score (IS) on a 1 to 5 scale (1: low intensity/frequency of implementation and 5: maximal implementation), and five open-ended questions with five associated tables to register the degree of implementation (IS: 1-5) of 95 measures. The response rate considered questionnaires with replies to at least half of the questions.

Statistical analysis

Frequencies and proportions were calculated for qualitative binary variables and mean \pm standard error of the mean (SEM) and 95% confidence interval (95% CI) for quantitative ones. The van der Waerden test was used to compare the frequency of the different responses obtained regarding the veterinary activities between CV vs. PV vets, using the central estimations of the responses. The JMP® 14 software for Windows (SAS Institute, Cary, NC, USA) was used.

Results and discussion

This study summarizes the opinion of dairy cattle veterinarians in São Miguel Island, Azores (Portugal), on implemented veterinary practices, herd health status and farm management practices in dairy farms in the island. The questionnaire response rate was 66.7% (20/30), similar to that previously reported in other surveys (Gerber *et al.*, 2020). The mean (95% CI) number of years of professional experience of the surveyed veterinarians was 6.9 (3.8–10.3) years.

The percentage of practitioners performing different kinds of veterinary services is reported in Table 1. Integral service covering bovine medicine, consultancy, herd reproduction and nutritional management advice on at least one farm, was provided by 3/20 veterinarians (15.0%), and all were PV. Instead, official zoosanitary procedures such as mandatory disease surveillance and vaccination and hygiene programs, were performed by 55.6% (10/18) of respondents, all being exclusively CV (Table 1). Official zoosanitary procedures are still one of the most frequent veterinary services more commonly required by farmers not enrolled in herd-level disease prevention programs. The proportion of veterinarians involved in herd reproduction management and milk quality programs were 28% and 17%, respectively (Table 1).

The percentage of veterinarians performing health surveillance was significantly higher among CV than PV (54.6 % vs. 0%; $p=0.03$). On the other hand, the percentage of veterinarians providing nutritional advice to farmers, as a specific veterinary service, was marginally higher among PV (43%; 3/7) than CV (9%; 1/11; $p=0.09$; Table 1). This

Table 1. Advisory/assessment of health programs implemented on dairy farms and implementation score (IS) according to a 5-point frequency scale (mean \pm SEM) by practitioners (CV vs PV), and percentage of veterinarians working by subject (veterinarian activity).

Veterinary activities	Percentage (n/N)	Average ^[1] (95% CI)	CV (n/N)	PV (n/N)	p value
Health surveillance	33.3 (6/18)	-	54.6% (6/11)	0% (0/7)	0.03
≥ 1 type of health plan implemented	77.8 (14/18)	-	72.7% (8/11)	85.7% (6/7)	0.52
Individual cow-oriented medicine	55.6 (10/18) ^[2]				
- Lameness		2.8 (2.1-3.6)	2.3 \pm 0.4 (10/11)	3.7 \pm 0.6 (6/7)	0.04
- Calf management		3.7 (2.9-4.4)	3.4 \pm 0.5 (10/11)	4.0 \pm 0.4 (7/7)	0.38
- Heifer management		2.8 (2.0-3.6)	2.3 \pm 0.4 (9/11)	3.8 \pm 0.6 (4/7)	0.07
- Dry cow management		3.5 (2.9-4.2)	3.1 \pm 0.4 (10/11)	4.2 \pm 0.5 (6/7)	0.04
Zoosanitary procedures	33.3 (6/18)				
- Biosecurity		3.0 (2.3-3.7)	2.9 \pm 0.4 (9/11)	3.3 \pm 0.8 (4/7)	0.52
- Parasite control		3.8 (3.1-4.4)	3.7 \pm 0.4 (9/11)	4.0 \pm 0.5 (5/7)	0.67
- Vaccination		3.9 (3.4-4.5)	4.0 \pm 0.3 (9/11)	3.8 \pm 0.6 (5/7)	0.75
Herd-level reproduction	27.8 (5/18)				
- Breeding assessment (AI/Sires)		2.5 (1.2-3.5)	1.6 \pm 0.4 (9/11)	4.9 \pm 0.8 (5/7)	0.02
- Fertility		3.9 (3.2-4.6)	3.3 \pm 0.4 (8/11)	4.8 \pm 0.2 (6/7)	0.009
- Postpartum management		4.1 (3.5-4.6)	3.7 \pm 0.3 (10/11)	4.7 \pm 0.2 (6/7)	0.03
Herd-level nutrition	22.2 (4/18)				
- Nutrition		3.5 (2.8-4.1)	2.8 \pm 0.3 (9/11)	4.5 \pm 0.2 (6/7)	0.002
Herd-level milk quality assessment	16.7 (3/18)				
- Adequate milking practices		3.8 (2.9-4.7)	3.6 \pm 0.6 (10/11)	4.2 \pm 0.5 (6/7)	0.42
- Mastitis control (complete) ^[3]		3.7 (3.0-4.4)	3.6 \pm 0.4 (10/11)	4.0 \pm 0.7 (4/7)	0.47
Animal welfare farm certification	5.6 (1/18)				

^[1] Scale 1–5; 1: low intensity/frequency of implementation and 5: maximal implementation. ^[2] Two respondents did not differentiate among services. ^[3] Mastitis control programs were implemented by 61.1% (11/18) of the veterinarians. 95% CI: 95% confidence interval. n/N: number of veterinarians with positive response with respect to all respondent veterinarians. CV: cooperative veterinarians. PV: private veterinarians. AI: artificial insemination.

is probably because PV worked for nutritional companies and providing such advice was their duty.

Eighteen veterinarians answered the health plans block (11 CV and 7 PV; Table 1). At least one type of health plan was implemented by 77.8% (14/18) of the veterinarians (Table 1). The implementation score (IS) averaged 2.8 (95% CI: 2.0–3.5), and was 2.1 \pm 0.2 for CV and 3.7 \pm 0.6 for PV ($p=0.05$). Mastitis plans included etiological culture, antibiogram, milking and parlor evaluation, mastitis and dry cow therapy, vaccination and on-farm culture protocols. Eighteen veterinarians answered this questionnaire block (12 CV; 6 PV), with 11/18 (61.1%) implementing mastitis control programs. The level of implementation by farmers of such programs was moderate (IS=3.2 \pm 0.2; $n=15$), according to 83.3% (15/18) of the veterinarians addressing this issue. Specifically, dry cow therapy was reported by 77.8% of the veterinarians responding (14/18), with an IS of 2.7 \pm 0.3 ($n=14$).

The nutritional programs were more likely implemented in dairy farms by PV (IS=2.8 \pm 0.3; $n=7$) than by CV

(IS=4.5 \pm 0.2; $n=11$; $p<0.01$). Moreover, PV implemented more frequently breeding assessment programs, including artificial insemination and/or bull sire selection, than CV did (IS=1.6 \pm 0.4 vs. 4.9 \pm 0.8, respectively; $p<0.05$). A similar situation was found for the implementation of fertility health programs, including for example, routine postpartum exams (IS=3.3 \pm 0.4 for PV vs. 4.8 \pm 0.2 for CV; $p<0.001$; Table 1). These results reflect that these issues are more important for nutritional consultants (in fact, private veterinarians), trying to maximize the frequency of new lactations and to optimize yields through an adequate reproductive efficiency.

The survey corroborated differences in the veterinary service provided by PV and CV in São Miguel Island, Azores, and this occurs also in other countries (Derks *et al.*, 2013). Despite similar ambulatory clinical services provided by both CV and PV, private veterinarians on São Miguel Island are significantly more focused on herd health, highlighting a trend of change in this region, as formerly described. Drivers for this can vary (PV more focused on integral service

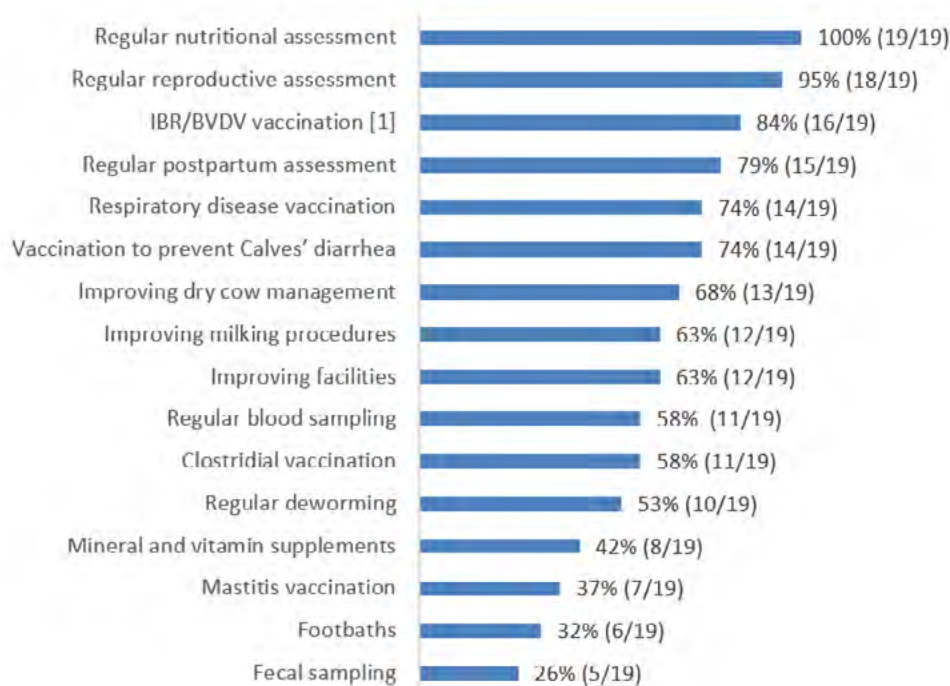


Figure 1. Percentage of practitioners considering the need for different preventive measures on dairy farms in the Azores. In parenthesis, n/N: number of veterinarians with a positive response among all responding veterinarians. [1] IBR, infectious bovine rhinotracheitis; BVDV, bovine viral diarrhea virus.

vs. CV on official zoosanitary procedures and bovine medicine) but moving beyond the traditional role of veterinarians is a fact all over the world (van der Leek, 2015). In Sweden, the lack of understanding of the benefits of such programs, organization and program adherence, coupled with a high turnover of veterinarians were the main reasons for farmers not to engage in VHHM programs (Svensson *et al.*, 2018). These are important issues that need to be considered to facilitate the implementation of VHHM in São Miguel Island and elsewhere. Veterinary herd health management contributes to a rapid increase in productivity, health, and economic efficiency in farms (Gertzell *et al.*, 2021). Moreover, the implementation of such services meets societal concerns about sustainable livestock production, animal welfare, disease prevention and biosecurity (Cannas da Silva *et al.*, 2006; Carmo *et al.*, 2018). Our study points out areas for improvement in Azores cattle veterinary practice particularly breeding assessment, disease prevention and control and biosecurity programs (Table S1 [suppl]) with an interesting perception of the prevalent problems perceived by the veterinarians. This divergence may reflect diversity of farmers and farm types, requiring different services based on the problems they experience (Fruscalso *et al.*, 2020; Weyl-Feinstein *et al.*, 2021).

Table S2 [suppl] shows that about half of the veterinarians (55.6%; 10/18) agreed that farmers implement preventive measures to avoid problems reported in Table S2, although their implementation was moderately frequent (IS=3.0±0.3; n=10).

Table S3 [suppl] shows that seasonal transhumance was practised in farms from 88.9% (16/17) of the veterinarians (IS=3.3; 95% CI: 2.8-3.8). Veterinarians with farms using antimicrobials adequately according to all rules of good practices accounted for 16.7% (3/18). Seventeen veterinarians answered the biosecurity and hygiene block (11 CV; 6 PV), with only 35% (6/17) reporting that farmers implemented appropriately biosecurity and hygiene programs (all CV; IS=2.1±0.3; n=6; Table S3). Low adherence to this kind of measure has been reported as a problem worldwide (Moya *et al.*, 2020), and it is an obvious challenge for farms in the Azores. Most farmers do not provide veterinarians disposable clothing for entering in their farms and biosecurity measures described were: (1) footbath/wheels entering disinfection, (2) professionals' cloths and material disinfection among farms, (3) limited cattle transhumance (seasonal cattle movement between pastures using public roads, to stay in pastures 1-3 weeks depending on the type of forages, until parcels are grazed), (4) land parceling, (5) limiting purchase of animals and testing and isolation/quarantine of incoming animals, (6) banned burial of animals on the land, (7) public health education, and (8) hygiene and milking routine improvement.

Veterinarians answering the questionnaire prevention block numbered 19 (13 CV; 6 PV) and 73.7% (14/19) stated that farms applied preventive measures with moderate frequency (IS=2.6±0.3; n=14; Table S3), and all of them considered that the degree of implementation was insufficient. Figure 1 presents the percentage of veterinarians that

consider specific practices important for successful dairy cattle production.

Farmers with complete vaccination programs are more likely to reduce disease dissemination and incidence, achieving higher milk yields and fertility. Likewise, nutrition programs are key issues in the herd health and efficiency of dairy farms (Cardoso *et al.*, 2020). Moving beyond traditional veterinary services towards VHHM programs requires a shift in mindset by both, the veterinarian and the client, which is sometimes forced by only one member of this equation: the veterinarian or the farmer (van der Leek, 2015). Shifting veterinary services from focusing on individual cow to herd-level medicine is often a matter of decades.

Nineteen veterinarians answered the further recommendations block (12 CV; 7 PV). The following recommendations were suggested: increasing yield efficiency; continuing education of farmers and consultants; digitalization of farm data (morbidity, cost analyses), evolution of the traditional mentality; and creation of a certified agrarian school.

This survey highlights that individual cow-oriented medicine, carried out by cooperative veterinarians, remains a large proportion of the veterinary service provided in dairy farms in São Miguel Island in the Azores. The implementation of veterinary herd health management programs, presently performed mostly by private veterinarians working for nutritional companies, needs enhancement, as a deep interrelationship between both veterinary services is likely to ensure ideal health and welfare in dairy farms. A higher investment in biosecurity, disease prevention and education of farmers in this region is needed. The results of our study should be pertinent to other regions of Portugal with similar farming and veterinary structures.

Authors' contributions

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Funding acquisition: J. Simões.

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Formal analysis: I. Medeiros, J. Simões. **Visualization:** F.E.L. Budiño.

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Writing – review & editing: F.E.L. Budiño.

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