

ROADMAP

Rethinking of antimicrobial decision-systems in the management of animal production

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Description of advisory and veterinary service models and possibilities for systemic strategies for change in AMU for health advisors and farmers

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About the ROADMAP research project

The overall aim of ROADMAP is to **foster transitions towards prudent use of antimicrobials (AMs) in animal production in different contexts to manage antimicrobial resistance (AMR). Prudent antimicrobial use (AMU) will be achieved by enhancing antimicrobial decision-systems along the food and drug supply chains.** ROADMAP will focus on supporting animal health and welfare through prevention and health promotion actions.

AMR is recognized as a significant threat to global public health and food security. Overuse and improper use of AMs in many parts of the world contribute to the emergence and spread of AMR. Although human and animal health require AMs, it has been estimated that two thirds of the future AMU growth worldwide will be in animal production. Improving the management of AMU in farm animals is therefore a critical component of dealing with AMR and optimizing production in the livestock sector. Nevertheless, the variety of contexts of AMU in the livestock sector is a major challenge to managing AMR. **There is no “one-size-fits-all” solution to improve AMU and strategies must be contextually developed** (for instance, strategies used in the Danish pig industry are difficult to adapt and adopt in the French free-range poultry farming). Successful solutions must be combined and tailored to the production systems and the social and economic context in which they operate.

ROADMAP will meet three general objectives, in line with the EU AMR Action plan: i) **Rethink AM decision-systems and animal health management;** ii) **Develop options for encouraging prudent AMU in animal production;** iii) **Engage all actors in the food and drug supply chains in fostering a more prudent use of AMs.**

Project consortium

Part. N°	Participant organisation name (acronym)	Country
1	Institut National de recherche pour l'agriculture, l'alimentation et l'environnement (INRAE) **	France
2	Association de coordination technique agricole (ACTA) ***	France
3	Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) **	France
4	University of Liverpool (ULIV) *	United Kingdom
5	Cardiff University (CU) *	United Kingdom
6	James Hutton Institute (HUT) **	United Kingdom
7	Alma Mater Studiorum - Università di Bologna (UNIBO) *	Italy
8	Aarhus Universitet (AU) *	Denmark
9	Eigen Vermogen van het Instituut voor Landbouw en Visserijonderzoek (EV-ILVO) **	Belgium
10	Research Institute of Organic Agriculture (FiBL) **	Switzerland
11	Stichting Wageningen Research (WR) *	Netherlands
12	Swedish University of Agricultural Sciences (SLU) *	Sweden
13	Southern Agriculture and Horticulture Organization (ZLTO) ***	Netherlands
14	European Forum of Farm Animal Breeders (EFFAB) ****	Netherlands
15	Fundacion Empresa Universidad Gallega (FEUGA) ****	Spain
16	Dierengezondheidszorg Vlaanderen (DGZ) ***	Belgium
17	INRAE Transfert (IT) ****	France

* *Universities/veterinary schools*

** *Research institutes specialized in both fundamental and applied agricultural and veterinary sciences*

*** *Public and private advisory services Organisations*

**** *Knowledge transfer and Innovation organisations*

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List of acronyms and abbreviations

- AMU Antimicrobial Use
- AMR Antimicrobial Resistance
- AST Antibiotic sensitivity tests

1 Summary

There is only limited literature available about the interaction between farmers and veterinarians, as well as veterinary services at a broader level. This literature review pointed to that a personalized communication strategy can play a central role. In order to tailor the approach, common knowledge and mutual understanding between the farmer and the veterinarian is important, as well as trustful atmosphere to ask open questions and build on a trustful relationship between veterinarians and those who are responsible for the herd management, health and disease strategies in the herd.

Dialogue and joint reflection are central aspects. Veterinarians need to understand the values of the farm, as expressed by the farm owners and managers, including their perception of risk, learning style, motivation, and very importantly their goals for their farms and animals.

The establishment and definition of a common goal between farmers and vets will increase the farmer's satisfaction with the veterinary practices and the implementation of disease prevention measures. The literature review pointed to a number of important elements to improve future efforts to more prudent AMU in the collaboration between veterinarians, veterinary services and farm related decision makers. Veterinarians should have access to training in communication, and all involved should acknowledge that advisory practice consists of 4 phases: 1) Agenda setting, 2) Investigation, 3) Reporting, and 4) Reviewing. Furthermore, literature pointed to the fact that cohesion and consistency among veterinarians is necessary regarding what is perceived as best practice, to avoid confusion, although also acknowledging that this is under constant negotiation, as new research insights and results are brought forward. The importance of efficient diagnostic tools should not be underestimated, e.g. more rapid and cheaper antibiotic sensitivity tests and availability of updated data for improved decision making on treatment strategies. Finally, transparency regarding prudent AMU through surveillance systems is pointed out as important. This can happen e.g. through benchmark indicator both on farms and among veterinarians.

2 Introduction

Monitoring of AMU in livestock alone reveals little about what drives AMU (Friedmann et al. 2007¹). It is important to assess the behaviors of key stakeholders responsible for antimicrobial prescription and administration.

The interaction and relationship between vets and farmers is a relevant leverage point to reduce AMU and increase animal health. In contrast to much previous research which has been limited to a focus mainly at farm and farmer levels, and behaviors, attitudes and perceptions at these levels, ROADMAP aims to go beyond these levels and take a wider multi-stakeholder approach and include more levels.

ROADMAP looks at the farm environment, the interactions between farmers, veterinarians and other key actors in the agricultural sector and the food systems.

Despite this wide approach, in this deliverable, we focused on the interaction and relationship between veterinarians and farmers, as this is a potential barrier or facilitator of reduced AMU, depending on the perceived relationship dynamic.

Farrell et al. (2021²) identified a variety of influences on farmer behavior and the authors suggest, that farmer decision-making is not always straightforward and depends on individual situations as well as on their working relationship with their veterinarian and that further research is needed to understand the interaction (Farrell et al. 2021²).

The interaction between farmers and vets is also addressed in some Living Labs established in the project:

- The Belgium Living Lab on pigs develops supporting methods of advisory service for vets to give advice or become coaches on farms.
- The Swiss Living Lab on organic dairy veal provides guidance for vets are supporting organic dairy farmers increase calf health.
- The Swiss Living Lab on organic pigs developed a training program for vets about organic farming in order to establish a better understanding of farmers goals and motivations.

In this literature review, the following research questions are addressed:

- What is known about veterinarians and their strategies to reduce of AMU?
- How relevant is the interaction between farmers and veterinarian to reduce AMU
- Are there examples of new interaction between health advisors and farmers to reduce AMU?

¹ Friedman, D.B., Kanwat, C.P., Headrick, M.L., Patterson, N.J., Neely, J.C., Smith, L.U. (2007) Importance of Prudent Antibiotic Use on Dairy Farms in South Carolina: A Pilot Project on Farmers' Knowledge, Attitudes and Practices. *Zoonoses and Public Health*, 54 (9-10) 366-375.

² Farrell, S., McKernan, C., Benson, T., Elliott, C., & Dean, M. (2021). Understanding farmers' and veterinarians' behavior in relation to antimicrobial use and resistance in dairy cattle: A systematic review. *Journal of Dairy Science*, 104(4), 4584-4603.

3 Methods

The literature study was conducted using the search terms in table 1 in ScienceDirect, Google Scholar and Google. Firstly, the titles of the studies resulting from this search were scanned for interesting studies (number of studies in brackets). 44 Studies were selected based on scanning through the titles. All studies included in this study were then selected by reading through the abstract. Studies were included if they contain information about antimicrobial use in veterinary practice or about veterinary advisory practice in general.

To find more potential studies, references of previously selected studies were looked at and considered based on title and abstract. From all the studies identified, 17 were selected for further analysis.

Table 1: Search terms for the literature survey

Search terms
<p>ScienceDirect</p> <ul style="list-style-type: none"> - "veterinary herd health management" (25) - "systemic strategies" AND veterinary AND antibiotic (3) - "veterinary service models" (2) - "antimicrobial use" AND "health advisor" (44) - "antimicrobial use" AND advis! AND "health advisor" (0)
<p>Google Scholar</p> <ul style="list-style-type: none"> - "veterinary herd health management" (267) - "systemic strategies" AND veterinary AND antibiotic (90) - "veterinary service models" (1) - "antimicrobial use" AND "health advisor" (34) - "veterinarian and farmers" AND "antimicrobial use" (5)
<p>Google</p> <ul style="list-style-type: none"> - Advisory and veterinary service models - Systemic strategies for change in AMU for health advisors and farmers

4 Results

With the above-stated search terms, it was possible to identify several papers about the veterinary advisory practice as well as about prudent antimicrobial use in veterinary practice. There is little research combining the two subjects. However, the studies about veterinary advisory practice discuss how advisory service can contribute generally improve the prevention of diseases and animal welfare. Healthier animals result in less antimicrobial use. Therefore, these studies were included in this literature research as they address important findings of the role of veterinarians.

This role has begun to change in the last years and is continuing to do so in the near future¹. A shift from treatment of single animals to herds as units is noticeable as well as a shift from test and treat to predict and prevent^{2,3}. As suggested by some authors veterinarians should evolve into advice-oriented consultants^{1,3,4}. Veterinary advisory practice should try to avoid damage instead of managing it once it has occurred⁵. An important term which appeared several times in different studies was “Herd health management” (or related expressions)^{1,3,5-7}. These expressions signify the need for a more holistic approach, which includes for example feeding regimes, housing, or alternative treatment methods to antimicrobials in order to prevent and contain diseases and therefore reduce antimicrobial use in farm animals. It goes beyond the treatment of purely clinical activities and requires a transdisciplinary approach^{3,5}.

Yet the literature research revealed that not the technical aspects of disease prevention or the lack of knowledge are the limiting factors in the widespread use of a holistic approach but communication is^{1,4,5,7-12}. Existing literature mostly agrees on what the most important communication tools for veterinarians are. Personalization of the communication strategy plays a central role. In order to tailor the approach, a veterinarian needs to know a farmer well, ask open questions and work on their personal relationship^{4,7}. Dialogue and reflection are central aspects⁷. Veterinarians need to understand the farmer’s values, perception of risk, learning style, motivation, and very importantly their goals for their farms^{3,7}. The establishment and definition of a common goal will increase the farmer’s satisfaction and the implementation of disease prevention measures. Tailored communication also leads to increased personal involvement and relevancy to them⁴. Instead of using the interpersonal vet-farmer relationship to prevent disease problems it is still rather framed as a barrier¹⁰. A pro-active approach by asking questions and engaging in discussions is generally seen as very useful to reach farmers^{3,4,9,12,13}. Joint decisions making by farmers and their veterinarians is perceived as the most effective decision making¹⁰. Yet, even though a good relationship seems to be important most farmers do not favor the “friend of the farmer” approach while it was the preferred approach by veterinarians⁶. Atkinson summarizes and structures the above-mentioned points and concludes that good veterinary advisory practice consists of four phases. It begins with establishing a common agenda. In order to analyze a specific farm system valid data is needed which is acquired in the investigative phase. The results found in the analysis are then reported to the farmer and ideally take preferred learning style into account (Report phase). A good advisor disseminates information to the whole farm team to achieve a more successful outcome. The fourth phase consists of reviewing and checking. It is crucial whether this advice is being followed or find out the reasons why not. This phase should be a continual process⁷.

Farmers and veterinarians rarely decide purely based on their own motivations but are embedded in a social environment, which shapes their values and believes. Changes in practice, therefore, depend on other actors such as colleagues, collective organizations, or downstream operators (distributors and slaughterers)^{13,14}. Increased transparency of prescription patterns of veterinarians is expected to trigger discussions and to mirroring of their colleague’s practices¹⁵. If there is little social pressure an individual farmer is less likely to change his behavior in biosecurity as an example¹⁰.

The implemented measures for prudent antimicrobial use are a result of the knowledge and the communication skills of a veterinary advisor⁷. There is a broad agreement in the literature that veterinarians should either receive additional communication training or that it should be ideally integrated into their current curricula.

Sometimes there are diverging attitudes between veterinarians on correct treatment practices which hinders the application of the most prudent and effective methods^{10,13}. It was shown that all persons and organizations in a farmer’s social environment should articulate the same message⁶.

In order to establish prudent practices, an effective regulation and policy framework is required. Some of them directly impact veterinary advisory practice. Some countries in Europe tried out different new schemes and defined clear goals for antimicrobial reduction. In the Netherlands, the aim is to reduce antimicrobial use by establishing more transparency through surveillance systems. To achieve this, they decided on benchmark thresholds for veterinary antimicrobial use on individual livestock farms. Prescription patterns of veterinarians can therefore be assessed and allow for self-regulation among them. Veterinarians compare and mirror the prescription patterns to colleagues¹⁵. Another option would be to promote the more frequent use of antibiotic sensitivity tests (AST). In Europe, they were still infrequently used in the year 2013. To encourage more widespread use of AST, governments could provide cheaper and more rapid AST¹⁶.

New challenges also emerge from the increased use of data from smart farming technologies. Access to real-time data and remotely accessible data has the potential to affect advisory practice. It demands new knowledge and skills from advisors such as data analysis capability. Knowledge of farm systems has to be combined with outputs from digital tools and therefore creating a hybrid knowledge. Additionally veterinarians are expected to be up-to-date to the scientific literature which is not an easy task due to the vast amount of resources and the fragmentation and competition of the advisory sector^{12,17}. Further adaptation of advisory practices is therefore required in order to create greater value from new technologies¹⁷.

Table 2: Main review findings and recommendations made in relation to improve the interaction between vets and farmers.

Veterinary advisory practices and possibilities for change
<p>Provide communication training for veterinarians</p> <ul style="list-style-type: none"> - Pro-active approach - Personalisation of approach - Good advisory practice consisting of 4 phases: Agenda setting, Investigation, Reporting, Reviewing
<p>Establish and invest in personal relationships</p> <ul style="list-style-type: none"> - Common goal setting - farmer’s values, - perception of risk, - learning style, - motivation
<p>Cohesion & Consistency among vets necessary on what is best practice</p> <ul style="list-style-type: none"> - Articulate the same message

More rapid and cheaper AST

Regulations to support more prudent antimicrobial use by vets

- Transparency through surveillance systems: benchmark indicator

Creation of hybrid knowledge

- Correct interpretation of data
 - Remotely accessible data
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5 Conclusion

This literature review on veterinary and advisory service models identified a number of options to improve the services related to AMU. First, veterinarians should have access to training in communication, to take pro-active, tailored and personalised action and use context relevant approaches. Good advisory practice consisting of 4 phases: 1) Agenda setting, 2) Investigation, 3) Reporting, and 4) Reviewing. The establishment and investment in personal relationships between veterinary service providers and the persons responsible on the farms for animal health and AMU, is crucial, and this involves common goal setting and a mutual respectful relationship, where the values and goals of the farm and herd is taken into account. Consciousness about different learning styles, and what motivates to improvement and change is important among all involved. Furthermore, cohesion and consistency among veterinarians is necessary regarding what is perceived as best practice, to avoid confusion, although also acknowledging that this is under constant negotiation, as new research insights and results are brought forward. The importance of efficient diagnostic tools should not be underestimated, e.g. more more rapid and cheaper antibiotic sensitivity tests and availability of updated data for improved decision making on treatment strategies. Finally, transparency regarding prudent AMU through surveillance systems is pointed out as important. This can happen e.g. through benchmark indicator both on farms and among veterinarians.

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