Research in Veterinary Science 97 (2014) 26–31

Contents lists available at ScienceDirect

Research in Veterinary Science

journal homepage: www.elsevier.com/locate/rvsc

Opinions of Spanish pig producers on the role, the level and the risk to public health of antimicrobial use in pigs

Miguel A. Moreno [a,b,*]

[a] Centro de Vigilancia Sanitaria Veterinaria, Universidad Complutense, Madrid, Spain
[b] Departamento de Sanidad Animal, Facultad de Veterinaria, Universidad Complutense, Madrid, Spain

ARTICLE INFO

Article history:
Received 28 January 2014
Accepted 13 April 2014

Keywords:
Antimicrobial use
Farmers
Opinions
Pigs
Survey

ABSTRACT

Antimicrobial use is a major driver of antimicrobial resistance and prescribers (physicians and veterinarians) and end users (patients, food producers and pet owners) are the cornerstones of this scenario. Intensive pig farming is a livestock activity that has a high antimicrobial use. This study is based on the opinions of pig producers.

The study was done at national level and comprised two independent cross-sectional surveys using a questionnaire-based methodology and face-to-face interviews carried out between April and October, 2010. The collected data, which consisted of opinions of producers on 48 farrow-to-finish farms and 62 finisher farms, showed that, irrespective of farm type, pig producers in Spain have an imperfect knowledge of the main use of antimicrobials. Antimicrobials are perceived as valuable cost-effective tools for animal health and husbandry and there is little concern among pig producers about the harmful effects on public health of on-farm antimicrobial use.

1. Introduction

Antimicrobials are singular among medicines in that their use may result in reduced efficacy (Sarkar and Gould, 2006) even in non-users. Antimicrobial resistance (AMR) in bacteria is a complex phenomenon resulting from the action of different forces. Little is known about the processes that trigger AMR in bacteria and increasing occurrence in people, animals and the environment. Nevertheless, as Baquero and Garau (2010) state: "*We still lack solid data about the true impact of antibiotic resistance in the morbidity and mortality of most bacterial infections*".

As antimicrobial use is one of the major drivers operating in this intricate scenario, much effort is being devoted to measuring it in an attempt to understand it (e.g. Bondt et al., 2013; Grave et al., 2006; Jensen et al., 2004; Moreno, 2012).

One of the cornerstones of antimicrobial use is made up of prescribers (physicians and veterinarians). The prescriber behaviour of physicians was systematically reviewed by Teixeira Rodrigues et al. (2013) and this topic has also been analysed in several studies with respect to veterinarians (e.g. Busani et al., 2004; Cattaneo et al., 2009; De Briyne et al., 2013; Gibbons et al., 2013). As a result, some common factors, such as perceived patient/client demand, have been revealed.

With regard to antimicrobial use and end users, several authors have also studied the attitudes, perceptions and opinions of patients (Emslie and Bond, 2003) and the public (André et al., 2010; Hawkings et al., 2007; McNulty et al., 2007a, 2007b) with respect to antimicrobial use and AMR. End users of antimicrobials are identified as crucial components for the understanding of antimicrobial use and the fight against AMR. Well-identified factors that contribute towards inappropriate antimicrobial use by human patients include self-medication and patient expectations of antimicrobial treatment.

In the veterinary field, pets and farm animals are the counterpart of human patients, but very little has been published on the attitudes and opinions of pet owners and farm animal producers with respect to AMR and antimicrobial use (Eltayb et al., 2012; Friedman et al., 2007). What is more, educational campaigns have not focused on them, despite the pioneer recommendation by the World Health Organization (WHO) as part of its global principles for the containment of AMR in animals intended for food. This is expressed as follows: "*Education strategies emphasizing the importance and benefits of prudent use principles must be developed and implemented to provide relevant information on antimicrobial resistance for producers and stakeholders*" (WHO, 2000). It is noteworthy that the ongoing European Commission's *Action Plan Against the Rising Threat from Antimicrobial Resistance* (European Commission, 2011) makes no specific mention of farmers under the '*communication, education and training*' section of the proposed key actions. The European Platform for the Responsible Use of Medicines in Animals (EPRUMA, 2013) has made demands to the European Union

* Tel.: +34 91 3943705; fax: +34 91 3943795.
E-mail address: mamoreno@vet.ucm.es.

http://dx.doi.org/10.1016/j.rvsc.2014.04.006
0034-5288/

for opportunities for farmers to undergo training in antimicrobial use.

Intensive pig farming is a livestock activity that has a putative higher antimicrobial use. In the year of the present study (2010), the production of pig meat in the 27 countries of the European Union was 22 million tonnes (Eurostat European Commission, 2011). Of these countries, Spain ranked second in pork production (Eurostat European Commission, 2011).

Bearing in mind the pivotal role of pig producers with regard to antimicrobial use and the ongoing Spanish Action Plan for Combating Antimicrobial Resistance (Anonymous, 2013), the aims of this study were to collect and analyse their opinions on the role, the level and the risk to public health of on-farm antimicrobial use. The study formed part of a broader research project on antimicrobial use in pigs in Spain (Moreno, 2012, 2014).

2. Material and methods

The study comprises two independent cross-sectional surveys focused on Spanish pig production (farrow-to-finish (FtF) farms and finisher farms) that had been described before (Moreno, 2012, 2014).

2.1. Questionnaires design, samplings and eligibility criteria

Detailed information on the surveys (questionnaires, samplings and eligibility criteria) has already been published (Moreno, 2012, 2014). Briefly, questionnaires with either 14 pages (FtF farms) or 9 pages (finisher farms) were used in face-to-face interviews carried out between April and October, 2010. These consisted mainly of open questions grouped into seven sections. Questions about antimicrobial use referred to the 6-month period prior to the interview.

The last section of the questionnaires (Table 1) was a list of 18 (FtF farms) or 15 (finisher farms) statements grouped as follows: health related (questions 1–5), husbandry related (questions 6–13) and public health related (questions 14–18). The original position of the questions in the questionnaire is shown in Table 1 to indicate that related questions were asked separately. Respondents were asked to rate their agreement with these statements using five ordinal closed answers: 'totally agree', 'agree', 'indifferent', 'disagree' and 'totally disagree'. In order to carry out some of the analyses, these ordinal variables were dichotomised into binary variables (e.g. 'agree' versus 'disagree') with neutral responses excluded.

The sampling frames were obtained from official data records from the Ministerio de Agricultura, Alimentación y Medio Ambiente (the Spanish Ministry of Agriculture, Food and the Environment) updated in January 2010 (FtF farms) and June 2010 (finisher farms). A multistage sampling methodology was applied to each survey. The primary sampling units were the Spanish Autonomous Communities and the secondary sampling units were farms in the first, second and third groups classified by size in accordance with Spanish regulations (Moreno, 2012).

2.2. Statistical methods

Descriptive (mean, median) and analytic (chi-squared tests and Student's t-tests) statistical analyses were performed using commercially available software (IBM SPSS Statistics V.19.0).

3. Results

3.1. Study participation

As already published (Moreno, 2012, 2014), of the 108 potentially eligible FtF farms, 33 (30.6%) were excluded because they did not fulfill the participation criteria (FtF farm in full operation for at least 6 months before the interview). This meant that 75 FtF farms were considered eligible and of these 49 (65%) were surveyed. Likewise, of the 108 potentially eligible finisher farms, eight (7.4%) failed to meet the participation criteria (finisher farm in full operation for at least 6 months before the interview). Interviews were conducted at 67 (67%) of the remaining 100 farms.

Table 1
Spanish pig producers' opinions (percentages) on antimicrobials per farm type.

QP	Question	Farrow-to-finish farms ($n = 48$)							Finisher farms ($n = 62$)						
		TA	A	I	D	TD	NA	A/D	TA	A	I	D	TD	NA	A/D
12[a]/11[b]	1. Antimicrobials can cure some of the diseases on my farm	21	79	0	0	0	0		34	61	0	5	0	5	19.7
1/1	2. Antimicrobials can cure all the diseases on my farm	2	15	10	54	19	0	0.2	3	21	3	56	16	5	0.3
5/5	3. Antimicrobials can prevent some of the diseases on my farm	19	69	0	10	2	0	7.0	13	55	5	19	8	0	2.5
9/8	4. Antimicrobials can prevent all the diseases on my farm	4	8	6	63	19	0	0.2	0	10	3	60	27	0	0.1
15/13	5. Antimicrobials can improve the health status of my farm	15	69	6	10	0	0	8.0	15	77	0	5	2	2	14.3
6/6	6. Antimicrobials can improve the performance parameters of my farm	6	67	13	15	0	0	5.0	11	53	5	23	5	3	2.4
2/2	7. Antimicrobials work less effectively than in the past on my farm	10	52	13	23	2	0	2.5	2	21	10	56	8	3	0.4
17/15	8. Antimicrobial use is profitable on my farm	8	73	6	10	0	2	7.8	10	55	11	10	2	13	5.7
11/10	9. Antimicrobial costs are high on my farm	2	21	4	60	2	10	0.4	3	13	8	42	16	18	0.3
3/3	10. I could reduce the use of antimicrobials on my farm	2	52	4	35	6	0	1.3	2	31	2	47	15	5	0.5
18/nd	11. I could reduce the use of antimicrobials at the pre-weaning stage on my farm	6	21	6	58	2	6	0.4							
7/nd	12. I could reduce the use of antimicrobials at the growing stage on my farm	0	46	6	42	2	4	1.0							
14/nd	13. I could reduce the use of antimicrobials at the finishing stage on my farm	2	42	0	48	4	4	0.8							
4/4	14. The use of antimicrobials in my pigs poses a risk to the health of farm-workers because of the selection of antimicrobial resistance	0	10	19	48	23	0	0.1	0	13	10	52	24	2	0.2
16/14	15. The use of antimicrobials in my pigs poses a risk to the health of farm-workers because antimicrobials will lose their ability to cure my own diseases	0	4	29	50	10	6	0.1	0	11	8	48	24	8	0.2
8/7	16. The use of antimicrobials in my pigs poses a risk to public health because of the selection of antimicrobial resistance	0	10	23	42	21	4	0.2	3	13	10	50	15	10	0.3
13/12	17. The use of antimicrobials in my pigs poses a risk to public health because antimicrobials will lose their ability to cure human diseases	0	10	27	46	10	6	0.2	0	10	11	45	19	15	0.2
10/9	18. The antimicrobials used on my farm are different from those used on people	17	21	31	13	2	17	2.6	10	31	8	29	5	18	1.2

QP, question position in the questionnaires; TA, totally agree; A, agree; I, indifferent; D, disagree; TD, totally disagree; NA, no answer; A/D, ratio agreements/disagreements.
[a] Farrow-to-finish farms.
[b] Finisher farms; nd: not done.