



Quantitative and qualitative antimicrobial usage patterns in farrow-to-finish pig herds in Belgium, France, Germany and Sweden



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ABSTRACT

Data on sales of antimicrobials using a standardised methodology have shown that there are vast differences between countries in amounts of antimicrobials sold for food-producing animals, but these data do not provide insight on how sales are distributed by species and age groups. The aim of this study was to compare herd level antimicrobial usage for pigs by age category, antimicrobial class and administration route for farrow-to-finish herds in four EU countries. A cross-sectional study was conducted among 227 farrow-to-finish pig herds with at least 100 sows and 500 finishing pigs in Belgium ($n = 47$), France ($n = 60$), Germany ($n = 60$) and Sweden ($n = 60$). Detailed information about the antimicrobial consumption for breeding and growing pigs was collected. Antimicrobial usage was quantified as active substance expressed as mg and then converted to treatment incidence (TI) based on Defined Daily Doses Animal per 1000 pig-days at risk. TIs varied between and within countries, herds and age groups. The Swedish herds had the lowest and the German herds the highest overall use. Most treatments were applied to weaned piglets except in the Swedish herds where treatments of suckling piglets were most frequent. Antimicrobials were most often applied through feed or water except in the Swedish herds where parenteral treatments were most frequent. Aminopenicillins was the antimicrobial class most commonly used. Use of third and fourth generation cephalosporins constituted 11% of use for the Belgian herds, which was higher compared to the other countries. There was a significant ($p < 0.01$) association between the within-herd antimicrobial use across different age categories. This study has shown that there were large differences in antimicrobial use for pigs between countries, herds and age groups in farrow-to-finish herds of similar size when actual consumption data were compared. Collecting detailed usage data can be used to efficiently target high users in order to reduce antimicrobial consumption.

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1. Introduction

Antimicrobials are crucial to both veterinary and human medicine but its use is hampered due to the risk of selection for and spread of resistance. Levels of resistance in pathogens varies

between countries (European Food Safety Authority (EFSA, 2015)) and when data on sales of antimicrobials for food-producing animals were compared to data on antimicrobial resistance, a clear association between use and resistance was found (Chantziaras et al., 2014; European Centre for Disease Prevention and Control (ECDC, 2015)) To retain a multitude of treatment options, it is therefore of utmost importance to reduce antimicrobial use to a minimum but without jeopardising animal health. Further, whenever antimicrobials are required to treat infectious diseases in animals, they should be applied prudently in line with the recently

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issued “Guidelines for the prudent use of antimicrobials in veterinary medicine” by the European Commission (Commission Notice, 2015).

For a number of years, data on sales of antimicrobials using a standardised methodology have been available which has allowed for comparisons between countries and provided valuable information for future work on reducing antimicrobial use (European Surveillance Veterinary Antimicrobial Consumption (ESVAC, 2015)). The ESVAC reports have shown that there are vast differences between countries in amounts of antimicrobials sold for food-producing animals (Grave et al., 2014; ESVAC, 2015), but these data do not provide insight on how sales are distributed by species and age groups. Other sources however have shown that the use of antimicrobials for pigs is higher than for other species (Merle et al., 2012; Bondt et al., 2013; DANMAP, 2013; Hosoi et al., 2013) and use may differ between age groups (Dunlop et al., 1998; Hybschmann et al., 2011; Callens et al., 2012; Jensen et al., 2012; Moreno, 2014; van Rennings et al., 2015). Comparing the sales on species level may change the relation between countries with regards to sales, as size and structure of the pig producing sector varies considerably between the European countries (Eurostat, 2014). Further, sales figures (expressed in kg active substance in relation to a certain measure of biomass produced) are only a crude measurement of actual consumption and do not provide insight into actual use and how use with regards to antimicrobial substance is distributed between different animal species and age categories. Moreover they do not take into account the huge differences in dosage between different antimicrobial compounds. As also suggested by ESVAC (ESVAC, 2015) and others (Bondt et al., 2013), a more detailed data collection of usage on species level would allow for a more in-depth analysis of antimicrobial consumption in different countries with different animal populations and production types. If antimicrobial usage data can be collected on herd level in a standardised manner, benchmarking could be applied across nations to stimulate reduction of antimicrobial use. Benchmarking has previously been shown to be an effective tool in Denmark (Jensen et al., 2014) and the Netherlands (Bos et al., 2013; Autoriteit Diergeneesmiddelen SDa, 2014; Speksnijder et al., 2014), and a similar farm level approach has recently been introduced in Belgium (Antimicrobial Consumption and Resistance in Animals (AMCRA, 2014)).

The present study was initiated as a first step for comparing antimicrobial usage on herd level in different countries using a standardised methodology. The specific aim of the study was to compare herd level antimicrobial usage by age category, antimicrobial substance and administration route for farrow-to-finish herds in four different EU countries with different intensities of pig production. Our hypothesis was that usage differs between countries and age groups as well as usage patterns with respect to administration route and choice of active substances. This study was conducted within the European research project MINAPIG (Evaluation of alternative strategies for raising pigs with minimal antimicrobial usage: Opportunities and constraints, www.minapig.eu).

2. Material and methods

2.1. Selection of herds

A cross-sectional study was conducted among 227 farrow-to-finish pig herds located in Belgium ($n=47$), France ($n=60$), Germany ($n=60$) and Sweden ($n=60$) between December 2012 and December 2013. Inclusion criterion was the presence of at least 100 sows and 500 finishing pigs. In Belgium, herds located in the Flanders region (representing 90% of the national pig production) were

recruited among those subscribing to a professional newsletter regularly issued by the University of Ghent. The newsletter is distributed to 609 subscribing farmers, veterinarians and other herd advisors with a known interest in biosecurity in pig production. In France, a simple random sample of 110 herds was drawn from a technical database maintained by the French Institute for pig and pork industry (IFIP) which on average covers 46% of the French pig herds with more than 50 sows. Inclusion criteria included localization in the North western region (representing 75% of the French pig production), as well as the presence of at least 100 sows and 500 finishing pigs. Eleven herds were excluded from the original sample mostly due to previous refusal to participate in studies. From the remaining sample, 79 herds were contacted to get the sample of 60 herds. German herds were recruited via consultancy circles together with contacts provided by several veterinary practices in the three regions, Mecklenburg-Vorpommern, Niedersachsen and Nordrhein-Westfalen, with the largest pig production constituting 64% of the total German pig production (Statistisches Bundesamt, 2014). Consultancy circles are regional farmers' organisations for pig producers as well as agricultural consulting organisations. A consultancy circle consists of a number of chairpersons together with ordinary members. Several, ten to 15, of the study herds belonged to a consultancy circle in Vechta, Kreislandvolkverband Vechta, which represented 2000 members and 1600 active farms. The office in Vechta employed 50 persons. Swedish herds were selected on a willingness to participate basis among herds either affiliated with the Swedish Animal Health Service (SvDHSV) with a herd veterinarian working for SvDHSV, or were herds with previous contact with researchers at the National Veterinary Institute as previously described (Sjölund et al., 2015).

2.2. Collection of antimicrobial consumption records

Herd visits were undertaken between December 2012 and December 2013. During the herd visits, detailed information about the antimicrobial consumption of breeding and growing pigs was collected. In Belgium, France and Germany, all herds were visited by the same investigator within country. These investigators were researchers within MINAPIG except in France where a veterinary student in the final year conducted all data collection for the students' graduation project. In Sweden, recruited herds were visited either by the herd veterinarian from SvDHSV (46 herds and 15 veterinarians) or by a researcher within MINAPIG (14 herds and 2 veterinarians) if the herd was not affiliated with SvDHSV (Sjölund et al., 2015). Antimicrobial consumption data for the participating herds were collected for one year preceding the visit in Belgium, Germany and Sweden and for the last batch in France. Invoices from veterinarians and feed companies combined with information from the farmer were used in Belgium. Dispensing and application forms from the prescribing veterinarian used as treatment records were used for the German herds. In Sweden, antimicrobial consumption data were retrieved from the farmers' treatment records. In France, antimicrobial consumption data were retrieved from the farmers' treatment records together with farmers' directed interview. Data collection was based on a form developed within the MINAPIG Consortium which can be provided by the authors of the article on request. Antimicrobial consumption, expressed as volume or mass, was recorded by product, strength of product, administration route and age category (breeding pigs, piglets, weaners and finishers).

2.3. Quantification of antimicrobial consumption

Antimicrobial usage was quantified using the ABcheck.UGent™ online tool developed by the Unit for Veterinary Epidemiology of the Faculty of Veterinary Medicine, University of Ghent (<http://www.abcheck.ugent.be/>). The ABcheck converts recorded anti-

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