

Comparison of the sales of veterinary antibacterial agents between 10 European countries

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Received 14 April 2010; returned 9 May 2010; revised 2 June 2010; accepted 7 June 2010

Objectives: To compare the sales of veterinary antibacterial agents between 10 European countries.

Methods: Data were compiled from published reports from the 10 countries. We express the usage as amounts sold of veterinary antibacterial agents per country and year, in mg active substances per kg biomass of slaughtered pigs, poultry and cattle plus estimated biomass of (live) dairy cattle for the corresponding year.

Results: The usage, as expressed in mg antibacterial drugs sold/kg biomass of slaughtered pigs, poultry and cattle and of (live) dairy cattle, varied from 18 to 188 mg/kg. The relative proportion of the various classes of antibacterial agents sold varied considerably.

Conclusions: The apparent wide variations in the usage of veterinary antimicrobial agents between countries cannot be explained by differences in the animal species demographics alone. Further in-depth analyses are required to identify the factors underlying the observed differences.

Keywords: risk factors, antimicrobial resistance, food safety, risk assessment

Introduction

Data generated from surveillance of the usage of veterinary antibacterial agents are essential to identify and quantify risk factors for the development and occurrence of resistance, such as methicillin-resistant *Staphylococcus aureus* (MRSA) or extended-spectrum β -lactamase (ESBL)-producing bacteria¹ in animals, as well as its impact on human health. Data on the use of antibacterial agents can be combined with data on antimicrobial resistance to inform the development of policies for the containment of antimicrobial resistance at national, regional and international levels.²

This article compares and discusses the usage and usage patterns of veterinary antibacterial agents between 10 European countries and is a first step towards the collation of data on usage of antibacterial agents categorized by animal species at the European level.

Methods

Currently, data on overall sales of veterinary antibacterial agents are published on a regular basis by 10 European countries: the Czech Republic; Denmark; Finland; France; Germany; the Netherlands; Norway; Sweden; Switzerland; and the UK.^{3–12} We have compiled overall sales data of veterinary antibacterial agents for therapeutic use from the published reports into a standardized table format; the data represent sales in 2007 except for Germany for which the most recent figures were for 2005.

The sales figures are reported in tons of active substance sold per antibacterial class (e.g. tetracyclines).

The overall sales data generally represent sales for use in the total animal population in the various countries in 2007. However, the inclusion criteria of veterinary antibacterial agents were inadequately described or lacking in several of the reports; therefore the data coverage may vary and affect its interpretation.

As the majority of antibacterial veterinary products are marketed for more than one species the sales cannot be ascribed to a single target species and thus the sales cannot be reported relative to the size of the target population, e.g. per number of slaughter pigs produced per study year and country. To correct for the population 'at risk' of being treated, a pragmatic approach is to use the total biomass of major production animals as the denominator.¹³ We derived data for slaughtered pigs, poultry and cattle and of (live) dairy cattle for the various Member States from the Eurostat¹⁴ database while for Norway and Switzerland data from Statistics Norway¹⁵ and Swiss Statistics¹⁶ were applied. We calculated the biomass of live dairy cattle by multiplying numbers of dairy cattle by the standard average weight of the various breeds (500 kg).

The type and incidence of bacterial diseases vary considerably between species and consequently the consumption of veterinary antibacterial agents is heavily influenced by animal species demographics. As the biomass produced reflects the population, we applied the above-described denominator as a measure to express the differences in the population patterns.

In the current paper, the usage is expressed as amounts sold, in mg active substances, of veterinary antibacterial agents per the total

biomass of slaughtered pigs, poultry and cattle and of (live) dairy cattle per country and year.

Results

The amounts used per country of veterinary antibacterial agents relative to the sum of the biomass of food-producing animals varied from 18 to 188 mg/kg across the 10 European countries (Figure 1).

Totally in the 10 European countries, 48% of the sales of veterinary antibacterial agents were accounted for by tetracyclines, 17% by sulphonamides and trimethoprim (as sulphonamides or in combination) and 16% by β -lactams.

The usage patterns varied considerably between countries: e.g. in the Netherlands, the Czech Republic and France tetracyclines accounted for 57%, 56% and 50% of the amounts sold (in tons of active substance), respectively, while in Finland, Sweden and Norway the corresponding figure was 11%, 11% and 5%, respectively. For the latter countries the sales of β -lactams were the most predominant, representing 64%, 55% and 44% of the total sales, respectively. The sales of cephalosporins accounted for 1% of total use in the Czech Republic, Denmark, France and Switzerland, 2% in the UK, 6% in Sweden and 7% in Finland; for Germany, the Netherlands and Norway cephalosporins may have been reported as β -lactams.

There are relatively large differences in the animal species demographics between the 10 countries (Figure 2). For example, in Denmark, slaughter pigs accounted for the major proportion of the biomass (76%) ‘at risk’ in 2007 while poultry represented only 7%; in the UK the corresponding figures were 18% and 36% and in the Netherlands the corresponding figures were 41% and 23%. In comparison, the estimated amounts of antibacterial agents sold per kg biomass of the

major animals amounted to 52 mg in Denmark, 94 mg in the UK and 188 mg in the Netherlands.

Discussion

The highest usage of antibacterial agents among food-producing animals is generally in pigs and consequently Denmark and the UK would be expected to have the highest and lowest usage, respectively, of the 10 countries included in the present study. The observed differences in overall sales of veterinary antibacterial agents in animals between the 10 European countries can therefore not be explained by differences in animal species demographics alone. The variations between the countries in overall sales could arise due to differences in animal husbandry, in dosing and/or in practices in terms of frequency when prescribing antibacterial agents for use in animals, while the observed variations in terms of differences in prescribing patterns could arise due to availability of veterinary antibacterial products on the market, prices and veterinarians’ prescribing behaviour. As the biomass of slaughtered animals has been used to describe animals at risk and some countries transport animals for slaughter in other countries this may give rise to over- or under-estimates of the usage for some of the countries. However, insufficient information is currently available to analyse the data in terms of the possible effects of differences with respect to dosing, prescribing practices, animal husbandry, transport of animals for slaughter in other countries as well as prices and availability of veterinary antibacterial products. For such analyses, overall sales need to be differentiated into use per species and then further analysed on the amount used per substance per treatment to estimate the number of animals treated. Provided the data coverage is similar for the countries included in this study it seems that the reported amounts of antibacterial

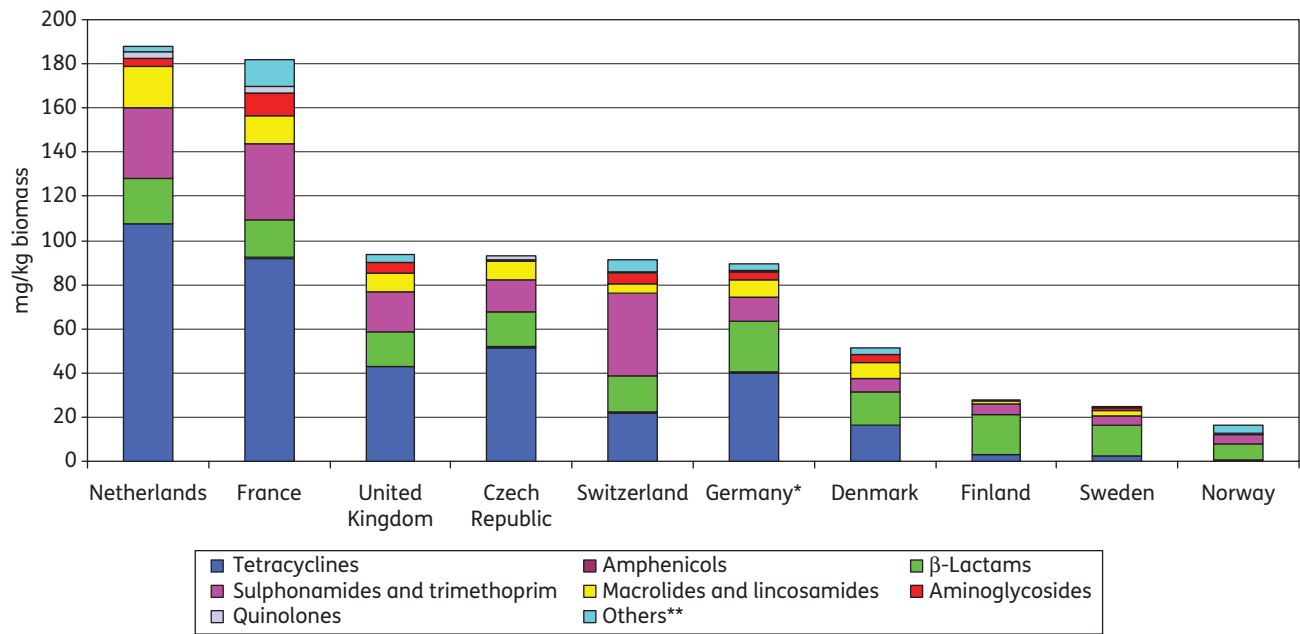


Figure 1. Amounts, in mg, of veterinary antibacterial agents sold in 2007 per kg biomass of pig meat, poultry meat and cattle meat produced plus estimated live weight of dairy cattle. *2005 data. **The substances included vary from country to country.

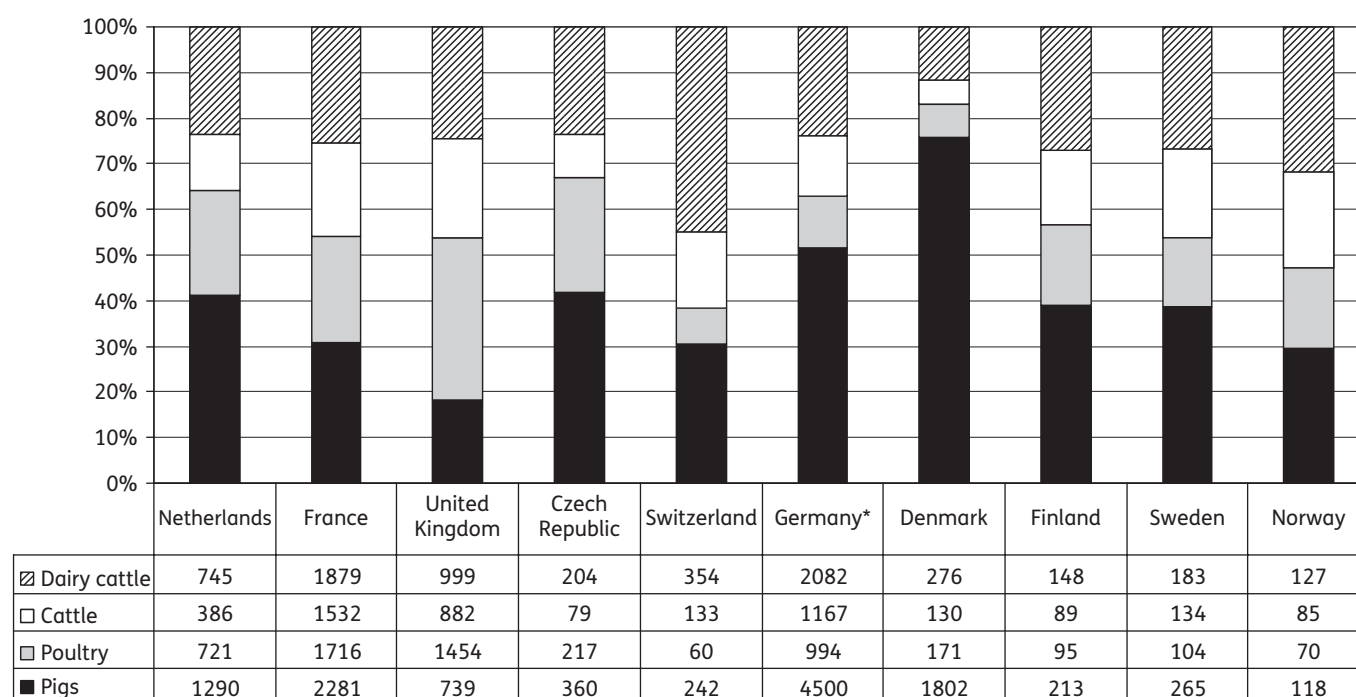


Figure 2. Biomass, as percentage of total biomass, of pig meat, poultry meat and cattle meat produced and of estimated live weight of dairy cattle for 2007 (in 1000 tons in table). *2005 data.

agents sold relative to the biomass of livestock varies almost 10-fold between countries. It is not possible to conclude on the factors underlying the differences observed.

Conclusions

An apparent wide variation in the usage of veterinary antimicrobial agents between countries was observed that cannot be explained by differences in the animal species demographics alone. Further analyses of the usage by animal species, age groups, dosing, animal husbandry and transport of animals for slaughter in other countries are required to identify the factors underlying these observed differences.

Acknowledgements

We wish to express our thanks to the originators of the data cited in this analysis for validating the data in the context of the 'Joint Opinion On Antimicrobial Resistance (AMR) Focused On Zoonotic Infections' carried out on behalf of the European Commission (<http://www.ema.europa.eu/pdfs/vet/sagam/44725909en.pdf>).

Funding

Funded by the European Medicines Agency.

Transparency declarations

None to declare.

Disclaimer

All views expressed in this paper are strictly personal and should not be understood or quoted as being made on behalf of the European Medicines Agency.

References

- 1 Hunter PA, Dawson S, French GL *et al.* Antimicrobial-resistant pathogens in animals and man: prescribing, practice and politics. *J Antimicrob Chemother* 2010; **65** Suppl 1: i13–7.
- 2 WHO. WHO Global Principles for the Containment of Antimicrobial Resistance in Animals for Food. Report of a WHO Consultation with the participation of the Food and Agriculture Organization of the United Nations and the Office International des Epizooties. Geneva, Switzerland, 5–9 June 2000. http://whqlibdoc.who.int/hq/2000/WHO_CDS_CSRAPH_2000.4.pdf (16 May 2010, date last accessed).
- 3 Hera A, Koutecká L, Dorn D. Spotřeba antibiotik a antiparazitik ve veterinární medicíně v ČR v letech 2003–2008. *Věstník ÚSKVBL* 2009; **3**: 33–8. http://www.uskvbl.cz/attachments/339_spot%C5%99eba%20ATB%202003-2008.doc (16 May 2010, date last accessed).
- 4 DANMAP 2007. Use of Antimicrobial Agents and Occurrence of Antimicrobial Resistance in Bacteria From Food Animals, Foods and Humans in Denmark. http://www.danmap.org/pdfFiles/Danmap_2007.pdf (16 May 2010, date last accessed).
- 5 Finnish Medicines Agency. Consumption of Veterinary Antimicrobials Increased. http://www.laakelaitos.fi/pharma_industry/veterinary_medicinal_products/20060731150559.html (16 May 2010, date last accessed).
- 6 Agence Française de Sécurité Sanitaire des Aliments. Suivi des ventes de médicaments vétérinaires contenant des antibiotiques en France

- en 2007. <http://www.afssa.fr/Documents/ANMV-Ra-Antibiotiques2007.pdf> (16 May 2010, date last accessed).
- 7** GERMAP 2008. *Antibiotika-Resistenz und -Verbrauch*. http://www.bvl.bund.de/cln_027/DE/08_PresseInfothek/00_doks_downloads/Germap_2008,templateId=raw,property=publicationFile.pdf/Germap_2008.pdf (16 May 2010, date last accessed).
- 8** MARAN-2007. *Monitoring of Antimicrobial Resistance and Antibiotic Usage in Animals in the Netherlands in 2006/2007*. http://www.cvi.wur.nl/NR/rdonlyres/A906A4C0-A458-423E-B932-28F222385988/83791/MARAN_2007_def3.pdf (16 May 2010, date last accessed).
- 9** NORM/NORM-VET 2007. *Usage of Antimicrobial Agents and Occurrence of Antimicrobial Resistance in Norway*. <http://www.vetinst.no/nor/Forskning/Rapporter/Norm-Norm-Vet-rapporten/Norm-Norm-Vet-rapporten-2007> (16 May 2010, date last accessed).
- 10** SVARM 2007. *Swedish Veterinary Antimicrobial Resistance Monitoring*. http://www.sva.se/upload/pdf/Tj%C3%A4nster%20och%20produkter/Trycksaker/SVARM_2007%5B1%5D.pdf (16 May 2010, date last accessed).
- 11** Swissmedic 2009. *Report on Sales of Antibiotics in Veterinary Medicine 2005–2008*. <http://www.swissmedic.ch/marktueberwachung/00147/00644/index.html?lang=en> (16 May 2010, date last accessed).
- 12** Veterinary Medicines Directorate 2008. *Sales of Antimicrobial Products Authorised for Use as Veterinary Medicines, Antiprotozoals, Antifungals, Growth Promoters and Coccidiostats, in the UK in 2007*. <http://www.vmd.gov.uk/Publications/Antibiotic/salesanti07.pdf> (16 May 2010, date last accessed).
- 13** Grave K, Jensen VF, McEwen SA et al. Monitoring of antimicrobial drug usage in animals: methods and applications. In: Aarestrup FM, ed. *Antimicrobial Resistance in Bacteria of Animal Origin*. First Edition. Washington: ASM Press, 2005; 375–95.
- 14** European Commission. *Eurostat*. http://epp.eurostat.ec.europa.eu/portal/page/portal/agriculture/data/main_tables (16 May 2010, date last accessed).
- 15** Statistics Norway. <http://www.ssb.no> (16 May 2010, date last accessed).
- 16** Swiss Statistics. <http://www.bfs.admin.ch/bfs/portal/en/index.html> (16 May 2010, date last accessed).