

DANMAP 2018

DANMAP 2018 - Use of antimicrobial agents and occurrence
of antimicrobial resistance in bacteria from food animals,
food and humans in Denmark



DANMAP 2018

Editors:

Birgitte Borck Høg (bibo@food.dtu.dk)
Johanne Ellis-Iversen (joell@food.dtu.dk)
Ute Wolff Sönksen (uws@ssi.dk)

Assisting editors:

Helle Korsgaard
Anna Emilie Henius
Karoline Skjold Selle Pedersen

DANMAP Steering Committee:

National Food Institute: Flemming Bager, Johanne Ellis-Iversen
Statens Serum Institut: Anders Rhod Larsen, Ute Wolff Sönksen

Layout:

Charlotte Brunholt Jensen, STEP PRINT POWER
Anja Bjarnum, Statens Serum Institut

Photos: Colourbox

Printing: STEP PRINT POWER

Contact:

National Food Institute,
Technical University of Denmark
Kemitorvet, Building 202, DK-2800 Kgs. Lyngby

Infectious Disease Preparedness - Bacteria, Parasites and Fungi,
Statens Serum Institut
Artillerivej 5, DK-2300 Copenhagen

DANMAP 2018 - September 2019 - ISSN 1600-2032

Text and tables may be cited and reprinted only with reference to this report:
DANMAP 2018 - Use of antimicrobial agents and occurrence of antimicrobial
resistance in bacteria from food animals, food and humans in Denmark. ISSN 1600-2032

The report is available from www.danmap.org

Authors:**National Food Institute**

Valeria Bortolaia
Rene S. Hendriksen
Birgitte Borck Høg
Johanne Ellis-Iversen
Helle Korsgaard
Channie Kahl Petersen

Statens Serum Institut

Jeppe Boel
Tine Dalby
Anette M. Hammerum
Frank Hansen
Henrik Hasman
Anna Emilie Henius
Steen Hoffmann
Mette Bar Ilan
Hülya Kaya
Anne Kjerulf
Brian Kristensen

Anders Rhod Larsen

Eva Møller Nielsen
Stefan Schytte Olsen
Karoline Skjold Selle Pedersen
Andreas Petersen
Lone Jannok Porsbo
Louise Roer
Sissel Skovgaard
Hans-Christian Slotved
Ute Wolff Sönksen
Mia Torpdahl

Danish Health Data

Authority, Register of
Medicinal Statistics:
Maja Laursen

Authors of invited textboxes:

Nissrine Abou-Chakra
Øystein Angen
Maiken Cavling Arendrup
Raluca Datcu
Hans Henrik Dietz
Mette Fertner
Karen Geismar
Jan Berg Gertsen

Sophie Gubbels
Christian Fink Hansen
Rasmus Krøger Hare
Jette Holt
Barbara Julianne Holzknecht
Anne Birgitte Jensen
Vibeke Frøkjær Jensen
Sven Erik Jorsal

Elsebeth Tvenstrup Jensen
Lise Kristensen
Jonas Kähler
Jesper Larsen
Tove Larsen
Pimlapas Leekitcharoenphon
Inge Mortensen
Patrick Munk

Peter Poulsen
Malene Risum
Charlotte Mark Salomonsen
Tina Struve
Marianne Voldstedlund

DANMAP 2018

DANMAP 2018 - Use of antimicrobial agents and occurrence
of antimicrobial resistance in bacteria from food animals,
food and humans in Denmark

Table of contents

1. Editorial	7
2. Summary	9
3. Introduction to DANMAP	15
3.1 Background	16
3.2 Information on demographics, food production and dataflow	18
4. Antimicrobial consumption in animals	23
Highlights	24
4.1 Introduction	25
Textbox 4.1 Regulation resulted in a shift between antimicrobial classes in pigs 2014-2018	27
4.2 Total antimicrobial consumption in animals	28
4.3 Antimicrobial consumption by animal species	28
Textbox 4.2 Establishment of an Advisory Committee on Veterinary Medicines	37
Textbox 4.3 OUA - an up and coming special production	38
Textbox 4.4 Antimicrobial use in mink - action plan/research projects	39
5. Antimicrobial consumption in humans	41
Highlights	42
5.1 Introduction	44
5.2 Total consumption	47
5.3 Primary health care	58
5.4 Hospital care	67
Textbox 5.1 Incidence of multi resistant bacteria and consumption of antimicrobial agents in Greenland	68
Textbox 5.2 Antibiotics in dentistry	70
Textbox 5.3 Infection prevention and control can combat antimicrobial resistance	72
Textbox 5.4 Candidaemia in Denmark: Epidemiology, antifungal consumption and resistance	74
Azole resistance in <i>Aspergillus</i> spp. - results from a new surveillance programme	77
6. Resistance in zoonotic bacteria	79
Highlights	80
6.1 Introduction	81
6.2 <i>Campylobacter</i>	81
6.3 <i>Salmonella</i>	84
Textbox 6.1 Antimicrobial resistance in <i>Salmonella</i> from sow, multiplier and breeder pig herds	89
Textbox 6.2 Resistance in bacteria from diagnostic submissions from pigs	92
7. Resistance in indicator bacteria	97
Highlights	98
7.1 Introduction	98
7.2 Indicator <i>Escherichia coli</i>	98
7.3 ESBL/AmpC- and carbapenemase-producing <i>E. coli</i>	103
Textbox 7.1 Antimicrobial resistance in prawns and pangasius fillets imported from Asia	106
Textbox 7.2 ESBL- and pAmpC-producing <i>E. coli</i> - comparison of isolates of animal origin and isolates obtained from human bloodstream infections	109
Textbox 7.3 Abundance and diversity of the faecal resistome in slaughter pigs and broilers in nine European countries	110

8. Resistance in human clinical bacteria	113
Highlights	114
8.1 Introduction	115
Textbox 8.1 MiBa, the Danish Microbiology Database - Now prepared for use in national AMR-surveillance	118
8.2 Surveillance based on MiBa data	122
8.2.1 <i>Escherichia coli</i>	122
8.2.2 <i>Klebsiella pneumoniae</i>	126
8.2.3 <i>Pseudomonas aeruginosa</i>	131
8.2.4 <i>Acinetobacter</i> species	132
8.2.5 Enterococci	133
8.3 Surveillance based on data from the reference laboratories	134
8.3.1 ESBL- and pAmpC-producing <i>E. coli</i> from bloodstream infections	134
8.3.2 Carbapenemase-producing bacteria	137
8.3.3 <i>VanA Enterococcus faecium</i>	138
8.3.4 Linezolid resistance and the <i>optrA</i> in enterococci	140
8.3.5 <i>Streptococcus pneumoniae</i>	141
8.3.6 Beta-haemolytic streptococci	143
8.3.7 <i>Haemophilus influenzae</i>	145
8.3.8 <i>Staphylococcus aureus</i> - MRSA	146
Textbox 8.2 LA-MRSA CC398 in animals and humans	151
8.3.9 <i>Neisseria gonorrhoeae</i>	153
9. Materials and Methods	155
9.1 General information	156
Animals and meat	
9.2 Data on antimicrobial consumption	156
9.3 Collection of bacterial isolates	158
9.4 Microbiological methods	159
9.5 Susceptibility testing	160
9.6 Whole genome sequencing	160
9.7 Data handling	160
Humans	
9.8 Data on antimicrobial consumption	162
9.9 <i>Salmonella</i> and <i>Campylobacter</i>	165
9.10 <i>E. coli</i> , <i>K. pneumonia</i> , <i>P. aeruginosa</i> , <i>Acinetobacter</i> spp. and <i>enterococci</i>	165
9.11 ESBL-producing bacteria	165
9.12 CPO in human patients	166
9.13 VRE in human patients	166
9.14 <i>Streptococcus pneumoniae</i>	166
9.15 Beta-haemolytic streptococci (Group A, B, C and G streptococci)	167
9.16 <i>Haemophilus influenzae</i>	167
9.17 <i>Staphylococcus aureus</i> - MRSA	167
9.18 Gonococci in humans	168
10. Terminology	169
List of abbreviations	170
Glossary	171

Additional information and supporting data on antimicrobial consumption and antimicrobial resistance is presented in the web annex at www.DANMAP.org.

