

Objectives

In 2008, Germany expanded the scope of its national antimicrobial resistance surveillance system to the sector of ambulatory care. This presentation gives a first insight into resistance in the most frequent gram-negative pathogens isolated from urine samples from outpatients in 2008/2009. Data will be stratified by year, age groups and selected geographical regions.

Materials & Methods

The dataset is taken from the German Antimicrobial Resistance Surveillance (ARS) System. Four laboratories with continuous data collection in 2008 and 2009 submitted data on 96,191 urine samples collected in 2405 practises in Germany; composition of the sample by region, specialty, sex and age group of patients is given in table 1. From these specimens, a total of 113,697 pathogens were isolated: the most frequent gram-negative pathogens were *E. coli*, *P. mirabilis* and *K. pneumoniae*; frequencies and percentages are shown in table 2.

Analysis of susceptibility is based on non-duplicate isolates. Species identification and antimicrobial susceptibility testing is performed by VITEK 2, results are evaluated according to CLSI guidelines. Proportions of susceptible isolates were calculated for the following antibiotics: ampicillin (AMP), ampicillin/sulbactam (AMS), piperacillin (PIP), piperacillin/tazobactam (PIT), cefotaxime (CTX), ciprofloxacin (CIP), co-trimoxazole (SXT).

Results

Results of susceptibility testing are displayed as percentages of susceptible isolates of all non-duplicate isolates tested in table 3.

In *E. coli* overall proportions of susceptibility for the most frequently used antimicrobials in urinary tract infections as AMP, AMS, SXT and CIP vary from 54.5% (AMP) to 84.3% (CIP), in *P. mirabilis* the corresponding range spans from 64.2% (SXT) to 92.5% (AMS) and in *K. pneumoniae* proportions for selected antibiotics are all above 80%.

Results

Stratification by age groups shows lower levels of susceptibility for patients older than 60 for AMP, PIP, CIP and SXT in *E. coli* as well as in *P. mirabilis*. Regional differences with similar patterns are observed for CIP, SXT and PIP across species.

Table 1: composition of sample (N=96.191 urine samples) by region, specialty, sex and agegroup

| parameter | value | no. of isolates | in percent |
|------------------|--------------------------|-----------------|------------|
| region | North Rhine-Westfalia | 35.835 | 37,3 |
| | Berlin-Brandenburg | 21.413 | 22,3 |
| | South-West * | 17.470 | 18,2 |
| | Schleswig-Holstein | 15.791 | 16,4 |
| | others | 5.682 | 5,9 |
| specialty | internal medicine/GPs | 52.168 | 54,2 |
| | nephrology | 14.839 | 15,4 |
| | obstetrics & gynaecology | 12.521 | 13,0 |
| | urology | 7.796 | 8,1 |
| | pediatrics | 7.344 | 7,6 |
| | others | 1.523 | 1,6 |
| sex | male | 18.982 | 19,7 |
| | female | 60.756 | 63,2 |
| | unknown | 16.453 | 17,1 |
| agegroup | <=15 | 8.554 | 8,9 |
| | 16-59 | 38.004 | 39,5 |
| | >=60 | 49.633 | 51,6 |
| total | | 96.191 | 100,0 |

* South West = Baden-Wuerttemberg, Rhineland-Palatinate, Hesse

Table 2: pathogens isolated from urine samples 2008/09

| pathogen(group) | no. of isolates | in percent |
|-------------------------------|-----------------|--------------|
| gram-negative pathogens | 75.273 | 66,2 |
| of these: | | |
| <i>Escherichia coli</i> | 53.863 | 47,4 |
| <i>Proteus mirabilis</i> | 5.517 | 4,9 |
| <i>Klebsiella pneumoniae</i> | 4.810 | 4,2 |
| <i>Pseudomonas aeruginosa</i> | 2.221 | 2,0 |
| <i>Klebsiella oxytoca</i> | 1.379 | 1,2 |
| <i>Enterobacter cloacae</i> | 1.072 | 0,9 |
| <i>Morganella morganii</i> | 796 | 0,7 |
| <i>Citrobacter freundii</i> | 567 | 0,5 |
| <i>Enterobacter aerogenes</i> | 411 | 0,4 |
| <i>Proteus vulgaris</i> | 408 | 0,4 |
| <i>Serratia marcescens</i> | 296 | 0,3 |
| gram-positive pathogens | 35.287 | 31,0 |
| fungi | 1.978 | 1,7 |
| others | 1.159 | 1,0 |
| total | 113.697 | 100,0 |

Results

 Table 3: susceptibility of *E. coli*, *P. mirabilis*, *K. pneumoniae* from urine samples of outpatients in Germany 2008/09: percentages of susceptible isolates from non-duplicate isolates tested (n) against AMP – ampicillin, AMS – ampicillin/sulbactam, PIP – piperacillin, PIT – piperacillin/tazobactam, CTX – cefotaxime, CIP – ciprofloxacin and SXT – co-trimoxazole; stratification by year, age group and region

| pathogen | stratification | antimicrobial | | | | | | n | | |
|----------------------|--------------------|---------------|-------------|-------------|-------------|-------------|-------------|-------------|---------------|--------|
| | | AMP | AMS | PIP | PIT | CTX | CIP | | SXT | |
| <i>E. coli</i> | total | 54,5 | 69,4 | 57,2 | 87,4 | 96,9 | 84,3 | 70,8 | 45.178 | |
| | by year | 2008 | 54,0 | 68,0 | 57,2 | 87,1 | 97,2 | 84,2 | 70,8 | 22.541 |
| | | 2009 | 55,0 | 70,8 | 57,3 | 87,7 | 96,6 | 84,5 | 70,7 | 22.637 |
| | by agegroup | <= 15 | 57,8 | 73,5 | 59,3 | 90,3 | 98,2 | 96,5 | 75,2 | 4.837 |
| | | 16-59 | 58,2 | 71,4 | 60,3 | 88,9 | 97,5 | 89,4 | 74,4 | 17.086 |
| | | >= 60 | 51,1 | 67,3 | 54,6 | 85,8 | 96,2 | 78,1 | 67,1 | 23.255 |
| | by region | BB | - | 65,6 | 60,4 | 88,6 | 96,9 | 88,9 | 73,8 | 11.684 |
| | | NW | 53,6 | 68,7 | 54,3 | 87,4 | 97,9 | 82,4 | 67,9 | 18.839 |
| | | SH | 56,5 | 71,6 | 57,6 | 88,1 | 96,7 | 84,8 | 70,2 | 6.533 |
| | | SW | - | 70,3 | 59,9 | 86,2 | 95,1 | 82,7 | 73,7 | 6.466 |
| <i>P. mirabilis</i> | total | 68,1 | 92,5 | 71,6 | 96,2 | 99,0 | 88,2 | 64,2 | 4.962 | |
| | by year | 2008 | 67,2 | 91,9 | 71,7 | 95,7 | 99,2 | 87,8 | 63,9 | 2.492 |
| | | 2009 | 69,1 | 93,1 | 71,4 | 96,6 | 98,8 | 88,7 | 64,5 | 2.470 |
| | by agegroup | <= 15 | 79,3 | 94,0 | 79,5 | 96,6 | 99,2 | 96,0 | 75,1 | 808 |
| | | 16-59 | 72,5 | 93,9 | 73,9 | 96,8 | 99,2 | 91,1 | 65,6 | 1.276 |
| | | >= 60 | 63,5 | 91,5 | 68,3 | 95,8 | 98,9 | 84,7 | 60,5 | 2.878 |
| | by region | BB | - | 90,9 | 77,4 | 97,8 | 99,5 | 94,2 | 70,9 | 1.376 |
| | | NW | 66,7 | 90,9 | 67,0 | 94,6 | 98,6 | 81,9 | 57,9 | 1.969 |
| | | SH | 71,1 | 95,3 | 71,7 | 97,1 | 98,9 | 93,4 | 62,8 | 803 |
| | | SW | - | 93,8 | 71,9 | 96,7 | 99,2 | 88,4 | 70,0 | 663 |
| <i>K. pneumoniae</i> | total | R | 82,5 | R | 88,7 | 95,9 | 92,3 | 86,5 | 4.324 | |
| | by year | 2008 | R | 82,9 | R | 89,4 | 96,9 | 92,3 | 88,1 | 2.175 |
| | | 2009 | R | 82,2 | R | 88,1 | 94,9 | 92,2 | 84,9 | 2.149 |
| | by agegroup | <= 15 | R | 84,3 | R | 91,1 | 99,5 | 98,1 | 90,2 | 205 |
| | | 16-59 | R | 82,7 | R | 88,6 | 96,9 | 94,5 | 86,7 | 1.373 |
| | | >= 60 | R | 82,4 | R | 88,6 | 95,2 | 90,7 | 86,2 | 2.746 |
| | by region | BB | R | 82,0 | R | 91,6 | 96,9 | 96,1 | 89,8 | 1.013 |
| | | NW | R | 83,6 | R | 88,1 | 95,9 | 90,3 | 86,5 | 1.795 |
| | | SH | R | 79,9 | R | 87,9 | 95,6 | 95,3 | 80,9 | 572 |
| | | SW | R | 84,4 | R | 89,3 | 95,3 | 90,9 | 86,4 | 701 |

BB - Berlin/Brandenburg, NW - North Rhine-Westfalia, SW - South West, SH - Schleswig-Holstein - not tested, R - intrinsic resistance

Conclusion

These first large-scale data from ambulatory care indicate that non-susceptibility of *E. coli* and to a lesser degree of *P. mirabilis* from urines to first-line antibiotics is highly prevalent, that it is even higher in patients older than 60 and that there are some regional variations. Interpretation of the data should consider that in ambulatory care settings specimens are mainly taken from pre-treated patients.

References

 ARS-Website: <https://ars.rki.de>

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