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Social Affairs, Health, Care
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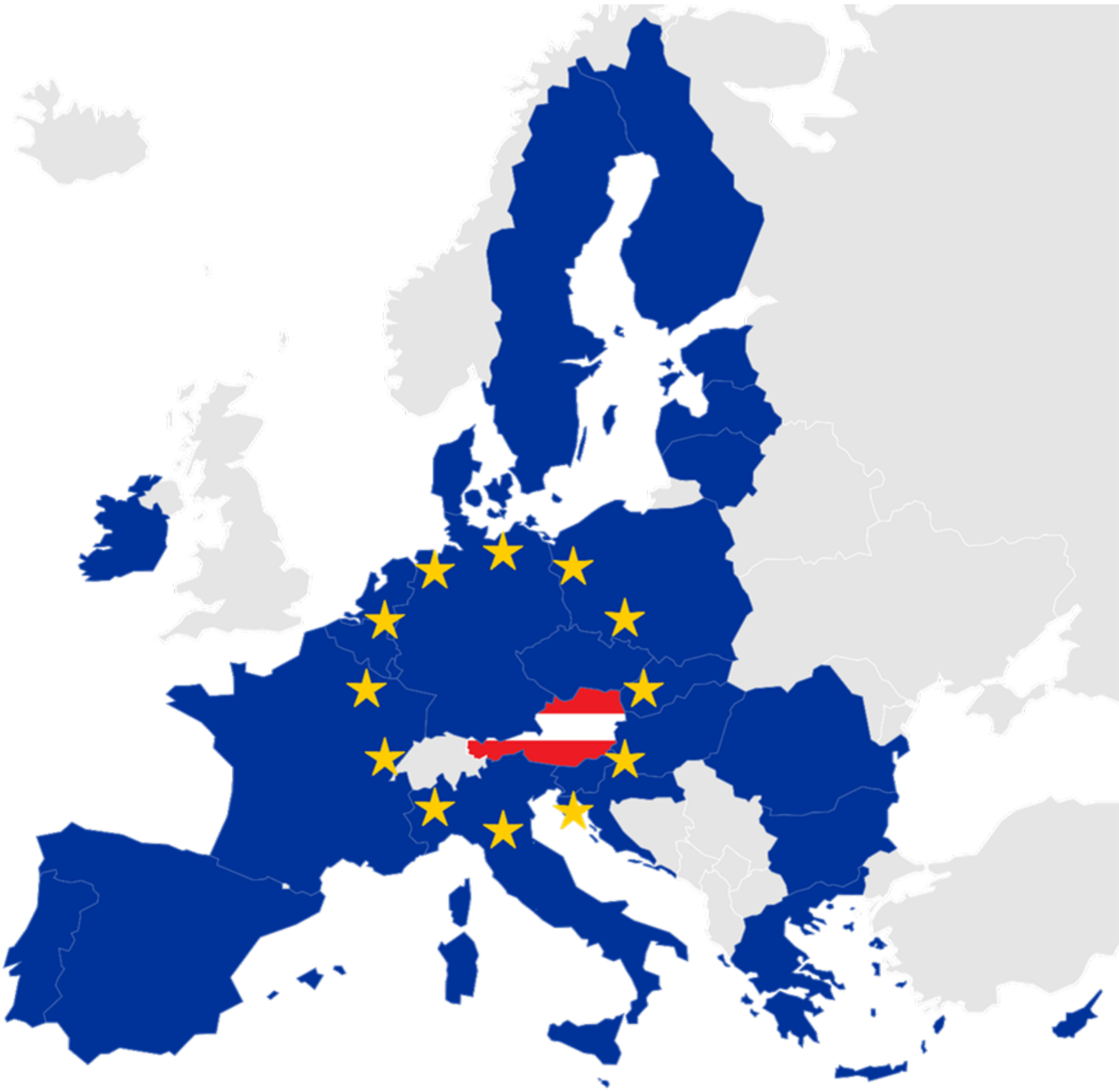
Resistance Report Austria AURES 2017

Summary



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INTRODUCTION

The present summary of the AURES 2017 has resulted from the full version of the AURES 2017, an inter-departmental co-operation in the field of human and veterinary medicine as well as food technology. Like in the reports of the previous years, the aim of the AURES 2017 is the sustainable and comparative illustration of representative data on antimicrobial resistance and on the consumption of antimicrobial agents with special consideration of Austrian characteristics and development trends over time. The data provided by National Reference Centres, appointed by the Federal Ministry of Social Affairs, Health, Care and Consumer Protection and the respective projects are illustrated in separate chapters. This method has been chosen in order to take into account the different approaches used in data collection. Direct comparison with data from veterinary medicine and human medicine is only possible to a limited extent at the present on account of the use of different test procedures and/or laboratory methods and antimicrobial limit values (epidemiological cut-offs and clinical limit values). The AURES provides data for a comprehensive professional discussion and will subsequently contribute to the optimization of the use of antimicrobial agents in Austria. The present short version is composed of the summaries of the individual chapters of the AURES. In this way, a first introduction to the subject of antimicrobial resistance and a brief survey on the situation in Austria will be made available. Details on the individual chapters may be found in the long version of the AURES 2017.

INITIAL SITUATION

For decades, antibiotics have been used for the treatment and prevention of infectious diseases and infections. Antimicrobial use has highly contributed to the improvement of health in humans and animals. Antibiotics are indispensable in modern medicine and procedures: transplantations, cancer treatment via chemotherapy or orthopaedic surgery, all of these could not be performed without antibiotics. Their wide application, however, is associated with a steady increase of resistant microorganisms. The Health Ministers of the European Union issued a declaration in 2012, emphasizing that the increasing antibiotic resistance in Europe and worldwide constitutes a growing health threat for humans and animals, leading to limited or inadequate treatment options and, therefore, diminishing the quality of life [1]. “Antimicrobial resistance: no action today, no cure tomorrow” was chosen as the primary issue by the World Health Organization at the World Health Day on April 7th, 2011 [2]. Since 2008, on the initiative of the European Parliament, the European Antibiotics Day has been held every year on November 18th with the aim of informing professionals and the public about the prudent use of antimicrobials. The problem of antimicrobial resistance has been furthermore set as a “Key Priority” in the 2015 working programme of the European Commission [3]. Antibiotic resistance was part of the agenda of the G7 Summit in 2015 in Schloss Elmau, Germany. The global action plan of the WHO is to be supported and promoted. The G7 member nations aim to follow a “One-Health”-approach [4].

The use of antibacterial agents for the treatment of viral infections, the unjustified use of wide spectrum agents, elongated “prophylactic” use of antibiotics in surgical interventions and the use of antibiotics in the case of mere colonization (and not infection) of the patient are considered the essential reasons and causes of antimicrobial resistance in human medicine. Patients, or in the case of children their parents, demanding therapy further contributes to the improper use of antibiotics. There is a clear causal relationship between the use of antibiotics and the development of bacterial resistance both for infections patients treated by local practitioners and nosocomial infections. [5]. In the Council Recommendation of November 15, 2001 for the prudent use of antimicrobial agents in human medicine, the member states were asked to ensure that specific strategies for the prudent use of antimicrobial agents are available and are implemented with the goal to limit the increase of microorganisms being resistant to these agents [6].

Attempts to reduce the development of resistance through a rational use of antibiotics by general practitioners have been found Europe-wide [7]. These efforts are mainly directed at the omission of antibiotic use in the treatment of viral infections. The fact that high-quality microbiological diagnostics are not available throughout Austria often hinders the physician to clearly identify infections which require antimicrobial therapies; in addition, it is frequently only possible to start with a very broad antimicrobial therapy. This results in unnecessary use of antibiotics and the preferred use of agents having a wide range of effect – both being factors that promote the development of antibiotic resistance due to innate selection pressure. Due to the improved treatability of viral diseases, drug-resistant viruses are also gaining increasing importance. The biggest hazard caused by drug-resistant viruses is currently posed by HIV infection. This may lead to limited or absent effectiveness of anti-retroviral therapy in patients already in treatment and in persons newly infected with these resistant viruses.

In hospitals, especially in intensive care units, multi-resistant hospital pathogens have been considered a daily occurring problem. The combination of "immunocompromised" patients, intensive and prolonged use of antibiotics as well as the transmission of pathogens between patients will lead to the occurrence of infections with multi-resistant pathogens, which are sometimes no longer responsive to antibiotic therapy. In the document "WHO Global Strategy for Containment of Antimicrobial Resistance", the World Health Organization refers to hospitals as "a critical component of the antimicrobial resistance problem worldwide" [8].

Although it is still true that "most of the problems with resistance in human medicine are correlated to use of antimicrobials in humans", it is currently in no way doubted that, regarding food of animal origin, the topic of antibiotic resistance is also of significance [9, 10]. As early as 2008, the Panel on Biological Hazards (BIOHAZ) of the European Food Safety Authority (EFSA) recommended the development and implementation of specific measures for the control of raw poultry, pork and beef, wherein measures to counter antibiotic resistance were classified as a priority [11]. Already since 2004, compulsory surveillance of the prevalence of zoonoses and selected zoonotic pathogens as well as their susceptibility to antimicrobial agents in the livestock population, has been carried out in the veterinary field in Austria (in the form of randomized sampling schemes in healthy slaughtered animals – cattle, pork, poultry) [12]. The OIE (World Organization for Animal Health) has developed recommendations for countering antimicrobial resistance in order to protect the health of animals and ensure food safety [13]. In regard to the surveillance of the antibiotic resistance and the ascertainment of antibiotics volume flows there have been existent guidelines for the harmonization of national programmes as well as recommendations on the prudent use of antibiotics in veterinary medicine and on the risk assessment of antibiotic resistance in the treatment of animals as well as for laboratory methods for the detection of antibiotic resistance.

The problem of increasing antibiotic resistance of human pathogens requires the willingness of all fields and sectors involved (human medicine, veterinary medicine, primary livestock production, food processing and food preparation, consumers) to assume responsibility in their respective areas of influence in order to impede the development and further distribution of antimicrobial resistance. The World Health Assembly (WHA) as the supreme decision-making organ of the World Health Organization (WHO), passed a resolution on May 25, 2015 asking all WHO member states to develop concrete national action plans (for countering the problem of antimicrobial resistance) within two years (until 2017), with the aspect of “ensuring sustainable investment in countering AMR" being one of the five objectives determined [14].

The issue of antibiotic resistance was discussed on occasion of the G7 Summit in Schloss Elmau (7th to 8th June 2015) [4].

In 2016 the conclusions of the Council regarding the next steps within the concept of “One Health” for combatting antimicrobial resistance were published [15]. On September 21, 2016, the problem of antimicrobial resistances was addressed at a General Assembly of the United Nations [16]. As a result a political declaration was published (“Political declaration of the high-level meeting of the General Assembly on antimicrobial resistance“) [17]. The European Commission published a new action plan against antimicrobial resistance in 2017 [18].

Co-ordinated measures for countering the distribution of antimicrobial resistance require the use of surveillance systems. Only then is it possible to assess how local and global resistance situations will react to an altered use of antibiotics and new measures for infection control. In the field of human medicine, many Austrian hospitals participate in the European system for the surveillance of resistance to antimicrobial agents (“European Antimicrobial Resistance Surveillance Network” [EARS-Net]) and in the “European Surveillance of Antibiotic Consumption Network“(ESAC-Net). EARS-Net and ESAC-Net are surveillance programmes initiated by the community and confirmed in their importance by the EU Council, wherein standardized, harmonized and comparative human medicine data on the resistance to bacterial pathogens and/or the use of antibiotics are sampled and collected [1]. The Resistance Report on hand makes the data acquired within the network of the Austria-wide resistance surveillance available to the public.

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ANTIMICROBIAL RESISTANCE IN SELECTED BACTERIAL INVASIVE INFECTIOUS PATHOGENS

Data from the human sector

An activity by the National Reference Centre for nosocomial infections and antibiotic resistance within the scope of participation in the European Antimicrobial Resistance Surveillance Network (EARS-Net)

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European Antimicrobial Resistance Surveillance Network (EARS-Net)

The Austrian EARS-Net data report represents data from currently 131 acute care hospitals. The resistance rates of the invasive indicator pathogens, hence, constitute a reliably measured substitute value for the prevalence of the resistance of the respective pathogens in relation to the antibiotic substances selected. In 2011, as far as human-medicine antimicrobial susceptibility testing methodology is concerned, Austrian microbiology laboratories switched from CLSI to EUCAST, a process that was successfully completed in 2012. The Austrian results for 2017 may be summarised as follows:

S. pneumoniae, a stable situation for penicillin susceptibility was reported in the last few years. According to EUCAST breakpoints that depend on indication and administration formulation, isolates with a MIC of > 2 mg/l are regarded as high level resistant. In 2017 no such isolates were reported in Austria. Based on meningitis breakpoints 12 invasive isolates were resistant to penicillin in 2017 (2.6%). Macrolide resistance rates increased from 8.8% to 11.2% compared to 2016. The three most frequent serotypes of invasive isolates in the year 2017 were 3, 19A and 22F. In the children younger 2 years group, type 19A was the most frequent reported type. In the age group of 60+, the most frequent serotype was 3.

The **MRSA rate** continuously decreased in the last five years, reaching the lowest rate in 2017 with 5.9%. No reduced susceptibility to vancomycin was reported in 2017.

Regarding to ***E. coli***, the resistance rate with regard to aminopenicillins (49.5%) has remained stable since 2013. In comparison to 2016, the resistance rate with regard to fluoroquinolones has slightly increased (from 19.8% to 20.5%), while the resistance rates with regard to 3rd generation cephalosporins (from 10% to 9.6%) and aminoglycosides (from 7.8% to 7.7%), respectively, have decreased.

In **enterococci**, the resistance rate with regard to aminopenicillin and aminoglycosides was stable compared to the years before. In 2017, the **VRE** rate was 0% in *E. faecalis* and 3.2% in *E. faecium*.

The resistance rate for ***K. pneumoniae*** with regard to 3rd generation cephalosporins and until 2016 in regard to fluoroquinolones showed a declining trend, with that for aminoglycosides remaining essentially stable. In comparison to 2016, in 2017 the resistance rate in regard to fluoroquinolones has increased (from 9.8% to 14.2%), while that in regard to 3rd generation cephalosporins has decreased (from 9.6% to 8.6%). The resistance rate in regard to aminoglycosides remained stable with 4.8%.

Carbapenemase producing Enterobacterales: In 2017, two invasive *E. coli* isolate strains and 11 invasive strains of *K. pneumonia* were documented.

P. aeruginosa, resistance rates of the following substance classes decreased 2017: aminoglycosides 5% (-1.1%), ceftazidime 8.7% (-2.6%) and piperacillin/tazobactam 13.5% (-0.3%). The resistance rates with regard to fluoroquinolones and carbapenems increased to 12.3% (+5.1%) and to 13.9% (+1%), respectively.

75 isolates of ***Acinetobacter* spp**. were reported, showed resistance rates in the following distribution: aminoglycosides 9.3%, fluoroquinolones 9.5%, carbapenems of 6.7%, respectively.

In conclusion, resistance rates in Austria are low compared to other European countries, especially in nosocomial gram-positive pathogens (MRSA and VRE). A rather problematic field, however, is still being represented by the gram-negative pathogens, with a slight increase of fluoroquinolone resistance being detectable in 2017.

The full report can be found in the long version of the **AURES 2017** from page 43 to page 128 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

PROJECT REPORT CARBA-NET

Data from the human sector

An activity by the National Reference Centre for nosocomial infections and antibiotic resistance

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Increasing numbers of carbapenemase producing gram-negative bacteria are reported worldwide[1]. Therefore, the surveillance project CARBA-Net was initiated in April 2015. In 2017 in 134 out of 200 Enterobacterales strains referred to the Austrian National Reference Laboratory due to decreased carbapenem susceptibility, a carbapenemase gene was confirmed. The enzymes could be assigned to Ambler classes A (*bla*KPC [n=28]), B (*bla*VIM [n=45] and *bla*NDM [n=22]) and D (*bla*OXA-48 like [n=39]). One *bla*KPC harboring isolate was positive for *mcr*-1, a plasmid encoded variant of Colistin resistance. With regard to other gram-negative bacilli, 52 out of 108 suspected *Pseudomonas aeruginosa* isolates were positive for a metallo-beta-lactamase (*bla*VIM [n=45], *bla*FIM [n=2] *bla*IMP [n=2] and *bla*NDM [n=2]) and 23 *Acinetobacter baumannii* complex isolates gave a positive result for at least one Ambler class D carbapenemase gene.

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The full report can be found in the long version of the **AURES 2017** from page 129 to page 138 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

RESISTANCE REPORT FOR SELECTED NON-INVASIVE PATHOGENS

Data from the human sector

An activity of the working group resistance reporting

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The resistance report on selected non-invasive pathogens is a supplementation to the EARS-Net, which focuses on blood culture and liquor, and in this way completes the assessment of the resistance situation in Austria in regard to important bacterial pathogens. The spectrum comprises key pathogens of infections of the respiratory and urinary tract but also *S. aureus* and ß haemolysing group A *streptococci* from various assay materials. For this reason, data supplied by the routine diagnostics of 12 Austrian laboratories operating on microbiological diagnostics have been summarized, evaluated and presented.

In the present AURES, the results are arranged in a colour-coded ranking system, which quickly offers an assessment of empirical therapy solutions and aims at facilitating the comparison with the EARS-Net numbers. In order to further provide a review over the last 5 years with the respective resistance developments, the separation between hospital and registered doctors in private practices has been maintained, where appropriate. For the first time, however, resistance numbers were also presented cumulatively for both fields of practice.

Summarizing, for the year 2017 the following is to be noted:

1. **Respiratory tract: ß-haemolysing group A *streptococci*** (n=2,280) show a lower macrolide resistance than ***pneumococci*** (n= 1,342) (7.1% versus 12.7%). The trend

observed last year thus remains more or less unchanged. The macrolide resistance for *pneumococci*, hence, lies slightly above that of the invasive pneumococci with 11.2% (EARS-Net AT). The resistance rates with *H. influenzae* (n=2,870) are for aminopenicillins 21.0%, for aminopenicillins with beta-lactamase inhibitor 8.8% and for fluoroquinolones 0.9%.

2. **Urinary tract:** The Ceph3-resistance rate for *E. coli* isolates (n=48,909) in total has been about the same with 7.5% for the last two years. The fluoroquinolones and sulfamethoxazole / trimethoprim show the highest resistance rates with 16.2% and 23.0%, respectively.
3. ***Klebsiella pneumoniae*** (n=9,752): The resistance in regard to 3rd generation cephalosporins was 8.1% in 2017, with the cabapenem resistance amounting to 0.9%.
4. ***Staphylococcus aureus:*** MRSA (n=1,561): With no major changes compared to the year before, the MRSA rate in hospitals was 8.2% and that with registered practitioners 4.6%. No linezolid or vancomycin resistant strain was isolated.
5. ***Pseudomonas aeruginosa:*** In tracheal secretion (n=701), a regressive tendency in regard to the resistance of all indicator substances, in particular in regard to piperacillin/tazobactam (24.4%) is determined. The carbapenem resistance currently amounts to 16.9%, with the ceftazidime resistance being 21.4%. With ear swabs (n=1,141), there is currently a resistance rate of 4.6% in regard to aminoglycosides and 7.0% in regard to ciprofloxacin.

Collectively, the range of non-invasive pathogens continues to reflect a stabile resistance situation in Austria, which, except for only a few exemptions (e.g., MRSA), hardly indicates any differences between hospital and registered practitioners. Empiric therapy options will further be existent for all pathogens, wherein with the gram-negative pathogens the importance of the antibiogram is steadily increasing due to the resistance rates: for many substances, the resistance rates determined range between 10 and 25%. A resistance rate that lies within this range would imply that the respective antibiotic shall only be used following susceptibility testing.

The full report can be found in the long version of the **AURES 2017** from page 139 to page 169 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

RESISTANCE REPORT *NEISSERIA MENINGITIDIS*

An activity of the National Reference Centre for Meningococci

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The National Reference Centre for Meningococci received 48 culturable isolates in 2017. Of these, 13 isolates were from invasive infections. Twenty of the 48 isolates were polyagglutinable (PA) (41.7%), 16 serogroup B (33.3%), 5 serogroup C (10.4%), 4 serogroup W (8.3%) and 3 were serogroup Y (6.3%).

According to EUCAST (v. 7.1), 15 isolates showed reduced susceptibility to penicillin. Five of the 15 intermediate strains were invasive isolates. Ten isolates, two of them invasive, were resistant to penicillin (MIC >0.25 mg/L). One strain was resistant to rifampicin. All strains were in vitro susceptible to ciprofloxacin und ceftriaxone.

The full report can be found in the long version of the **AURES 2017** from page 170 to page 176 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

RESISTANCE REPORT *CAMPYLOBACTER*

Data from the human and food sector

An activity of the National Reference Centre for *Campylobacter*/the National Reference Laboratory for *Campylobacter* from food and feed products

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In 2017, a total of 7,204 cases of campylobacteriosis was reported in Austria. A high to very high tetracycline and fluoroquinolone resistance rate, respectively, were found in *C. jejuni* and *C. coli* isolates of human and food (chicken, turkeys, ducks, geese) origin. The fluoroquinolone resistance in *C. jejuni* from human isolates (72.9%) has remained virtually unchanged, in *C. coli* the resistance rate slightly decreased being as high as 79.2%. Resistance towards erythromycin remained low and was primarily recorded in *C. coli*.

The full report can be found in the long version of the **AURES 2017** from page 177 to page 191 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

RESISTANCE REPORT *SALMONELLA*

Data from the human, food and veterinary sector

An activity of the National Reference Centre for Salmonella

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In 2017, the number of primary human isolates sent to the National Reference Centre for *Salmonella* increased by 15.3% as compared to 2016.

Due to the decline of fully susceptible *S.* Enteritidis isolates there has been a shift towards higher resistance rates in recent years in Austria. The highest resistance rates are found against ampicillin, sulphonamides and tetracycline (resistance pattern typical for multiresistant *S.* Typhimurium strains) and against nalidixic acid (low-level ciprofloxacin resistance), which is typical for *S.* Infantis, and several *S.* Enteritidis phage-types.

High level resistances against ciprofloxacin and third generation cephalosporins (cefotaxime, ceftazidime) were still extremely rare. The resistance rates among non-human salmonella isolates are partly considerably higher than those among human strains.

The full report can be found in the long version of the **AURES 2017** from page 192 to page 211 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

RESISTANCE REPORT *SHIGELLA*

Data from the human sector

An activity of the National Reference Centre for *Shigella*

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In Austria 56 cases of shigellosis were reported to the health authorities in 2017. In the same year, a total of 54 *Shigella* isolates were received by the National Reference Centre for *Shigella*. The incidence rate was 0.63/100,000 inhabitants; in 2016 an incidence of 0.7/100,000 inhabitants was registered. The predominant species was *Shigella sonnei* accounting for 68.5% of all isolates. We detected resistance against ciprofloxacin in 20 strains and resistance to nalidixic acid in 32 isolates. 5 *Shigella* strains were ESBL positive (9.3%).

The full report can be found in the long version of the **AURES 2017** from page 212 to page 222 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

RESISTANCE REPORT *YERSINIA*

Data from the human sector

An activity of the National Reference Centre for *Yersinia*

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In 2017, the Austrian National Reference Centre for *Yersinia* examined 146 isolates of *Yersinia* spp. Of these isolates, 93 were pathogenic, 53 were non-pathogenic. Among the pathogenic isolates 92 belonged to Yersinia enterocolitica and one strain to *Y. pseudotuberculosis*. In 2017, the incidence rate for cases confirmed by the National Reference Centre was 1.06 per 100 000 inhabitants. In vitro susceptibility testing revealed no abnormalities – twelve *Y. enterocolitica* isolates showed resistance to amoxicillin/clavulanic acid, and three to tetracycline.

The full report can be found in the long version of the **AURES 2017** from page 223 to page 227 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

RESISTANCE REPORT TUBERCULOSIS 2017

Data from the human sector

An activity of the National Reference Centre for tuberculosis

Authors/contact persons

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In 2017, a total of 570 cases of tuberculosis (445 confirmed, 73 probable, and 52 possible cases) were notified in Austria, which results in an incidence of 6.5/100,000 population. Men were 1.9 times more affected than women (8.4 versus 4.5/100,000 population). A total of 169 cases (29.6%) where found among native Austrians, 170 cases (29.8%) among Austrian residents born in the WHO region Europe and 231 cases (40.5%) among residents born outside of the WHO region Europe. The lowest incidence of tuberculosis was observed in the age group 5-14 years (1.0/100,000 population) and the highest among the 15-24 years old (11/100,000). The tuberculosis incidence among native Austrians decreased from 2008 to 2017 by 6 cases per 1 million residents per year. In 2017, a total of 18 cases of MDR -tuberculosis (including 3 cases of XDR-tuberculosis) among non-native Austrians were confirmed at the national reference center. No case of MDR- or XDR-Tb was detected among native Austrians.

The full report can be found in the long version of the **AURES 2017** from page 228 to page 243 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

RESISTANCE REPORT *NEISSERIA GONORRHOEAE*

Data from the human sector

An activity of the Nationale Reference Centre for gonococcal

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Due to the rapid emergence of antimicrobial resistance mechanisms in *Neisseria gonorrhoeae* the continuous surveillance of antimicrobial resistance data of *Neisseria gonorrhoeae* is crucial for the control and management of gonorrhea.

In 2016 the Institute for Medical Microbiology and Hygiene of AGES (IMED-WIEN) was mandated in collaboration with the Microbiology Laboratory Möst Innsbruck for the tasks of a national reference laboratory for *Neisseria gonorrhoeae*.

In 2017, data of 259 *Neisseria gonorrhoeae* isolates were evaluated for their antimicrobial susceptibility. The Isolates were provided by 12 Austrian laboratories via a sentinel-system. All isolates showed sensitivity to Ceftriaxone. Resistance rates for Cefixime, Azithromycin and Ciprofloxacin were 3.9%, 3.9% and 51.3% respectively. A total of 10% of isolates produced penicillinase (PPNG).

The full report can be found in the long version of the **AURES 2017** from page 244 to page 254 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

RESISTANCE REPORT YEASTS

Data from the human sector

An activity of the National Reference Centre for Yeasts

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Up to now resistance in Candida doesn't seem to be a real threat. In general, the situation in Austria is in concordance with globally reported data. In total, 59 resistant strains were found, 39 of these were *C. albicans*, 22 of these being resistant to micafungin. However, MIC values were mostly only one dilution above the breakpoint, thus it does not seem that we are confronted with clinically relevant resistance. Only a small number of strains was resistant against azoles. For the other echinocandins only a minor number has been identified as resistant. Also, the resistance rate to azoles is still relatively low.

The full report can be found in the long version of the **AURES 2017** from page 255 to page 292 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

RESISTANCE REPORT MOULD

Data from the human sector

An activity of the National Reference Centre for Mould

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156 moulds out of sterile body sites and bronchoalveolar lavages were collected from the Medical University Vienna, Department of Laboratory Medicine, the Medical University of Innsbruck, Division of Hygiene and Medical Microbiology, the Donauspital Vienna and the analyse BioLab GmbH of Linz in 2017. *Aspergillus* species, which were isolated in 80% (125/156), are still the leading causative agents of invasive mould diseases; thereof 70% (87/125) belong to the *Aspergillus fumigatus complex*.

Apart from *Aspergillus terreus* isolates, which exhibit intrinsic resistance to amphotericin B, 9% (11/125) of *Aspergillus* isolates showed elevated minimal inhibitory concentrations (MIC > 1 mg/l) against amphotericin B (5 *A. flavus*-, 4 *A. fumigatus*-isolates, 1 *A. niger* and 1 *A. ochraceus*-isolate); 14% (17/125) represented elevated MICs (> 0.125 mg/l) against posaconazole (10 *A. fumigatus*-, 2 *A. niger*-, 2 *A. flavus* , 2 *A. spezies*-isolates und 1 *A. nidulans*-isolate) and 10% (6/58) against itraconazole (> 1 mg/l; 4 *A. fumigatus*- und 2 *A. niger*-isolate), respectively. Out of 47 *Aspergillus*-isolates (33 *A. fumigatus*-, 6 *A. niger*-, 5 *A. flavus*-, 2 *A. lentulus*-isolates and 1 *Aspergillus* spezies-isolate) tested against isavuconazole, 44 showed MICs of ≤ 0.5 mg/l and can therefore be valued as susceptible. 1 *Aspergillus* spezies-, 1 *A. flavus*- and 1 *A. fumigatus*-isolate showed MICs > 0.5 mg/l against isavuconazole.

Among the non-*Aspergillus* isolates (31/156) elevated MICs above 1 mg/l for amphotericin B, above 0.125 mg/l for posaconazole and above 1 mg/l for voriconazole were detected in 27% (7/26), 54% (14/26) and 57% (13/23) respectively.

The full report can be found in the long version of the **AURES 2017** from page 293 to page 300 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

RESISTANCE REPORT OF THE AUSTRIAN HIV COHORT STUDY PART 1: TRANSMISSION OF DRUG-RESISTANT HIV IN AUSTRIA

An activity of the association "Austrian HIV Cohort Study"

Authors/contact persons

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Prevalence of Transmitted Drug Resistance is Stabilising at a Low Rate in Austria

Strickner S.[1], Rieger A.[2], Schmied B.[3], Sarcletti M.[4], Geit M.[5], Haas B.[6], Egle A.[7], Kanatschnig M.[8], Zoufaly A.[9], Zangerle R.[4], for the AHIVCOS Study Group

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Objective: To determine the prevalence of transmitted drug resistance (TDR), temporal trends in resistance, and predictors for TDR.

Method: Newly diagnosed patients from 2003 to December 2017 from eight centres were analyzed. Mutations were judged as resistant according to Bennett et al. (WHO 2009 mutation list). For patients with acute or recent infection the year of infection was

obtained by the date of primary HIV infection or the median point in time between negative and positive HIV test. For patients with chronic infection the rate of resistance was plotted against the year of the HIV diagnosis.

Results: Overall 2,986 of 4,912 patients had an amplifiable resistance test. The overall prevalence of TDR was 8.0% (240 of 2,986 patients; 95% CI: 7.1%-9.1%). The prevalence of NRTI resistance was 3.4% (2.8%-4.1%), the prevalence of NNRTI resistance was 3.2% (2.6%-3.9%), and the prevalence of PI resistance was 2.0% (1.6%-2.6%). The relative risk of TDR in men who have sex with men compared to heterosexual contacts was 1.6 (95% CI: 1.2-2.1). The prevalence rate of TDR in the 967 patients with acute/recent infection was 8.8% (63 of 718 patients; 6.9%-11.1%). One patient (0.1%) showed TDR against 3 drug classes (K70R; K103N; L90M). The prevalence rate of TDR in the 3922 patients with chronic infection was 7.8% (177 of 2268 patients; 6.8%-9.0%).

Conclusions: The prevalence of TDR among newly diagnosed patients was found to be stabilizing. No difficult to treat cases of TDR has been observed.

The full report can be found in the long version of the **AURES 2017** from page 301 to page 314 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

RESISTANCE REPORT OF THE AUSTRIAN HIV COHORT STUDY PART 2: RESISTANCE DEVELOPMENT UNDER ANTIRETROVIRAL THERAPY

An activity of the association “Austrian HIV Cohort Study”

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Prevalence of Development of Drug Resistance in HIV infected patients in Austria

Strickner S.[1], Rieger A.[2], Schmied B.[3], Sarcletti M.[4], Geit M.[5], Haas B.[6], Egle A.[7], Kanatschnig M.[8], Zoufaly A.[9], Zangerle R.[4], for the AHIVCOS Study Group

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Objective: To determine the prevalence of development of drug resistance, predictors and temporal trends in resistance.

Method: Patients currently in care in one of eight centres who have ever been on antiretroviral therapy (ART) were analyzed. Mutations were judged as resistant according

to “2017 Update of the Drug Resistance Mutations in HIV-1” from the International Antiviral-Society-USA.

Results: Overall 4,625 patients have ever received ART, 4,607 of them currently. 1,263 had a resistance test after ART (27.3%). The overall prevalence of development of drug resistance was 74.7% (943 of 1,263 patients), the prevalence of NRTI resistance was 36.3%, the prevalence of NNRTI resistance was 28.0%, and the prevalence of PI resistance was 67.5%. The prevalence of 3-class-resistance was 18.2% (230 of 1,263 patients). The risk factors for developing a 3-class-resistance were a CD4 nadir <50 (OR=3.4; 95% CI: 2.3-5.1), a CD4 nadir between 50 and 200 (OR=2.2; 95% CI: 1.5-3.2) and initial therapy before 1997 (OR=27.2; 95% CI: 18.1-40.9) as well as from 1997 to 2003 (OR=9.1; 95% CI: 6.0-13.8) and an age at ART-start <30 (OR=2.3; 95% CI: 1.2-4.7). The risk to develop a 3-class-resistance was lower in patients with a low viral load (for <50 copies/ml OR=0.2; 95% CI: 0.1-0.4) and in female patients infected through intravenous drug use (OR=0.4; 95% CI: 0.2-0.9).

Conclusions: The overall prevalence of development of drug resistance is at a rather high level, while the prevalence of 3-class-resistance was found to be stabilizing at a low level. The risk for developing resistance is small in those who initiated therapy in recent years.

The full report can be found in the long version of the **AURES 2017** from page 315 to page 335 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

REPORT OF ANTIBIOTIC RESISTANCE MONITORING ACCORDING TO THE COMMISSION IMPLEMENTING DECISION 2013/652/EU IN AUSTRIA, 2017

Authors/contact persons

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In accordance with the EU-Directive 2003/99/EC, the Federal Ministry of Health in cooperation with the Austrian Agency for Health and Food Safety (AGES) and officially designated veterinary practitioners conducted annual programs in order to monitor the prevalence and the antimicrobial resistance of certain zoonotic and indicator bacteria in different Austrian farm animal species. Since 2014, based on the Commission Implementing Decision (2013/652/EU), the member states have to monitor and report antimicrobial resistance in zoonotic and commensal bacteria isolated from samples of food producing animals and from food. In 2017, representative samples of slaughtered fattening pigs and bovines under one year of age – each from a different holding – were investigated for indicator *E. coli*, *Salmonella* and ß-lactamase-producing *E. coli* as well as different batches of fresh pork and fresh beef from retail for ß-lactamase-producing *E. coli*. The collected samples had to be sent to the AGES-laboratory within two days arriving at a temperature between 2–8°C. In the respective national reference laboratories the obtained isolates were specified or typed and tested for their susceptibility to a given number of antimicrobial substances applying epidemiological Cut-OFFs according to EUCAST.

Indicator *E. coli*-isolates from 180 fattening pigs and 181 bovines under one year of age were susceptibility tested. Fifty percent of isolates from pigs and 73% from bovines under one year of age did not show any microbiological resistance. High resistance rates were found in isolates from pigs towards tetracycline (41%), sulfonamides (24%), and ampicillin (20%), and moderate resistance rates towards trimethoprim (13%). In isolates from bovines under one year of age resistance rates were lower than in isolates from pigs other than chloramphenicol (6%), towards tetracyclin (24%), sulfonamides (18%), ampicillin (9%), and trimethoprim (7%). Resistance rates towards all other antimicrobials tested were below 5%. Two indicator *E. coli*-isolates from pigs were confirmed as ESBL-producing *E. coli* and one as AmpC-producing *E. coli*. Two isolates from bovines under one year of age were tested resistant to 3rd generation cephalosporines but these could not be confirmed as ß-lactamase-producing *E. coli*.

Using selective media, 291 caecal samples from fattening pigs and 303 from bovines under one year of age as well as 309 samples of fresh pork and 300 of fresh beef were examined for ESBL-/AmpC-producing *E. coli*. Putative ESBL- or AmpC-producing *E. coli* were identified in 181 (62%) caecal-samples from pigs, in 68 (22%) from bovines under one year of age, and in 32 pork samples (10%) and five beef samples (2%) and all of those were confirmed as ß-lactamase-producing *E. coli*.

Phenotypical resistance to colistin was not detected in any isolate. Therefore, no examination for *mcr*-genes was performed.

Co-resistance to cefotaxime and ciprofloxacin in ß-lactamase-producing *E. coli* could be found in 42 (23%) isolates from pigs, in 30 (44%) isolates from bovines under one year of age, in seven isolates (22%) from pork and in one of five isolates from beef.

Carbapenemase-producing *E. coli* could neither be identified in 283 caecal samples of fattening pigs, 300 of bovines under one year of age, 302 pork samples nor in 297 beef samples from retail.

In 2017, no *Salmonella* could be detected in any pig slaughter house on carcases after dressing but before chilling in term of controlling process hygiene criteria; no susceptibility testing could be performed with any isolate of *Salmonella*.

The full report can be found in the long version of the **AURES 2017** from page 336 to page 387 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

EUROPEAN SURVEILLANCE OF VETERINARY ANTIMICROBIAL CONSUMPTION (ESVAC)

An activity of AGES – Agency for Health and Food Safety
Department data, statistics and risk assessment

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In 2017, the total sales of active ingredients of antimicrobial agents in Austria for livestock equal 44.61 tons (t). After a steady decline over the years 2013 to 2016, the total sales were slightly higher (+ 0.5%) than in the previous year.

The largest amount of veterinary antimicrobials was for systemic use (more than 90%), which may take the form of parenteral or oral administration. Within the group for systematic use more than half were tetracyclines, followed by penicillins with extended spectrum, sulfonamides and macrolides.

Oral preparations – this group includes oral powders, oral solutions, tablets and oral paste – are with more than 80% still the most used application form. Parenteral preparations are on second place with roughly 13%, followed by premix with 3%.

Within the group, which, according to the WHO, are the "Highest Priority Critically Important Antimicrobials (HPCIA)", there was an increase of 2% to 5.35 tons. The share in total is relatively constant at round 12% over the years.

The full report can be found in the long version of the **AURES 2017** from page 388 to page 397 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

ANTIMICROBIAL CONSUMPTION IN HUMAN MEDICINE IN AUSTRIA

National Reference Centre for nosocomial infections and antibiotic resistance
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The AURES report is based on consumption data provided by the Hauptverband der österreichischen Sozialversicherungsträger (The Organisation of Austrian Social Security), and antibiotics consumption data provided by IQVIA™. The data from both sources were depicted in regards to sectors, substances, reference figures and seasonal fluctuation.

The systemic overall consumption of antibiotics in Austria amounted in the year 2017 in the field of human medicine to 65.498 t (2016: 71.602t) active ingredients, with 66% (2016: 67%) thereof accounting for registered practitioners and 34% (2016: 33%) for the hospital sector.

In retrospect, and in view of the data of 2011, overall consumption has decreased from 66.907 t to 65.498 t active ingredients. For the hospital sector antibiotic consumption increased by 12.4% (2011: 19.7 t; 2017: 22.1 t), whereas in the sector of registered practitioners consumption decreased by 8.1%.

Consumption density in Austria in 2017 was 18.90 DDD/1,000 inhabitants per day, thus having decreased since 2011 by 11.0% (21.2 DDD/1,000 inhabitants per day). In comparison with 2016, the prescriptions per 10,000 inhabitants per day have increased from 16.5 to 17.3, respectively.

Penicillins (J01C) account for 54% of overall consumption, with a tendency of being stable towards slightly decreasing (2011: 10.5 DDD/1,000 inhabitants per day; 2017: 10.3 DDD/1,000 inhabitants per day). The dominance of penicillins (J01C), is also being reflected in the sector of registered practitioners (2017: 8.1 DDD/1,000 inhabitants per day), where penicillins are followed by the group of macrolides, lincosamides and streptogramins (J01F) (2017: 2.8 DDD/1,000 inhabitants per day). In the hospital sector, the penicillins (J01C) also show the highest consumption (J01C) (2017: 37.6 DDD/100 occupancies per year), followed by cephalosporines (2017: 11.0 DDD/100 occupancies per year).

The monthly consumption shows a fluctuation in correlation with the various seasons. In 2017 significant fluctuation was seen in penicillins (J01C), in cephalosporines (J01D), and in the group of the macrolides, lincosamides and streptogramins (J01F) as well as in quinolones (J01M). In the year 2017, the fluctuation amounted to 57.9% for the macrolides, lincosamides and streptogramins (J01F), followed by cephalosporines (J01D) with 24.2%, penicillins (J01C) with 22.1%, and quinolones (J01M) with 19.7%.

The seasonal fluctuation in the sector of registered practitioners showed the largest fluctuation range in the group of the macrolides, lincosamides and streptogramins (J01F) (59.7%), followed by cephalosporines (J01D) with 30.6%, penicillins (J01C) with 25.8%, and quinolones (J01M) with 20.1%. In the hospital sector, seasonal fluctuations in the group of tetracyclines (J01A) amounted to 44%, the group of the macrolides, lincosamides and streptogramins (J01F) to 28% and quinolones (J01M) to 19.1%.

Carbapenems showed in 2017 a hospital-related consumption of 2.48 DDD/100 occupancies per year, with meropenem representing the most-used substance (only 0.5% of overall consumption assigned to the sector of registered practitioners).

In the hospital sector among “reserve antibiotics” used for treatment of gram-positive pathogens, the consumption of linezolid and vancomycin decreased during the period of the study. In the gram-negative arena, there was an increase of consumption of meropenem and cefepim, while the consumption of the remaining active ingredients has been decreasing (imipenem/cilastatin, doripenem, ertapenem, cefpirom).

The full report can be found in the long version of the **AURES 2017** from page 398 to page 430 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

RESISTANCE REPORT *ERWINIA AMYLOVORA*

An activity of AGES - Austrian Agency for Health and Food Safety
Sector food security
Institute of sustainable plant production

Authors/contact persons

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Fire blight is one of the most destructive pome fruit diseases. It is caused by the plant pathogenic bacterium *Erwinia amylovora* and is highly infectious. In Austria fire blight can be controlled by the use of streptomycin as plant protection agent amongst other measures. In order to determine the prevalence of streptomycin resistant *E. amylovora* strains at an early stage, surveillance activities have been carried out since 2006. Up to date, all *E. amylovora* isolates from treated orchards have been tested as susceptible to streptomycin. The distribution of minimum inhibitory concentrations between wild-type strains and test strains was compared. No shifting of the sensitivity range of the tested isolates has been revealed so far.

The full report can be found in the long version of the **AURES 2017** from page 431 to page 441 (https://www.sozialministerium.at/Themen/Gesundheit/Antimikrobielle-Resistenzen-und-Gesundheitssystem-assoziierte-Infektionen/Antimikrobielle-Resistenzen/AURES---der-%C3%B6sterreichische-Antibiotikaresistenz-Bericht.html).

Table 1: Overview contribution summary with authors and contact persons

contributions	authors and contact persons
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Resistance report of the Austrian HIV cohort study part 1: transmission of drug resistant HIV in Austria	**Mag.[a] Stefanie Strickner** **Univ.-Prof. Dr. Robert Zangerle** University Clinic of Dermatology and Venereology Anichstraße 35 6020 Innsbruck Email: hiv.hohorte@uki.at
Resistance report of the Austrian HIV cohort study part 2: resistance development under antiretroviral therapy	**Mag.[a] Stefanie Strickner** **Univ.-Prof. Dr. Robert Zangerle** University Clinic of Dermatology and Venereology

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Report of antibiotic resistance monitoring according to the commission implementing decision 2013/652/EU in Austria, 2017	**Dr. med. vet. Peter Much** **Hao Sun, Bakk.rer.soc.oec.** Austrian Agency for Health and Food Safety Department of Statistics (STA) Integrative risk assessment, data and statistics (DSR) Spargelfeldstraße 191 1220 Wien Email: peter.much@ages.at
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Resistance report *Erwinia amylovora*	Mag.[a] Helga Reisenzein DI [in] Ulrike Persen Austrian Agency for Health and Food Safety Sector Food Security Institute of sustainable plant production

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