EUCAST European Committee on Antimicrobial Susceptibility Testing

Klebsiella pneumoniae

EUCAST rapid antimicrobial susceptibility testing (RAST)

Calibration of zone diameter breakpoints to MIC values.

EUCAST RAST breakpoints version 9.0
January 2026

MIC and zone diameter correlates

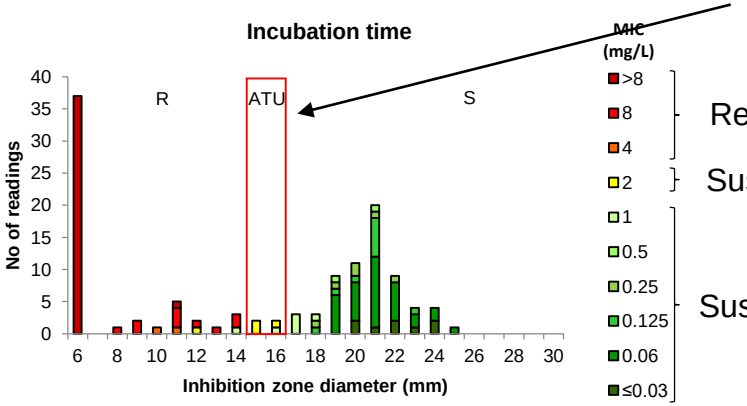
- The following histograms present inhibition zone diameter distributions from EUCAST rapid antimicrobial susceptibility testing (RAST).
- The reference method is MIC with broth microdilution.
- In addition, SIR interpretations from standard disk diffusion have been used as a reference for isolates for which MICs are lacking.
- In most, the different colours of the bars indicate different MIC values. In some, the colours of the bars indicate a resistance gene or a resistance mechanism. When SIR interpretation from standard disk diffusion have been used as a reference this is shown as striped bars.
- This presentation is based on EUCAST RAST Clinical Breakpoint Table v. 9.0 (based on EUCAST Breakpoint Tables version 16.0).

Changes from previous version

Changes
• New distributions for aztreonam and aztreonam-avibactam.

Explanation of graphs:

- These graphs show zone diameter distributions with MIC values or resistance mechanisms as coloured bars. Colours are related to current EUCAST MIC breakpoints.

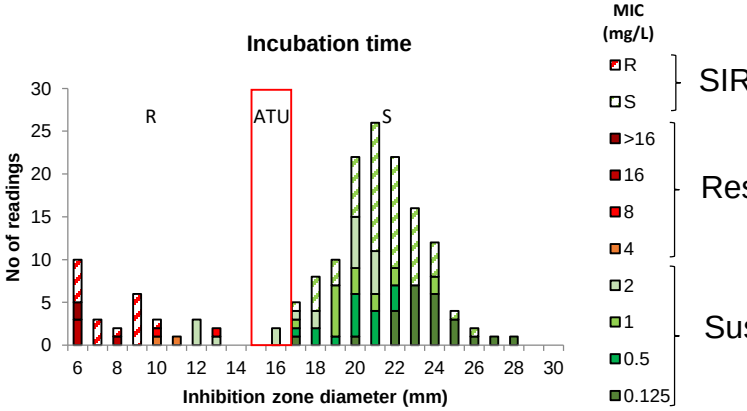


Area of Technical Uncertainty (ATU), inhibition zone diameters above the ATU are interpreted as susceptible (S or I) and those below as resistant (R).

Resistant (R)

Susceptible, increased exposure (I)

Susceptible, standrad dosing regimen (S)



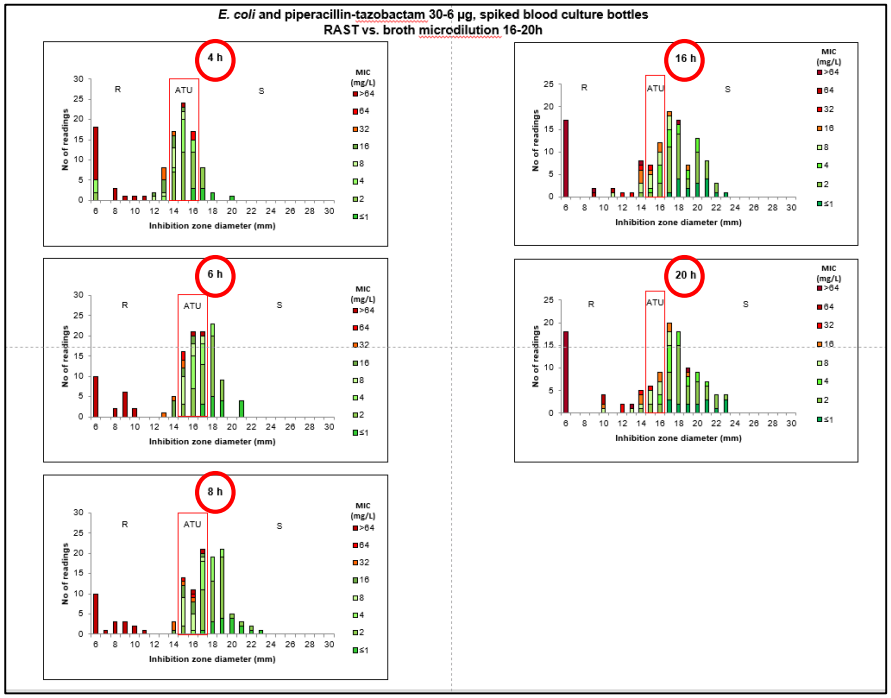
SIR interpretations from using standard disk diffusion as a reference

Resistant (R)

Susceptible, standard dosing regimen (S)

For each species-agent combination, the first slide shows RAST graphs versus reference method and the second slide shows data for the same isolates tested with EUCAST standard disk diffusion method versus reference method*. Graphs with RAST data are shown per incubation time; data for 16-20 hours incubation are shown as two graphs one for 16 and one for 20 hours.

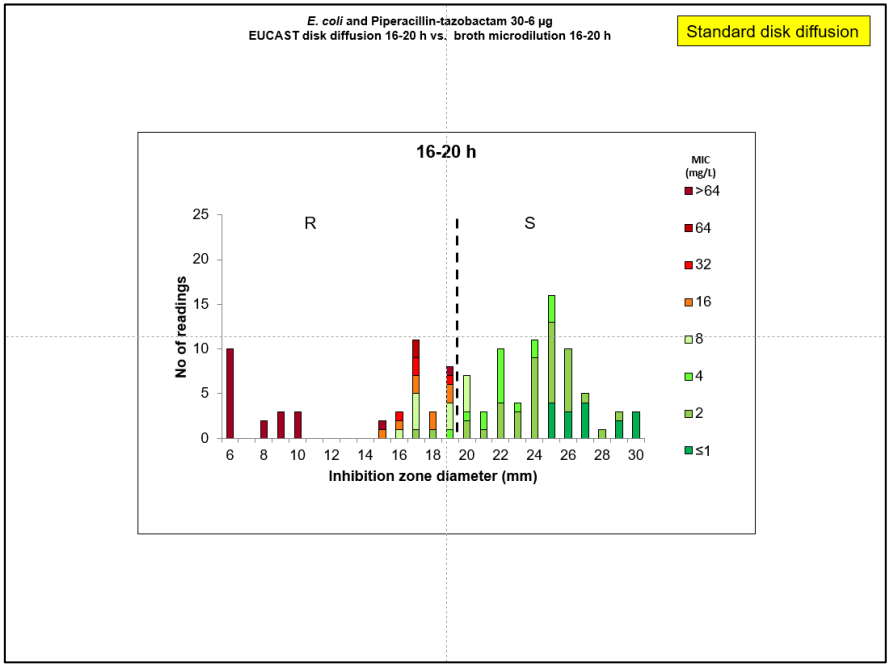
*This slide will not be available for species-agent combinations where EUCAST standard disk diffusion is used as the reference.



← RAST versus reference method, one graph per available incubation time.

Standard disk diffusion versus reference method.

↓



Material and method

- Isolates have been tested from spiked blood culture bottles.

- All isolates have been tested on media agar from two manufacturers. The number of tests are therefore twice the number of isolates except for enterococci where some tests were repeated more than once.

Klebsiella pneumoniae
The proportion of readable zone diameters

The proportion of zone diameters (%) which are possible to read* after 4, 6, 8 and 16-20 h of incubation.

Organism	**4 hours (%)**	**6 hours (%)**	**8 hours (%)**	**16-20 hours (%)**
Klebsiella pneumoniae	96	98	98	100

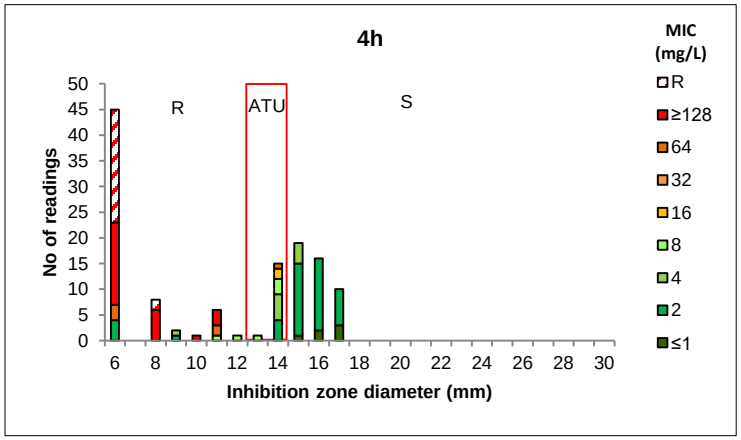
*The table displays “possible to read”, not “possible to interpret”, since some of the zone diameters will be in the ATU.

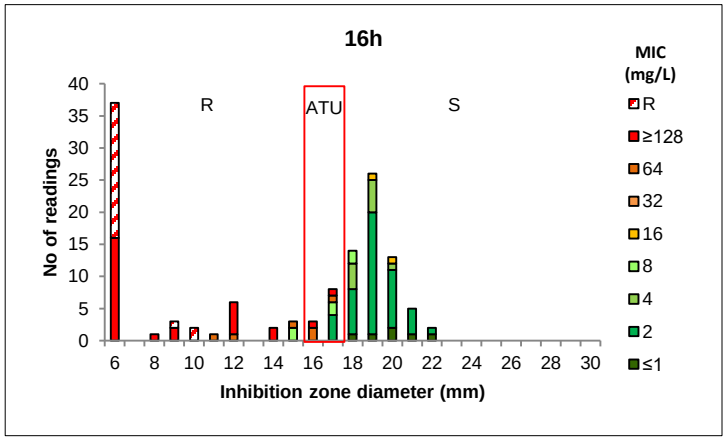
Klebsiella pneumoniae
Antimicrobial agent and number of tested isolates

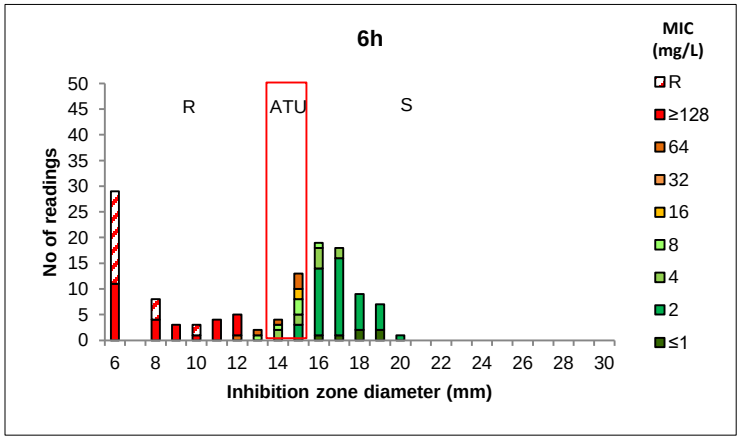
Antimicrobial agent	Number of tested isolates (number of tests)
Amoxicillin-clavulanic acid	63 (126)
Piperacillin-tazobactam	52 (104)
Temocillin	63 (126)
Cefotaxime	52 (104)
Ceftazidime	52 (104)
Ceftazidime-avibactam	53 (106)
Ceftolozane-tazobactam	53 (106)
Imipenem	53 (106)
Imipenem-relebactam	63 (126)
Meropenem	52 (104)
Meropenem-vaborbactam	63 (126)
Aztreonam	45 (90)
Aztreonam-avibactam	45 (180*)
Ciprofloxacin	52 (104)
Levofloxacin	53 (106)
Amikacin	52 (104)
Gentamicin	52 (104)
Tobramycin	52 (104)
Trimethoprim-sulfamethoxazole	53 (106)

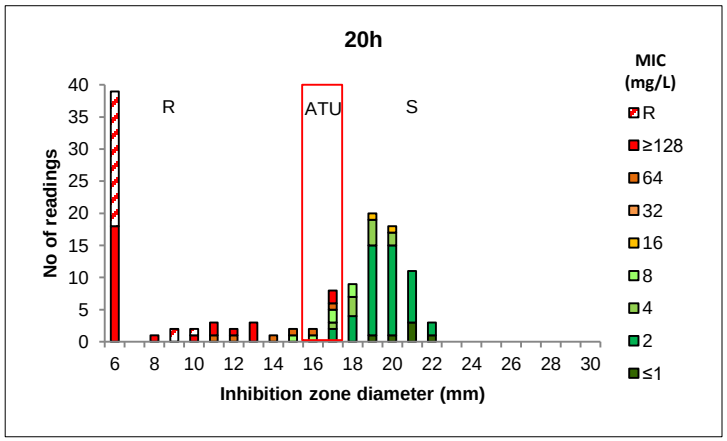
*Antimicrobial disks from two manufacturers have been tested.

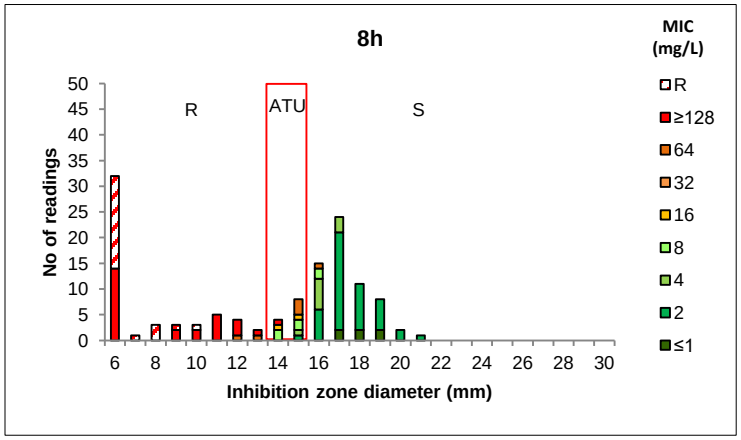
K. pneumoniae and amoxicillin-clavulanic acid 20-10 µg, spiked blood culture bottles
RAST vs. broth microdilution and EUCAST disk diffusion 16-20 h





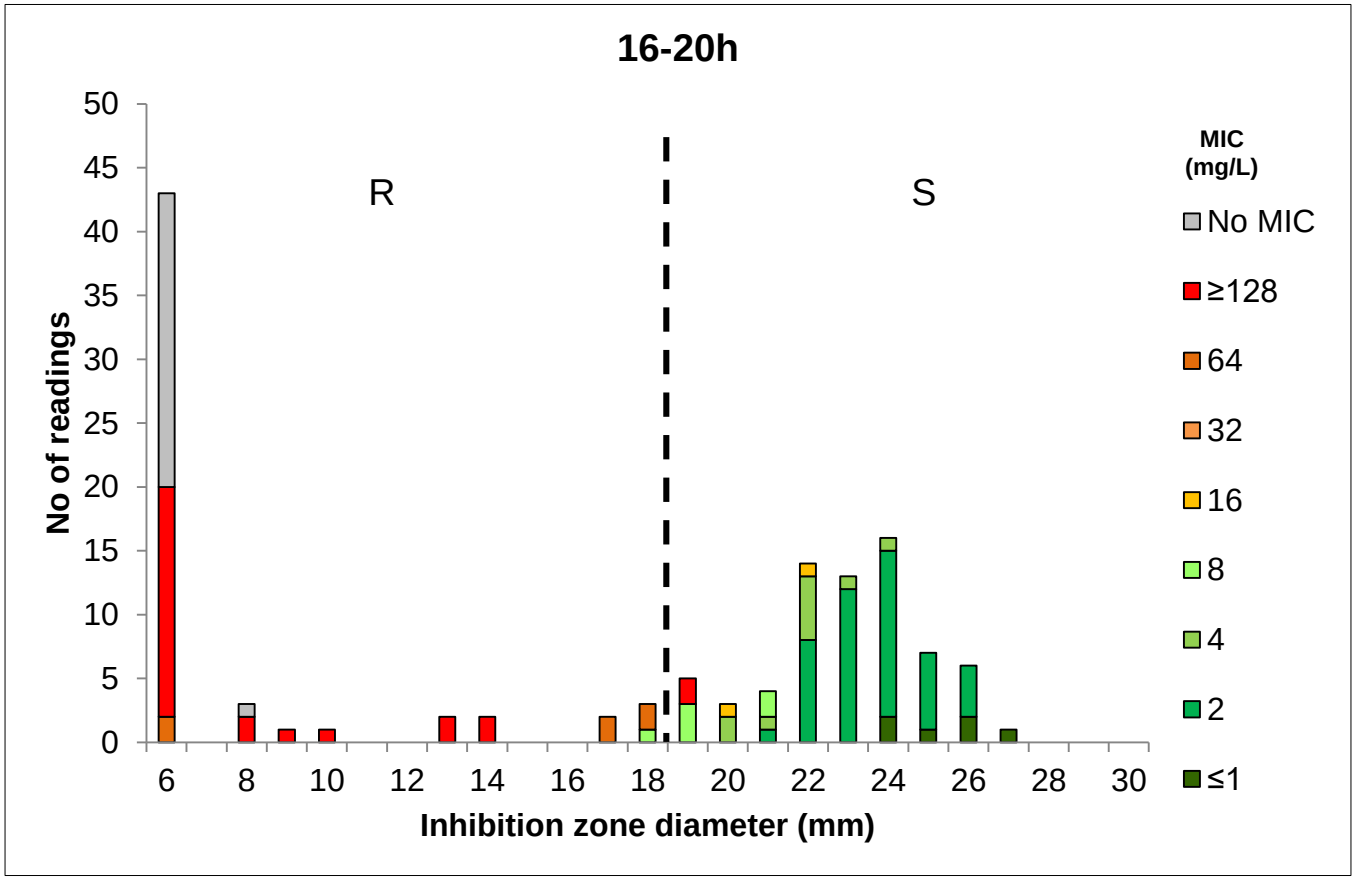




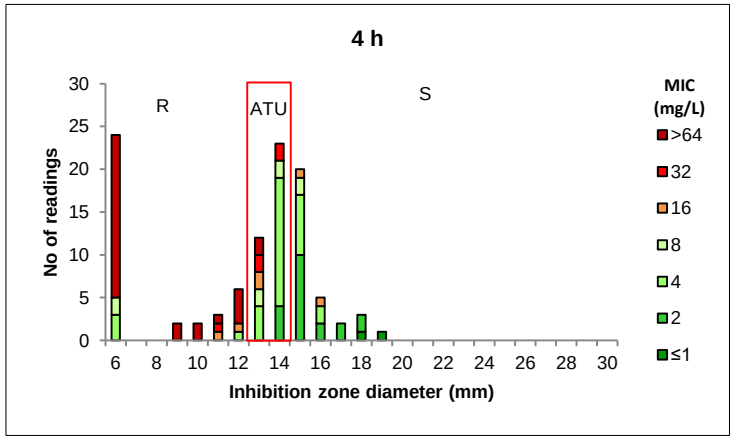


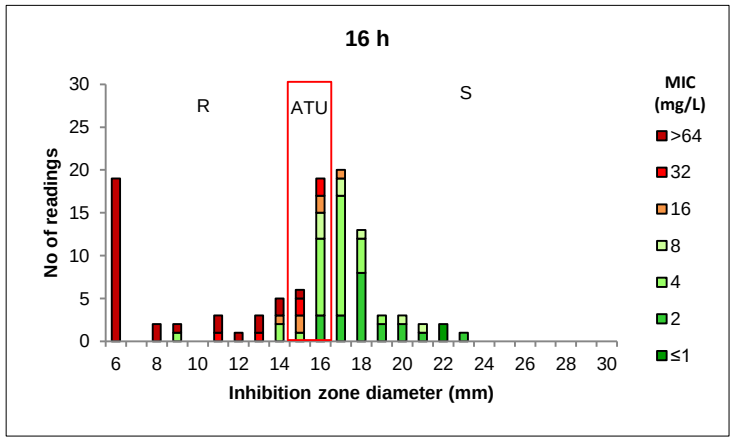
***K. pneumoniae* and amoxicillin-clavulanic acid 20-10 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

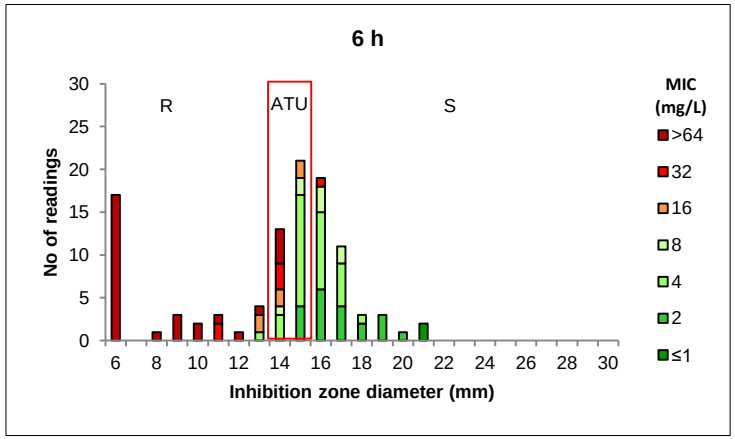
Standard disk diffusion

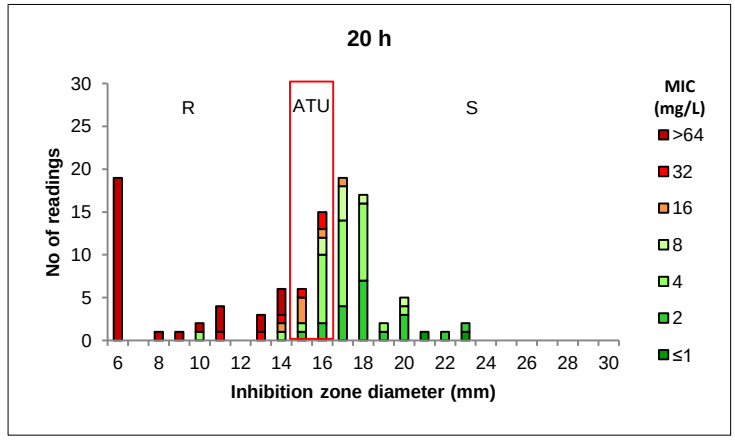


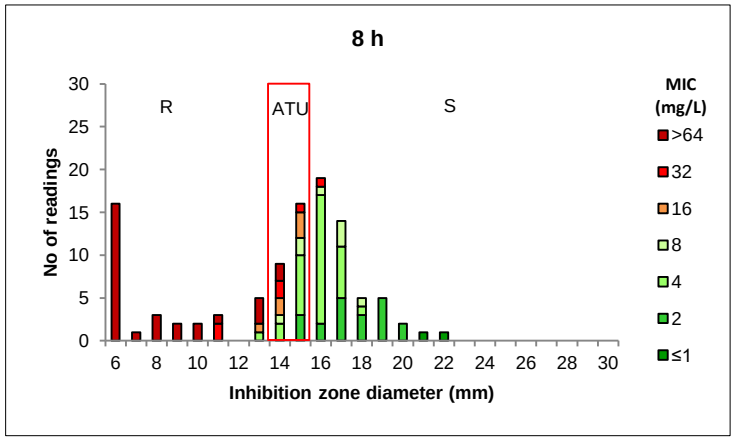
***K. pneumoniae* and piperacillin-tazobactam 30-6 µg, spiked blood culture bottles**
RAST vs. broth microdilution 16-20h





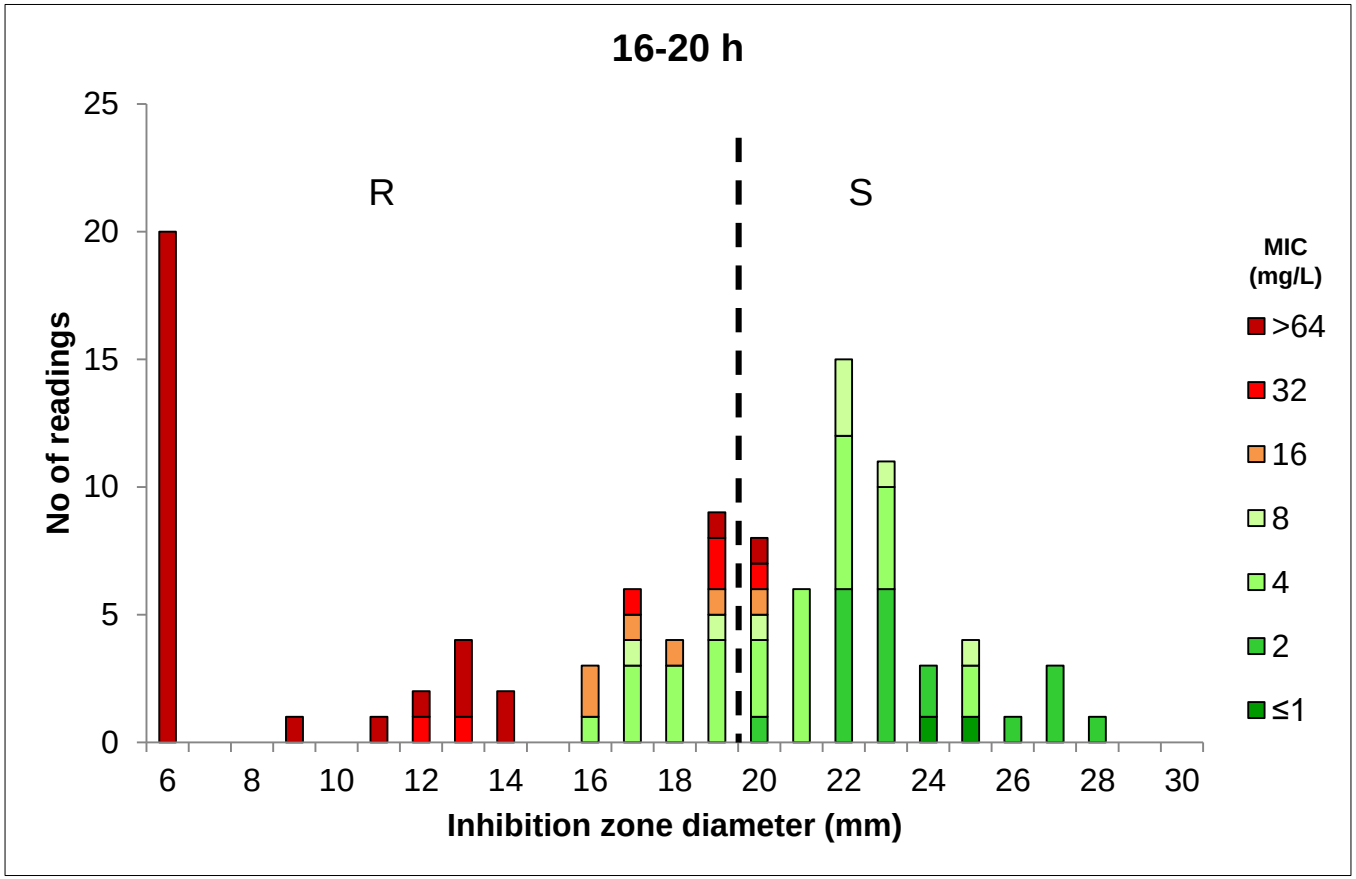




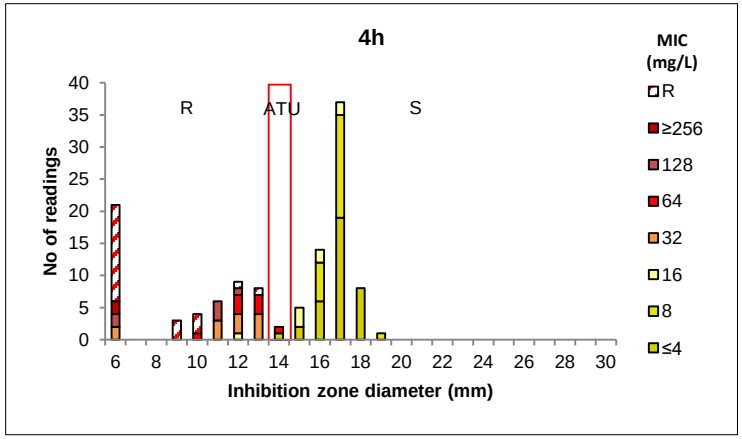


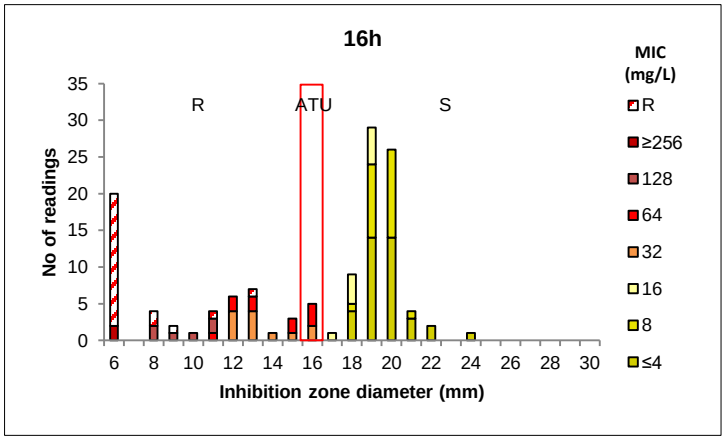
***K. pneumoniae* and piperacillin-tazobactam 30-6 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

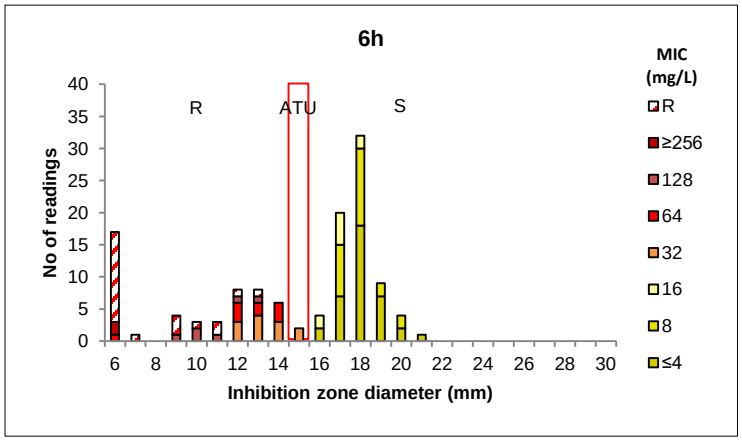
Standard disk diffusion

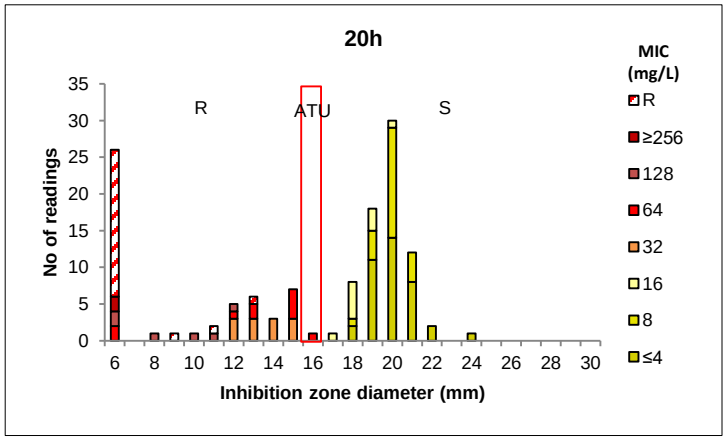


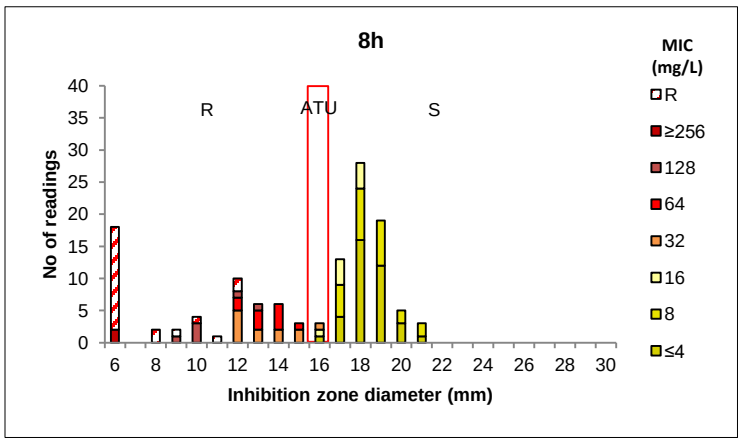
***K. pneumoniae* and temocillin 30 µg, spiked blood culture bottles**
RAST vs. broth microdilution and EUCAST disk diffusion 16-20 h





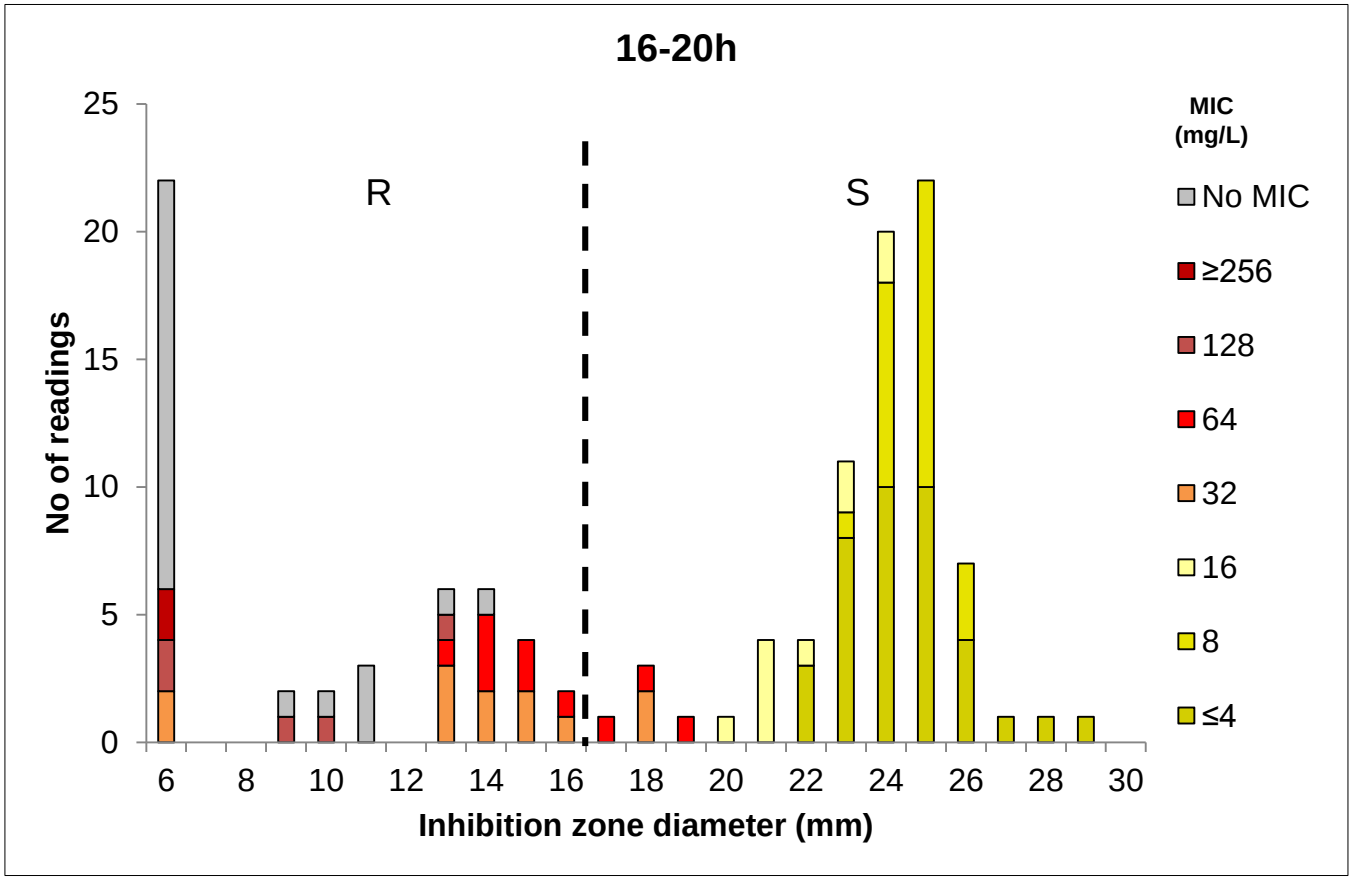




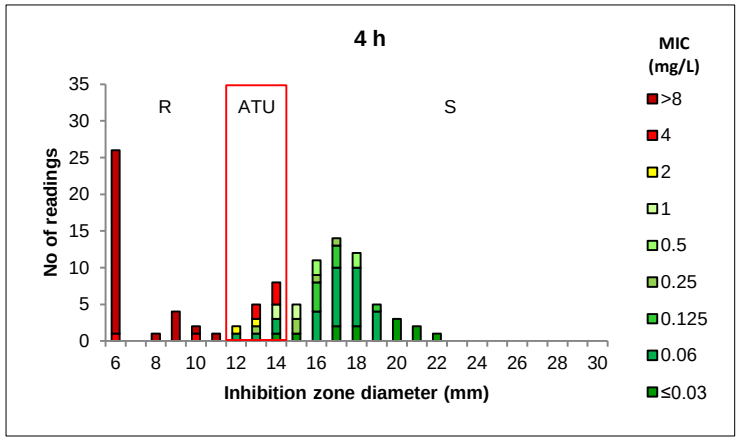


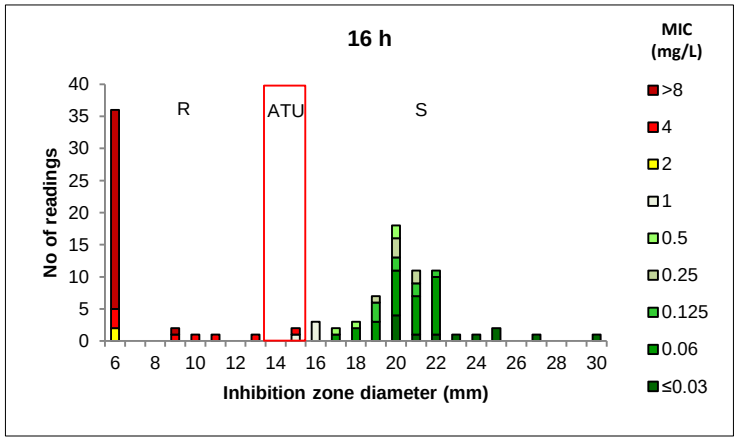
***K. pneumoniae* and temocillin 30 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

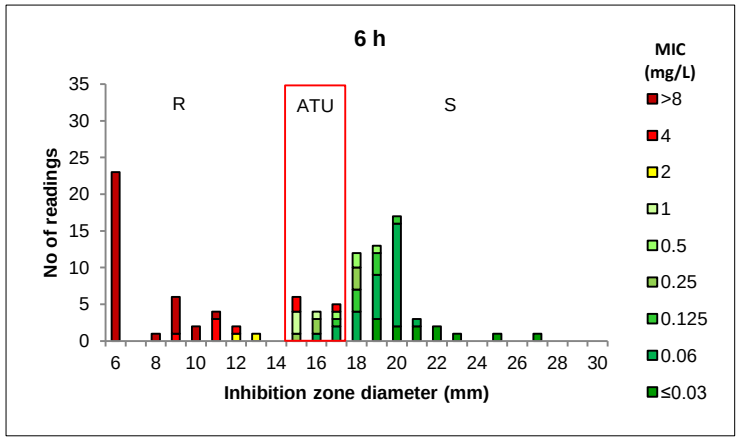
Standard disk diffusion

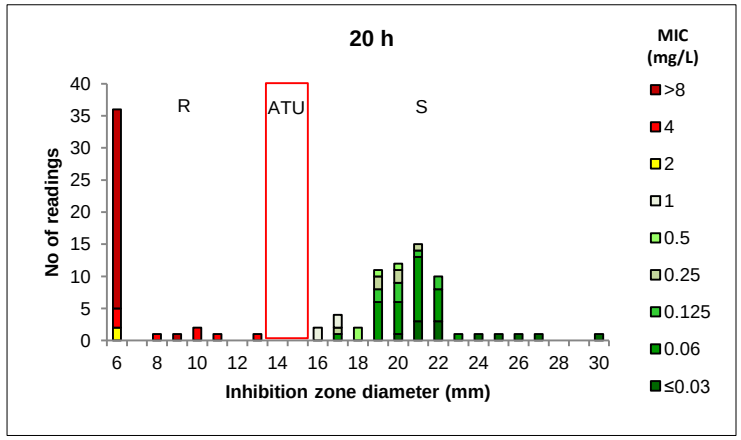


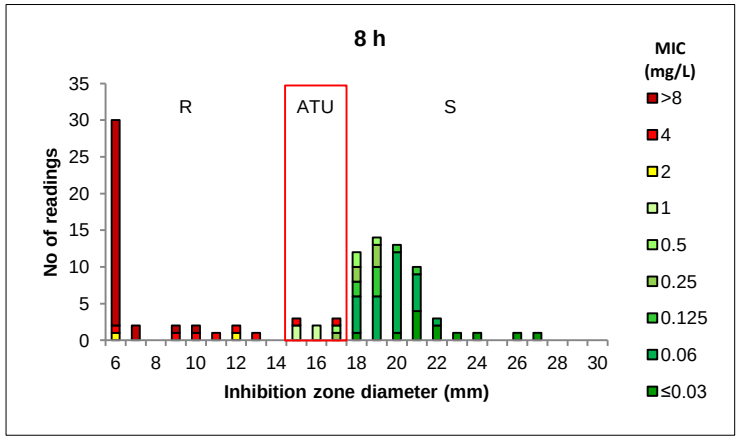
***K. pneumoniae* and cefotaxime 5 µg, spiked blood culture bottles**
RAST vs. broth microdilution 16-20h





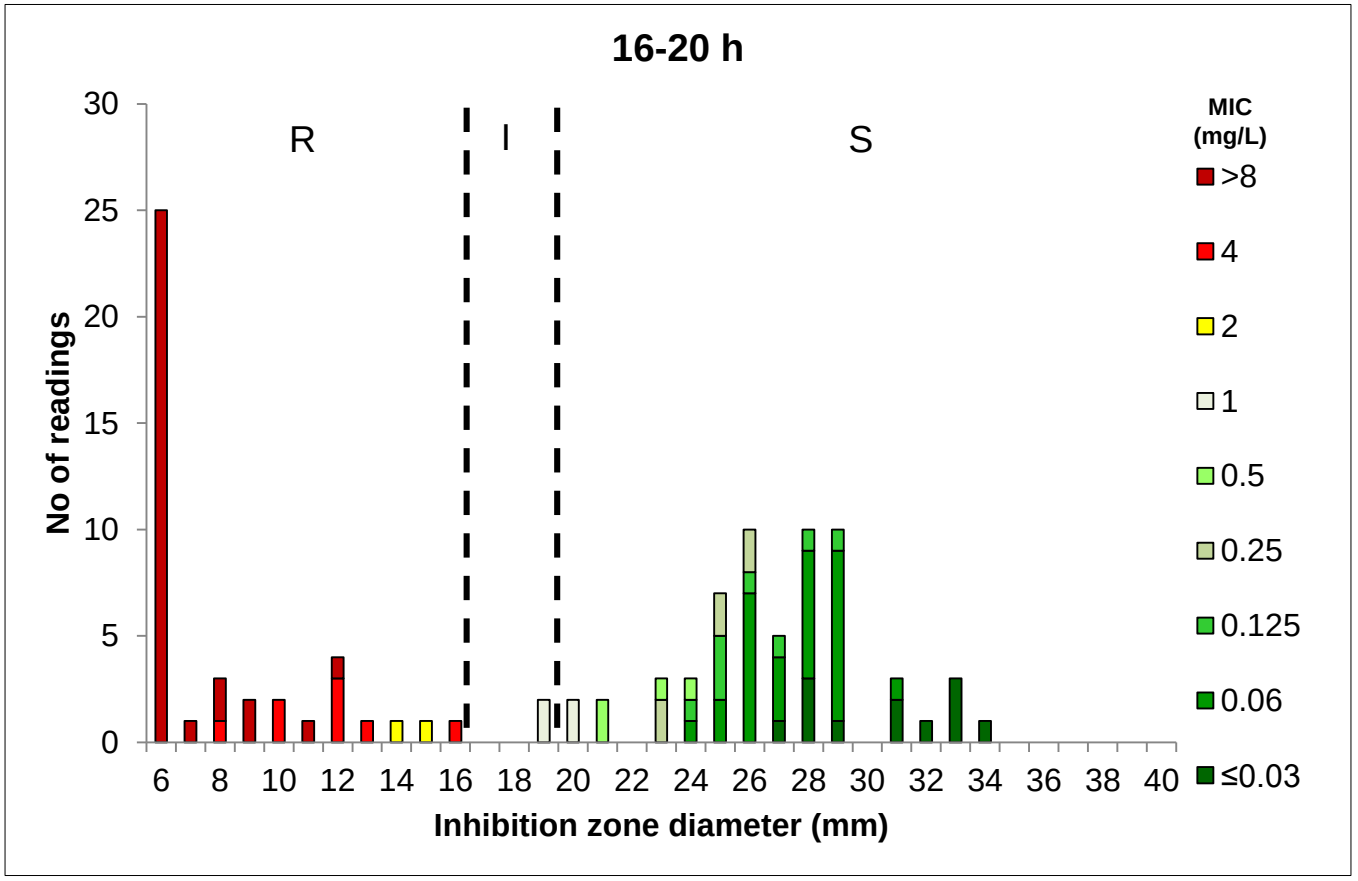




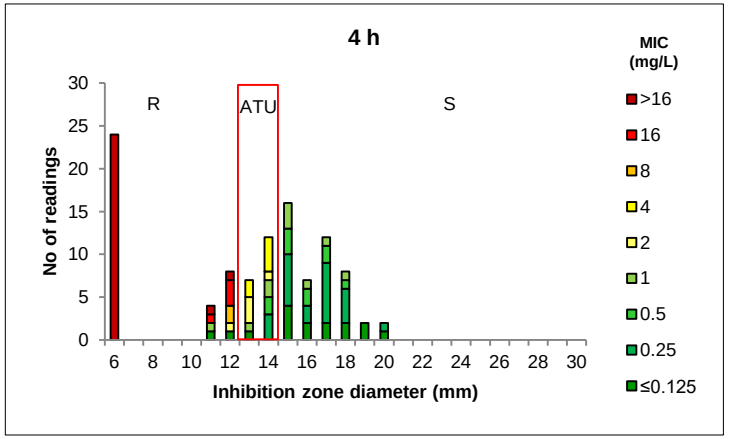


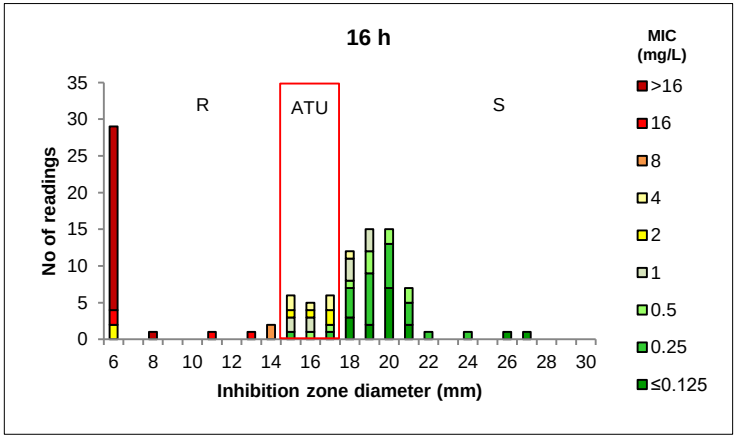
***K. pneumoniae* and cefotaxime 5 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

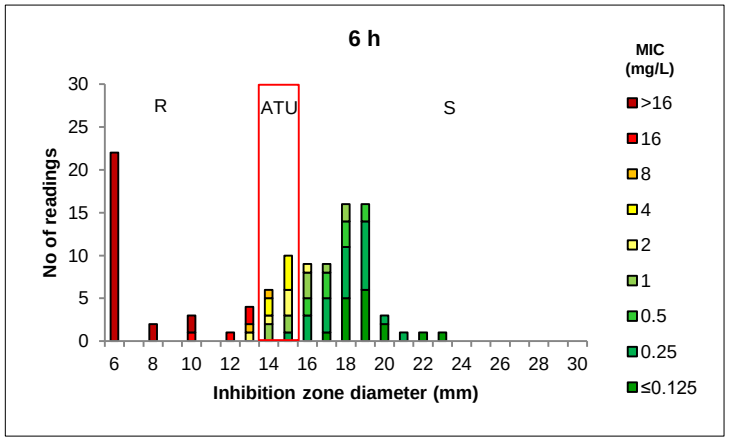
Standard disk diffusion

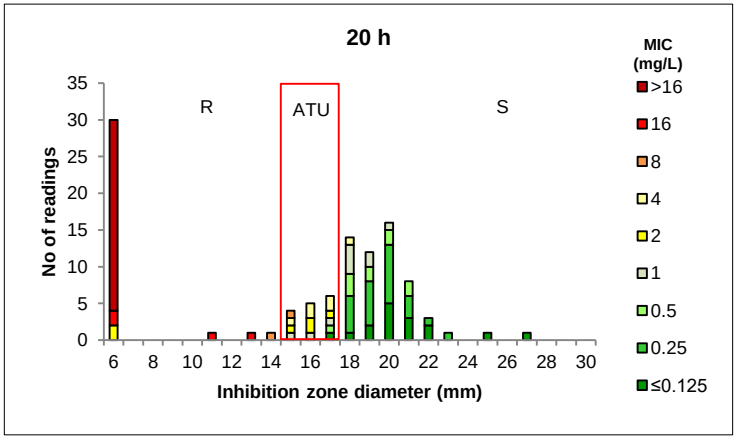


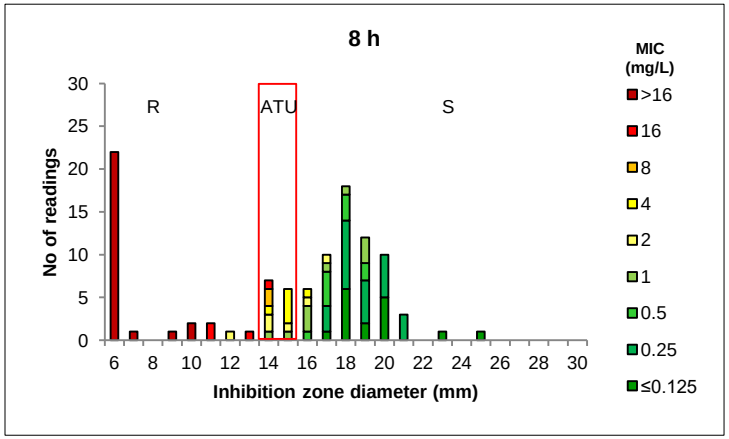
K. pneumoniae and ceftazidime 10 µg, spiked blood culture bottles
RAST vs. broth microdilution 16-20h





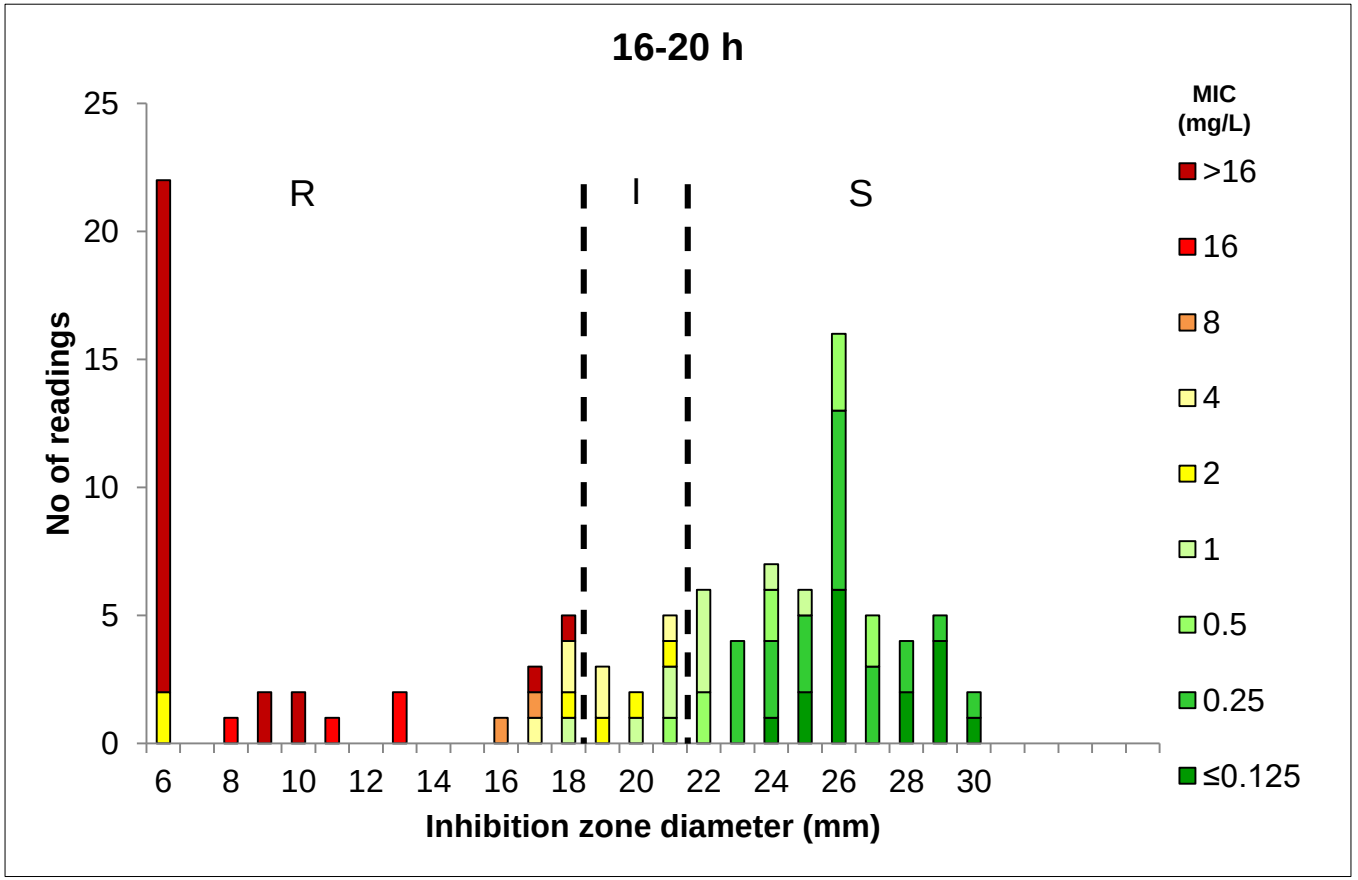




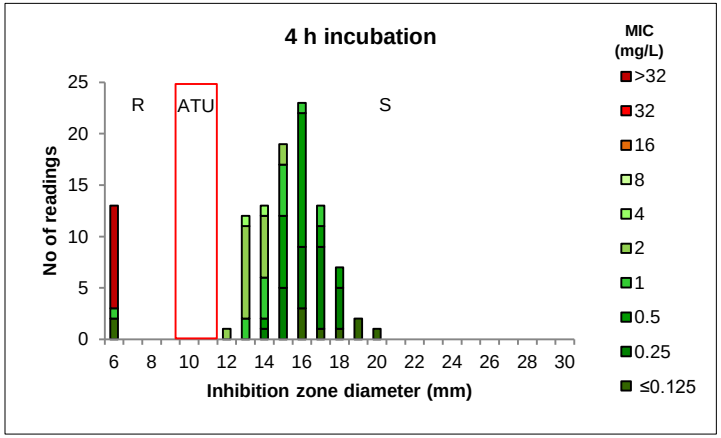


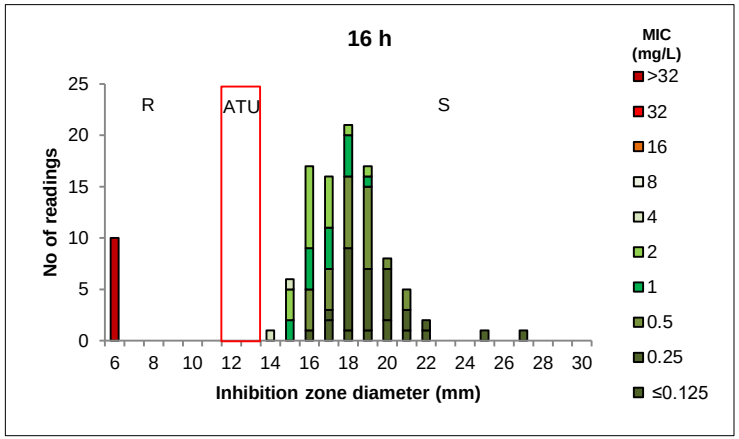
***K. pneumoniae* and ceftazidime 10 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

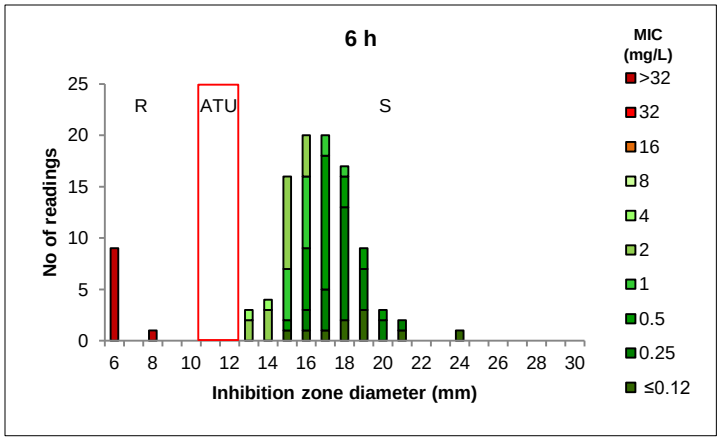
Standard disk diffusion

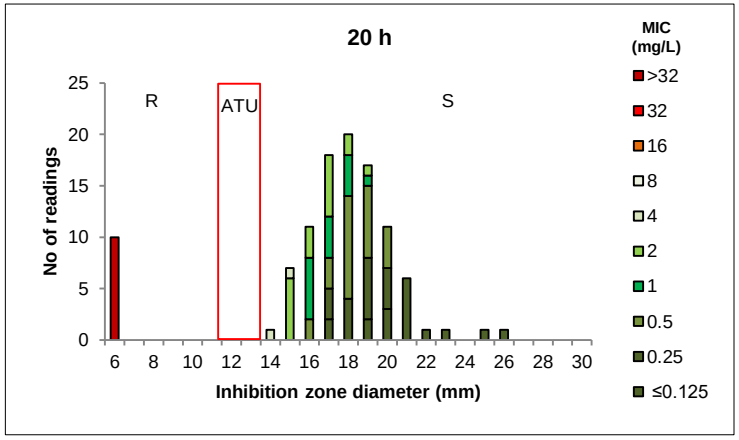


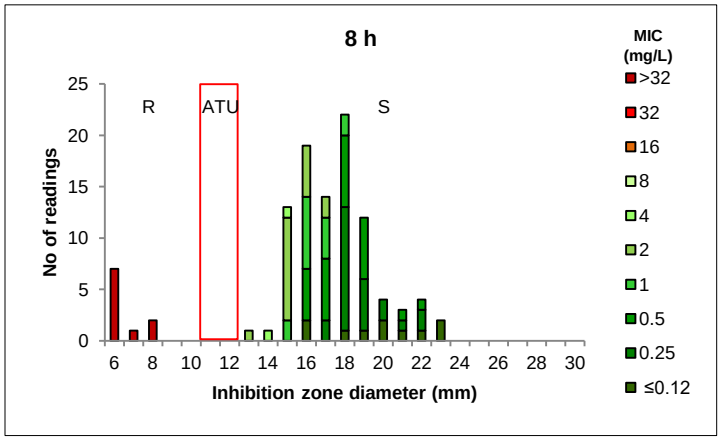
K. pneumoniae and ceftazidime-avibactam 10-4 µg, spiked blood culture bottles
RAST vs. broth microdilution 16-20h





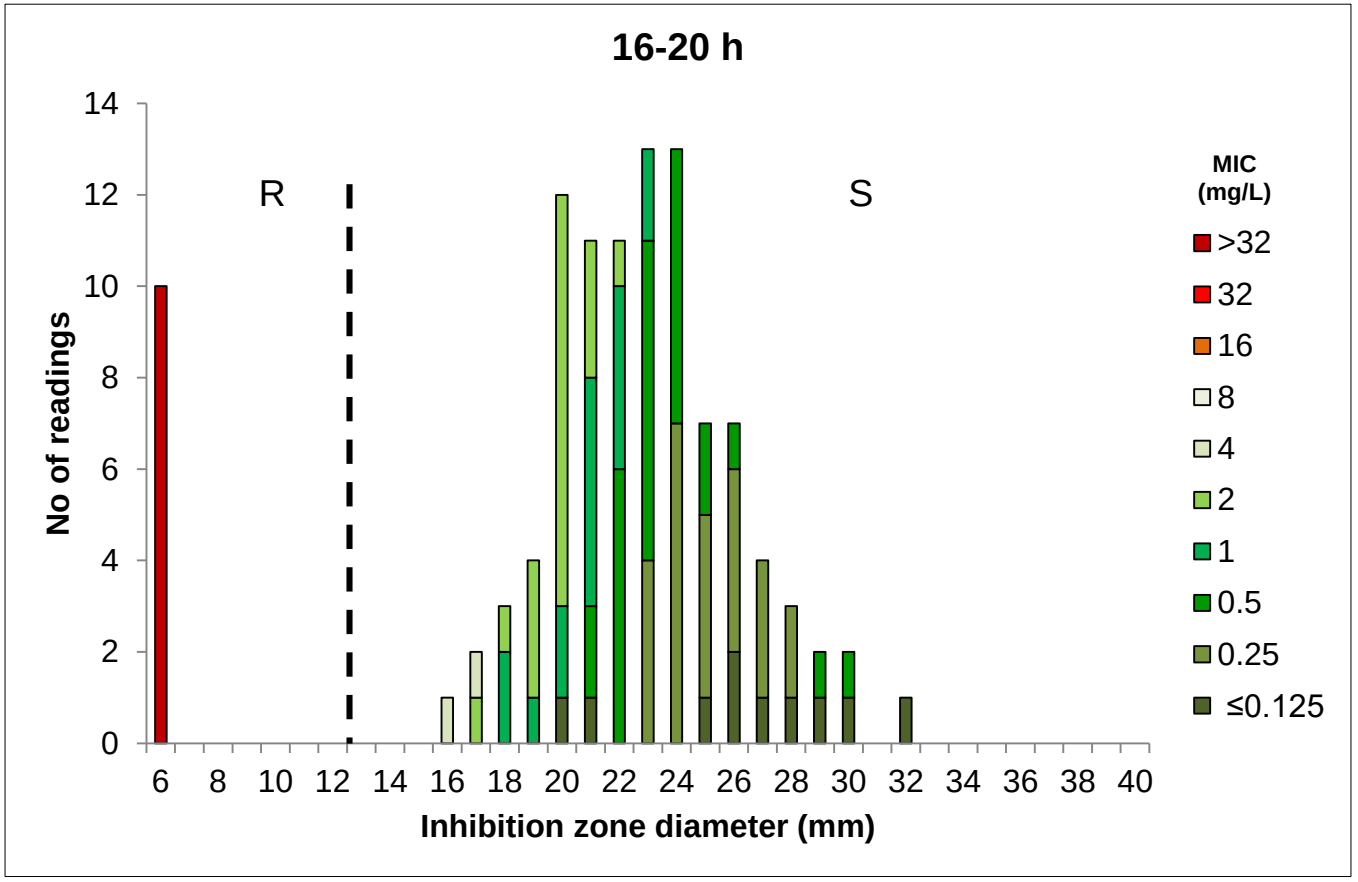




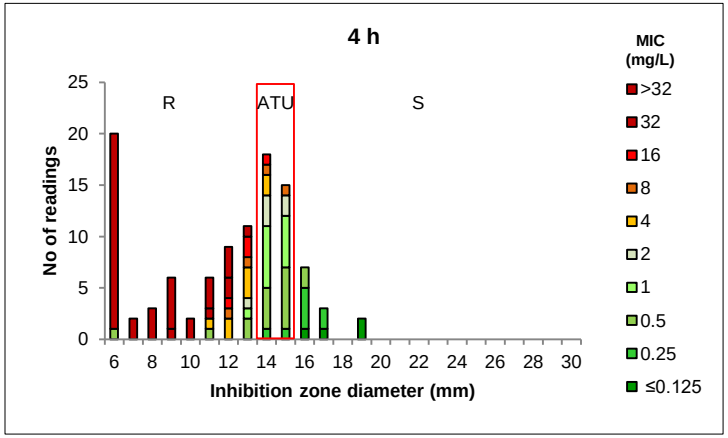


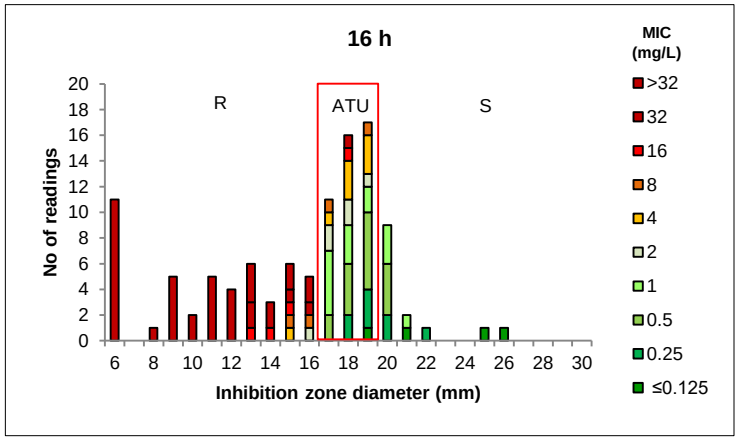
***K. pneumoniae* and ceftazidime-avibactam 10-4 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

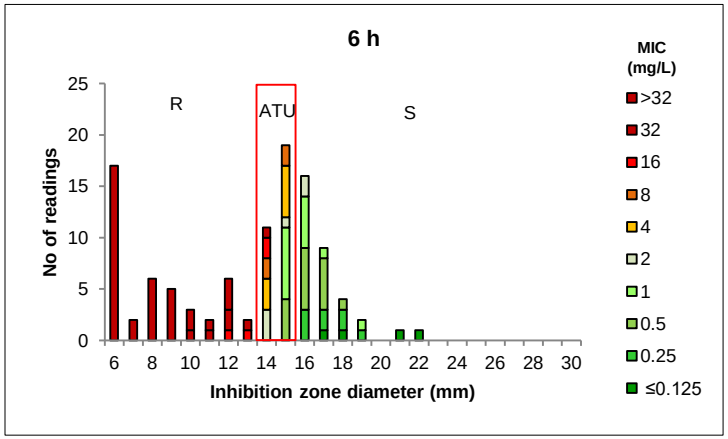
Standard disk diffusion

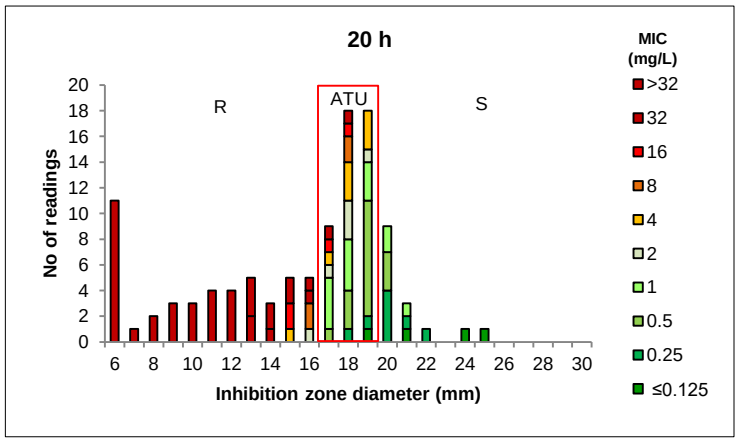


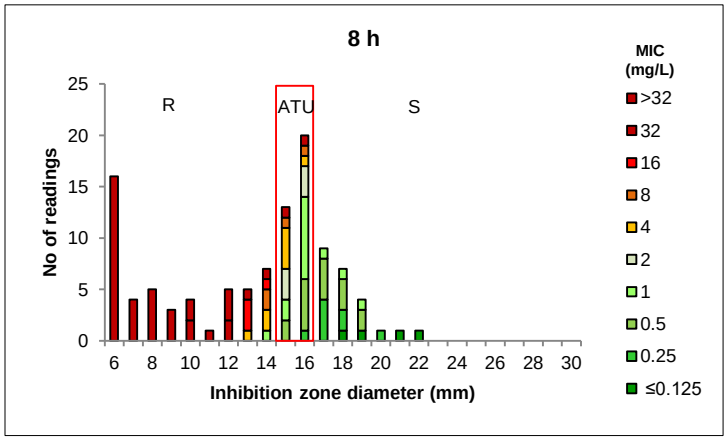
K. pneumoniae and ceftolozane-tazobactam 30-10 µg, spiked blood culture bottles
RAST vs. broth microdilution 16-20h





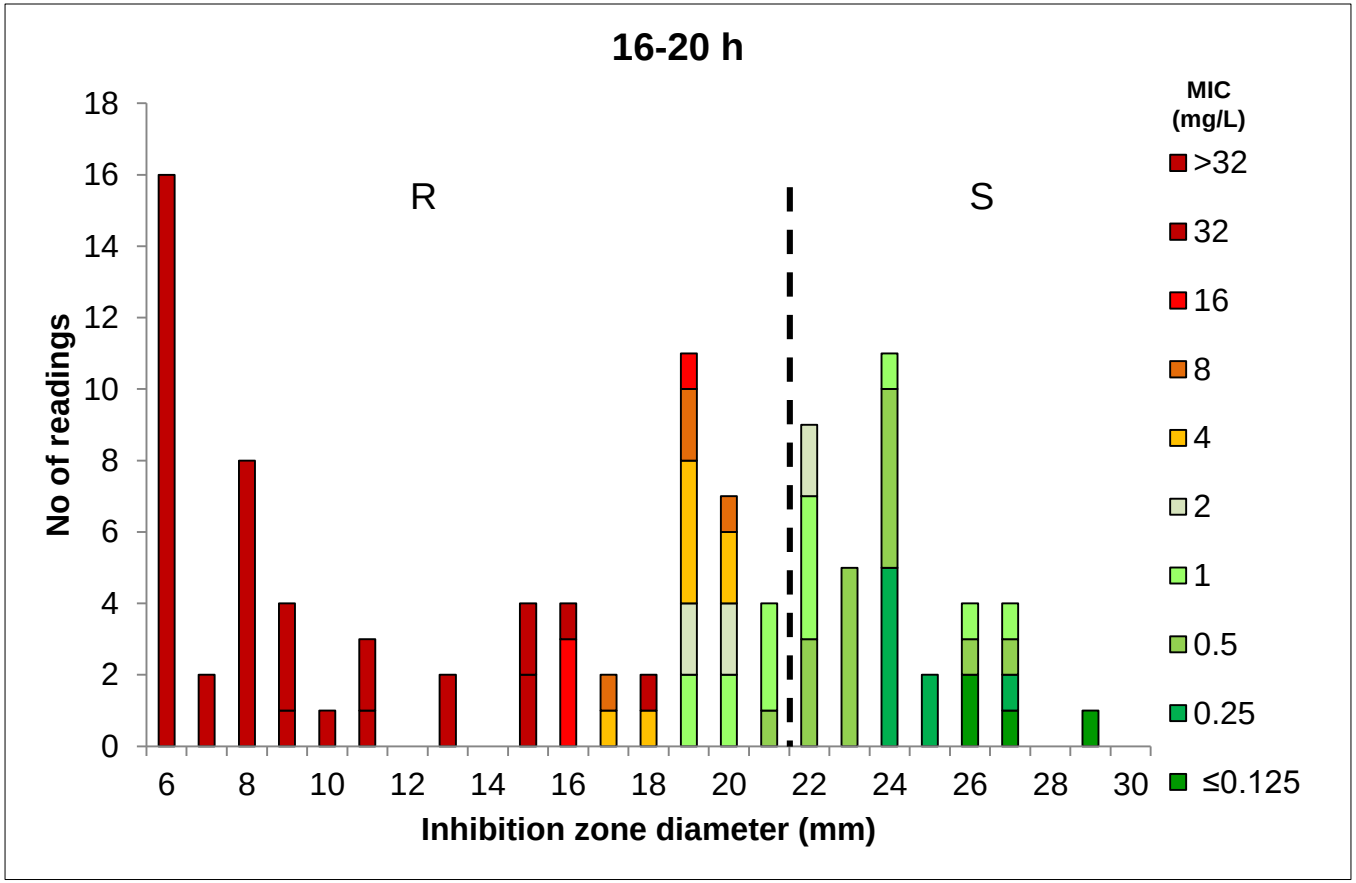




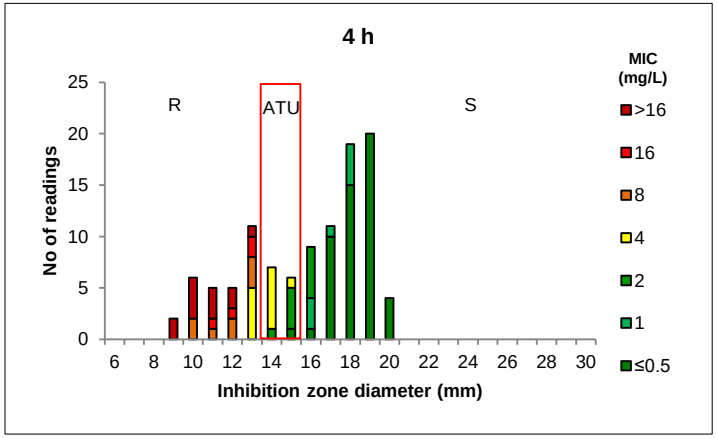


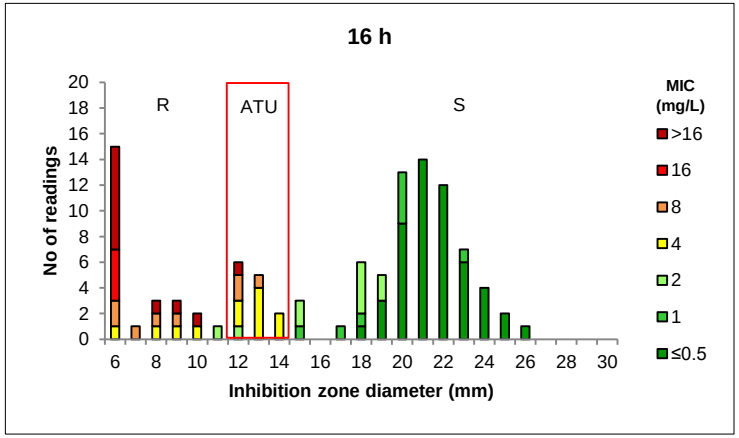
***K. pneumoniae* and ceftolozane-tazobactam 30-10 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

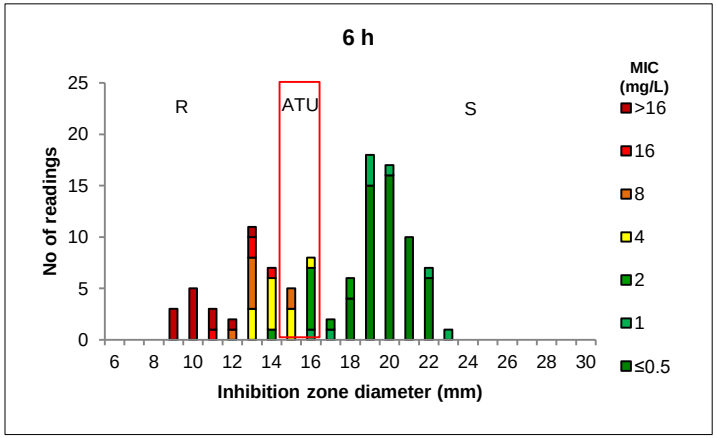
Standard disk diffusion

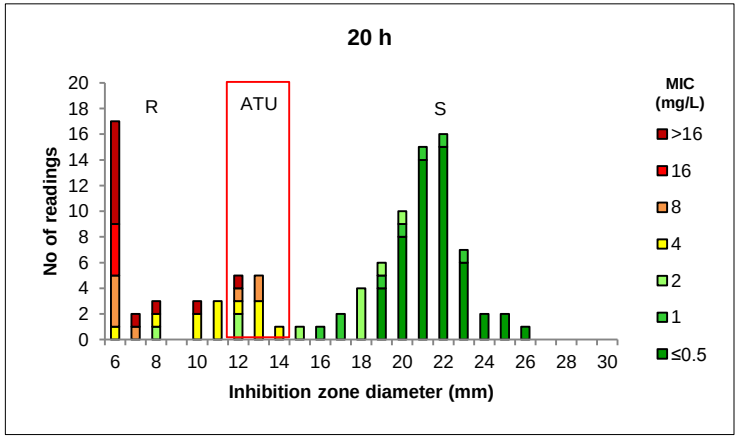


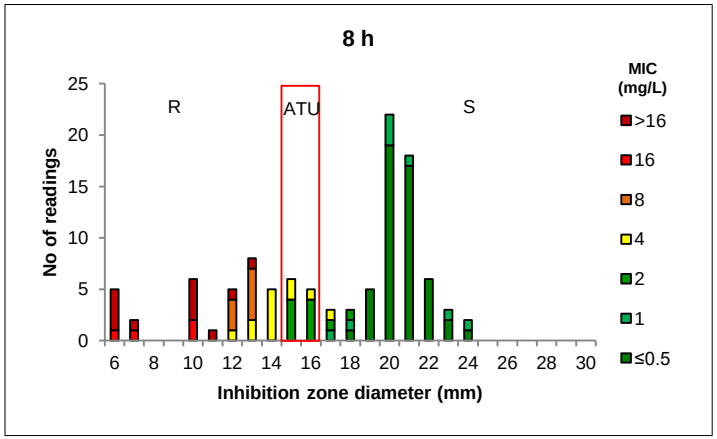
K. pneumoniae and imipenem 10 µg, spiked blood culture bottles
RAST vs. broth microdilution 16-20h





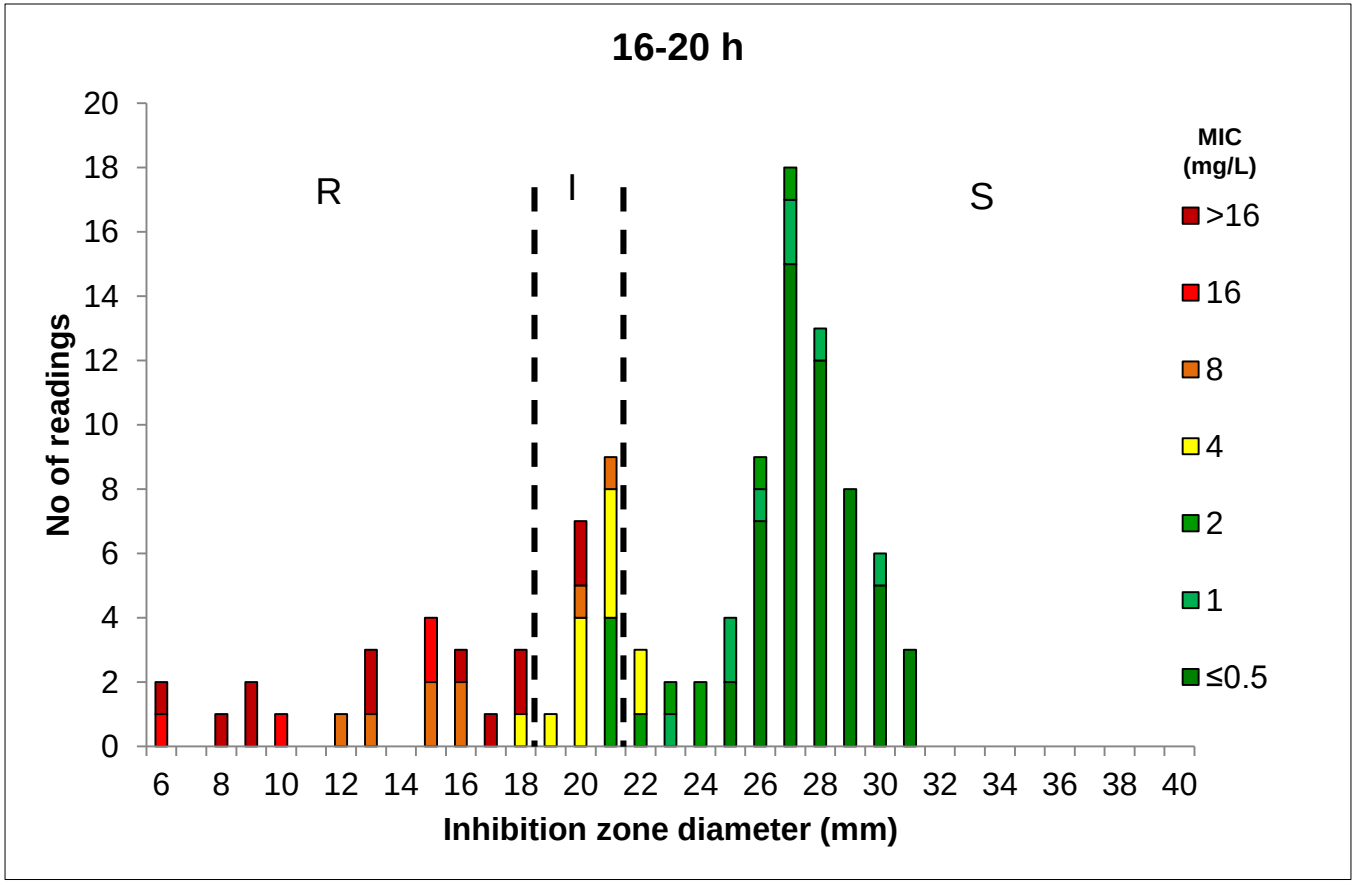




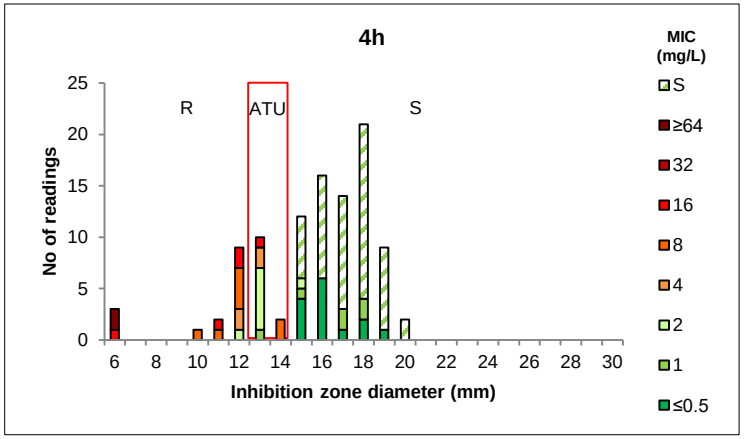


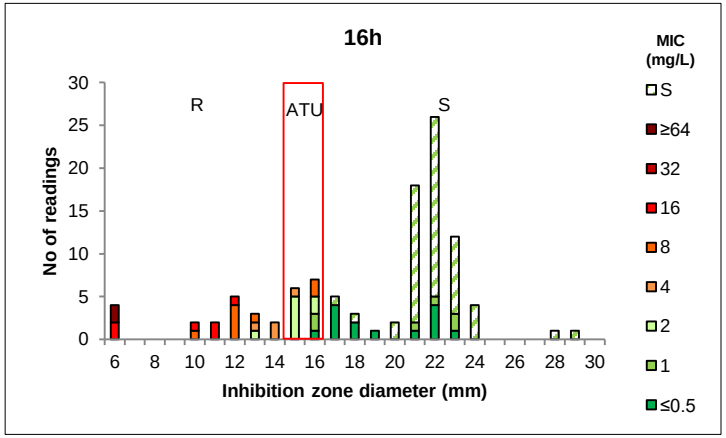
***K. pneumoniae* and imipenem 10 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

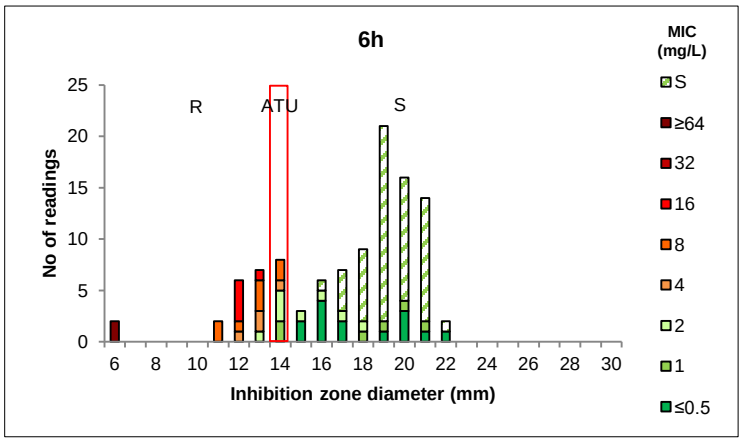
Standard disk diffusion

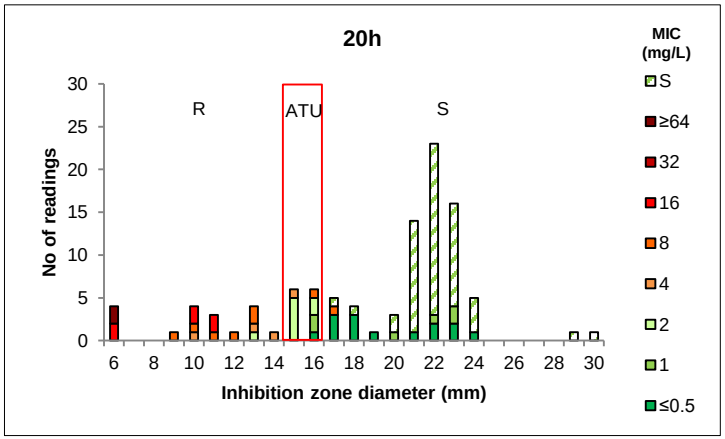


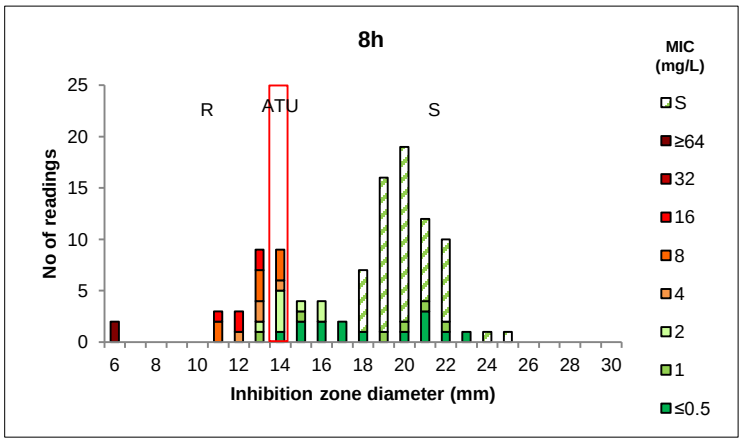
K. pneumoniae and imipenem-relebactam 10-25 µg, spiked blood culture bottles
RAST vs. broth microdilution and EUCAST disk diffusion 16-20 h





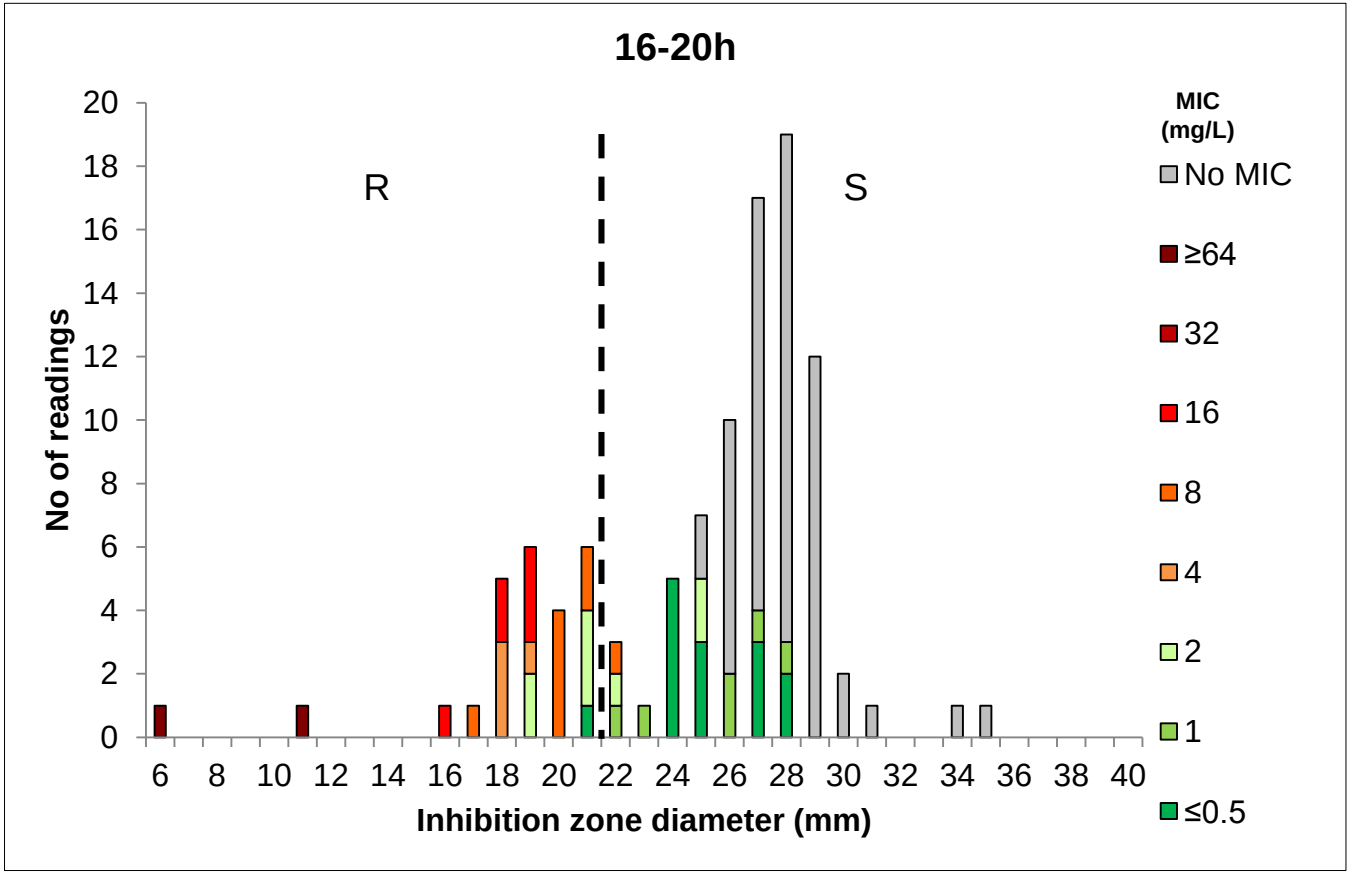




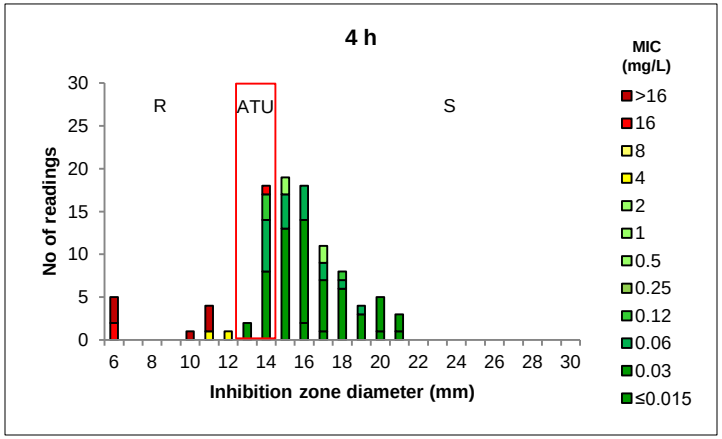


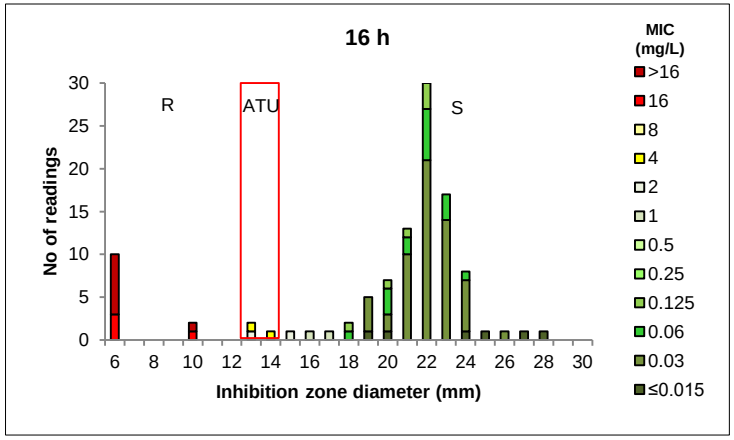
***K. pneumoniae* and imipenem-relebactam 10-25 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

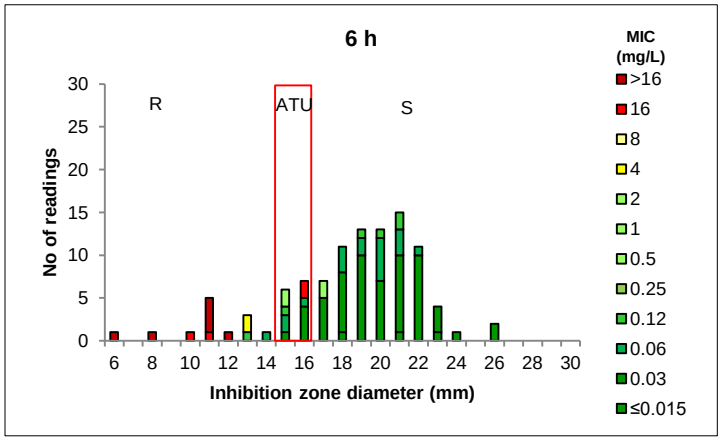
Standard disk diffusion

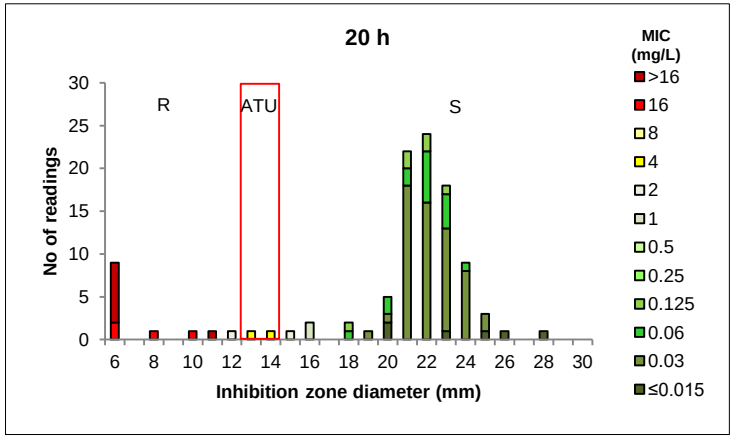


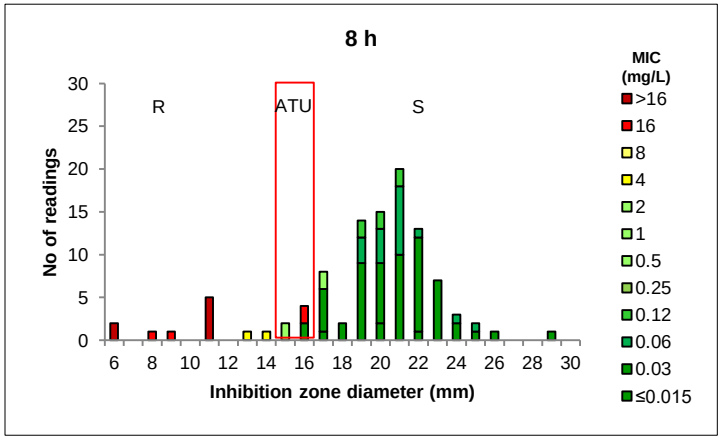
K. pneumoniae and meropenem 10 µg, spiked blood culture bottles
RAST vs. broth microdilution 16-20h





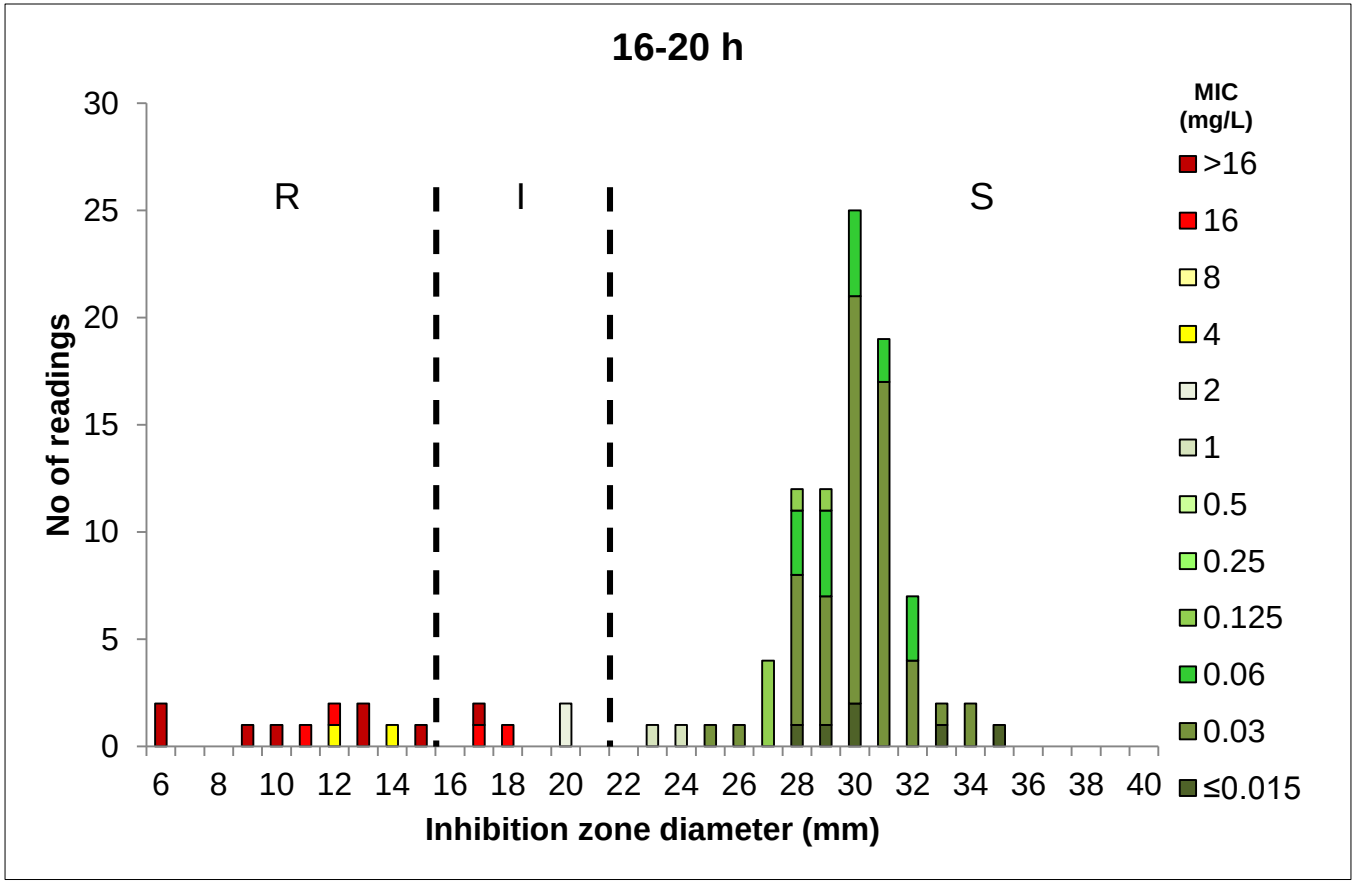




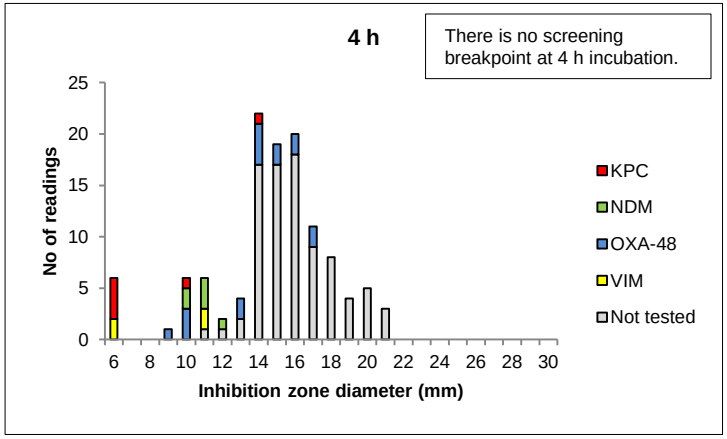


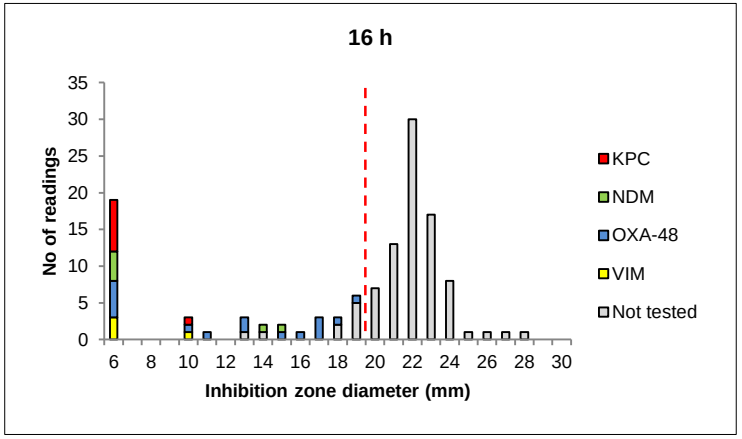
***K. pneumoniae* and meropenem 10 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

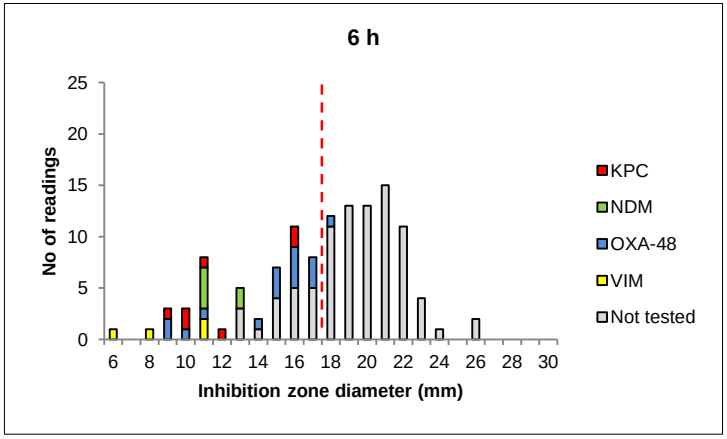
Standard disk diffusion

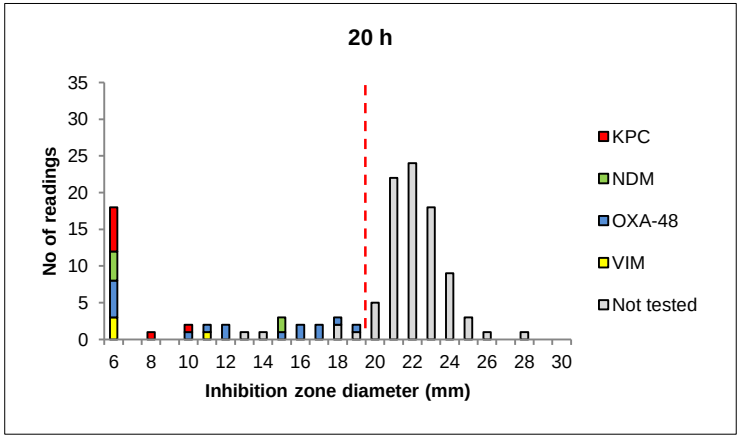


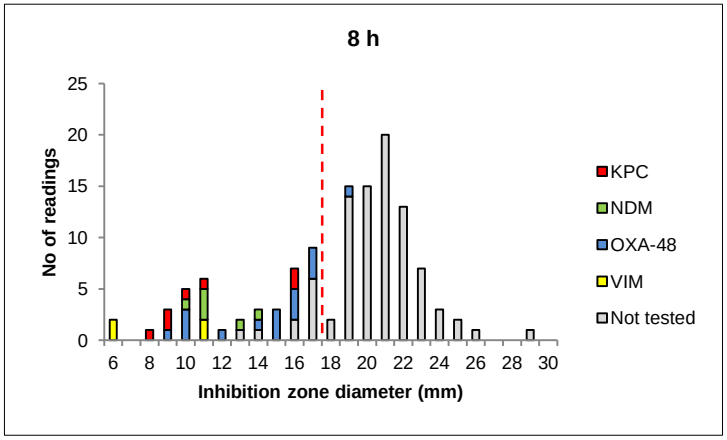
K. pneumoniae and meropenem 10 µg, spiked blood culture bottles
RAST vs. carbapenemase-producing _K. pneumoniae_









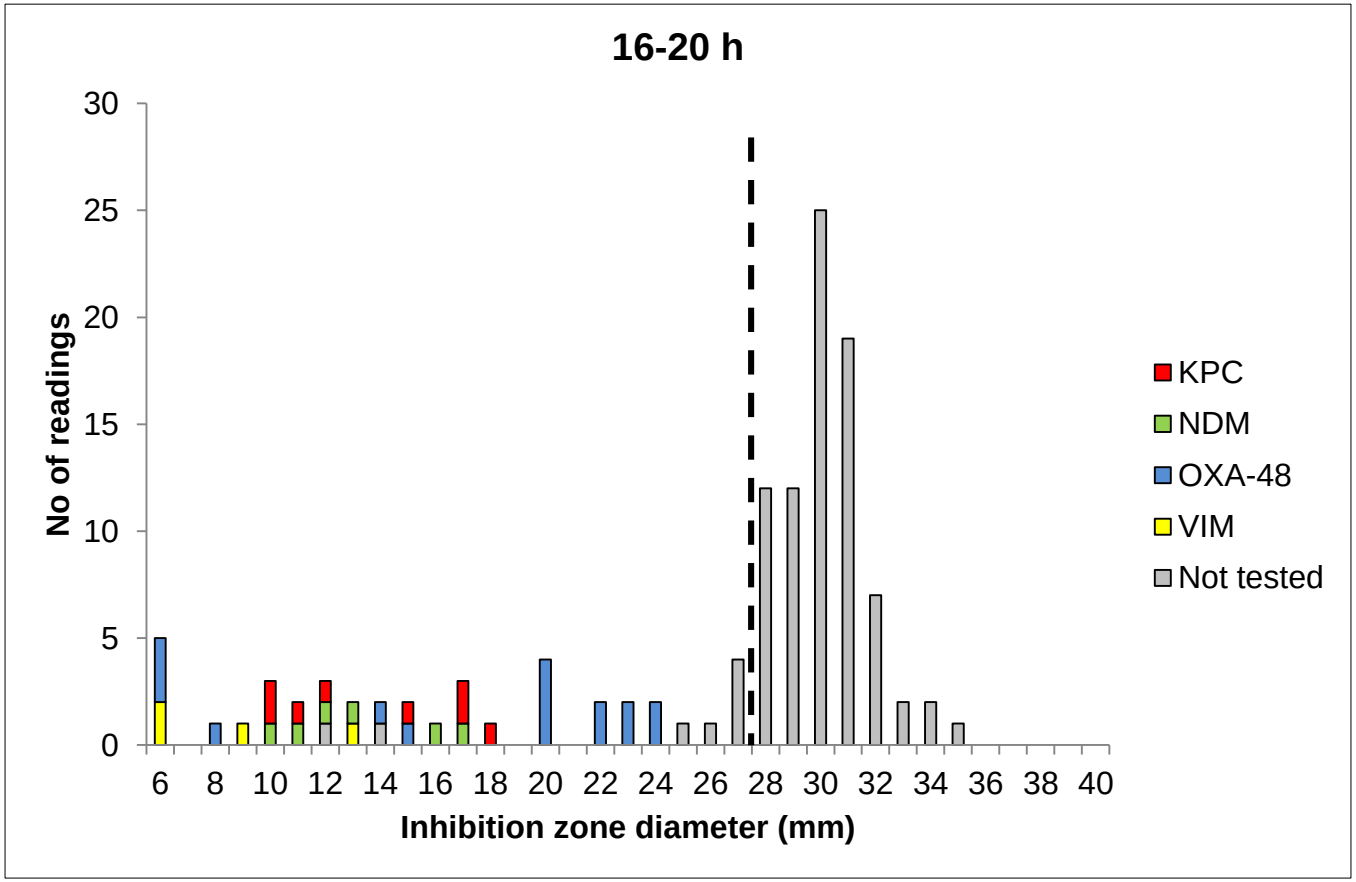


The dotted line corresponds to the screening cut-off for carbapenemase-producing _K. pneumoniae._

Isolates with carbapenem resistance mechanisms: KPC (n=4), OXA-48 (n=8), VIM (n=2), NDM (n=3)

***K. pneumoniae* and meropenem 10 µg**
EUCAST disk diffusion vs. carbepenemase-producing *Enterobacterales*

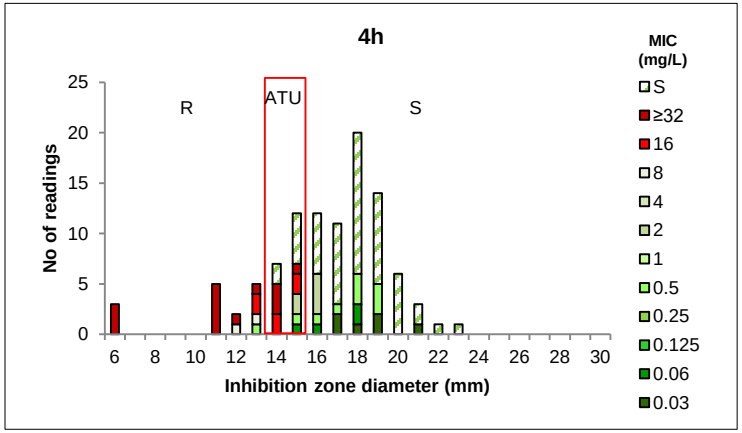
Standard disk diffusion

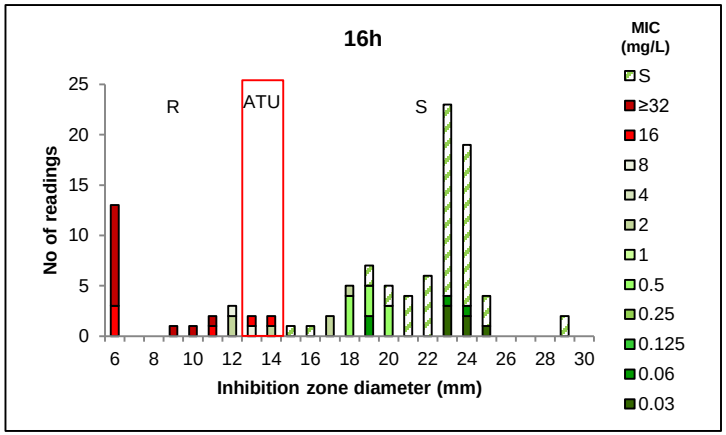


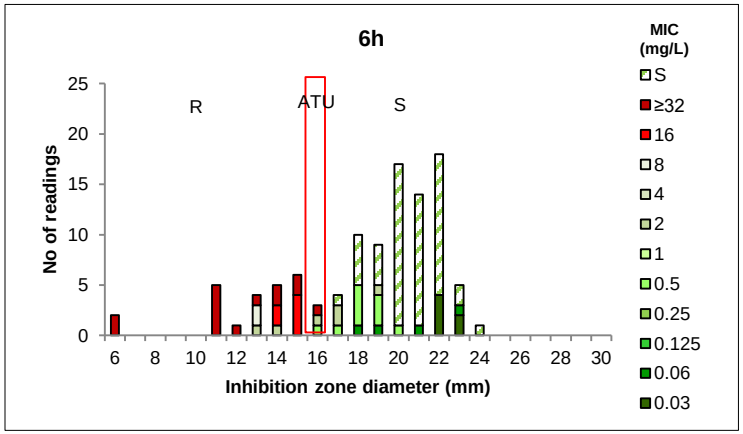
The dotted line corresponds to the screening cut-off for carbapenemase-producing *Enterobacterales.*

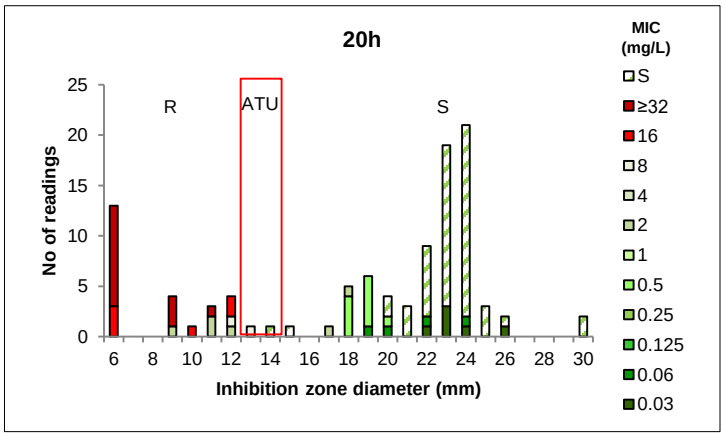
Isolates with carbapenem resistance mechanisms:
KPC (n=1), OXA-48 (n=6), VIM (n=1), NDM (n=2)
Carba – unidentified carbapenem resistance mechanisms (n=8)

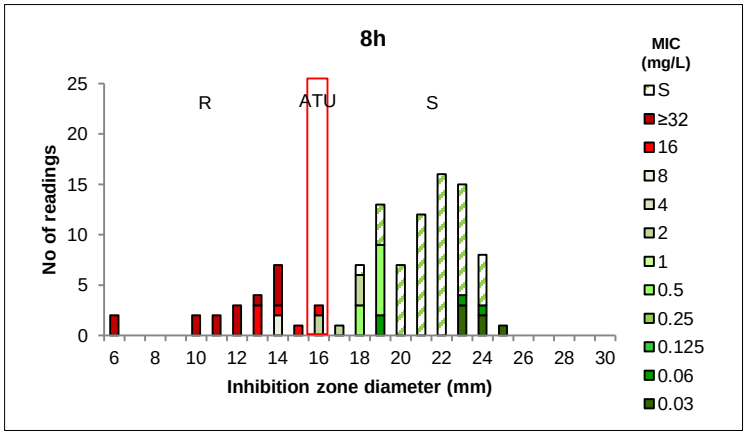
K. pneumoniae **and meropenem-vaborbactam 20-10 µg, spiked blood culture bottles**
RAST vs. broth microdilution and EUCAST disk diffusion 16-20 h





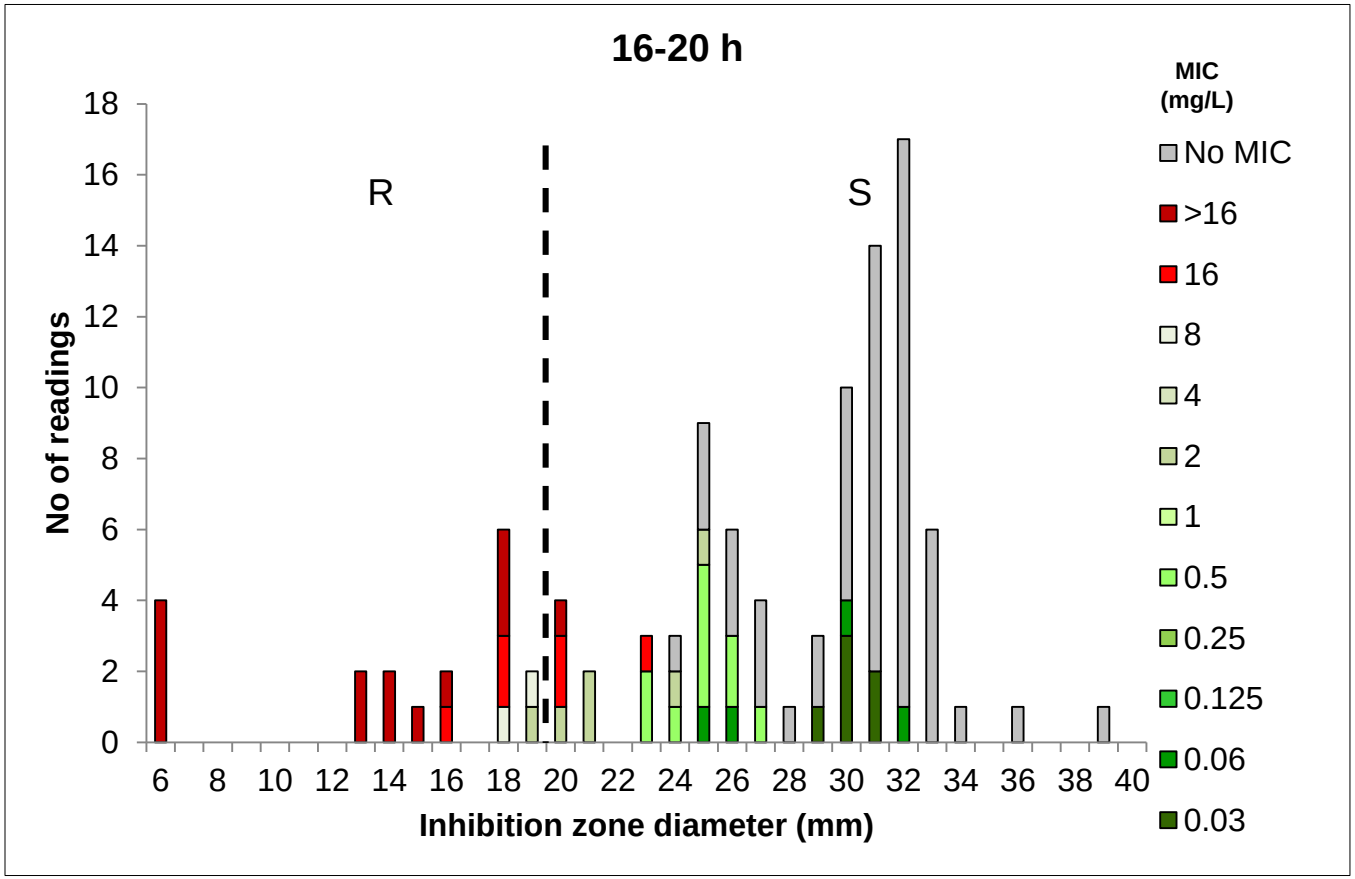




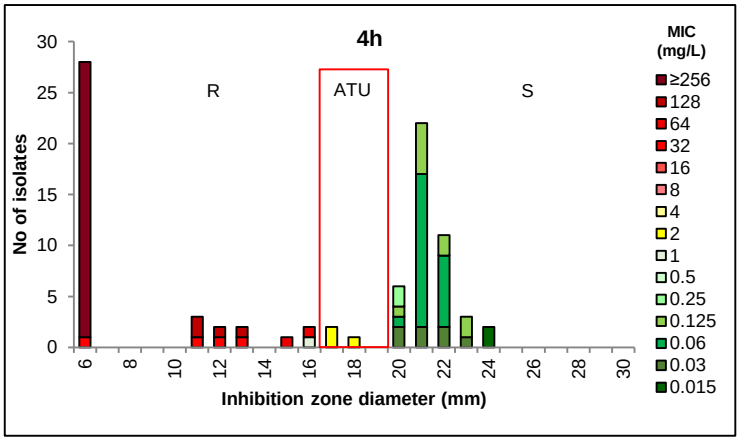


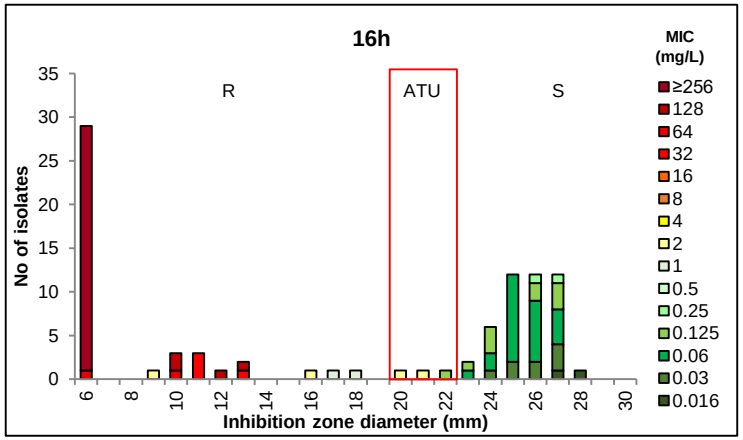
***K. pneumoniae* and meropenem-vaborbactam 20-10 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

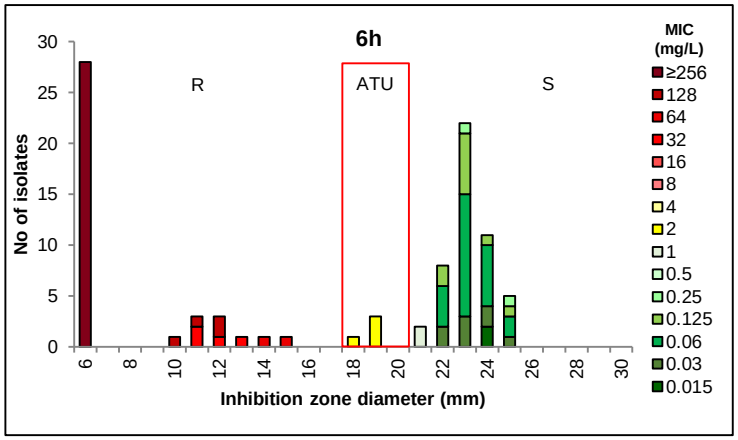
Standard disk diffusion

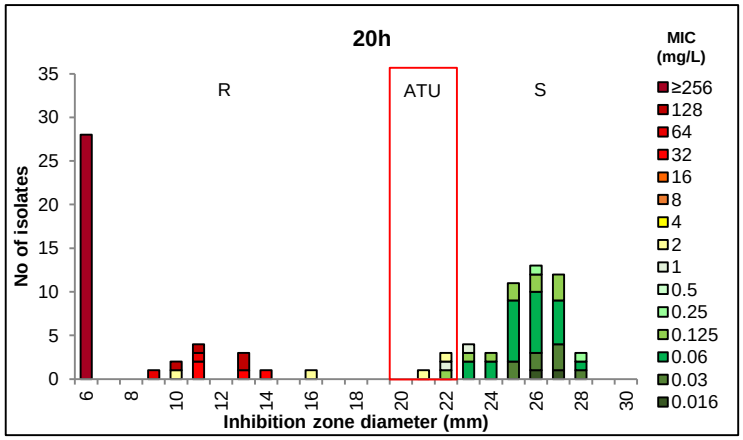


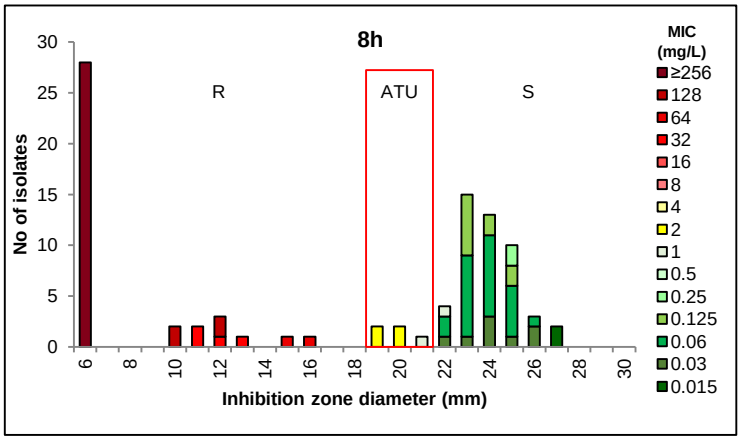
K. pneumoniae and aztreonam 30 µg, spiked blood culture bottles
RAST vs. broth microdilution 16-20 h





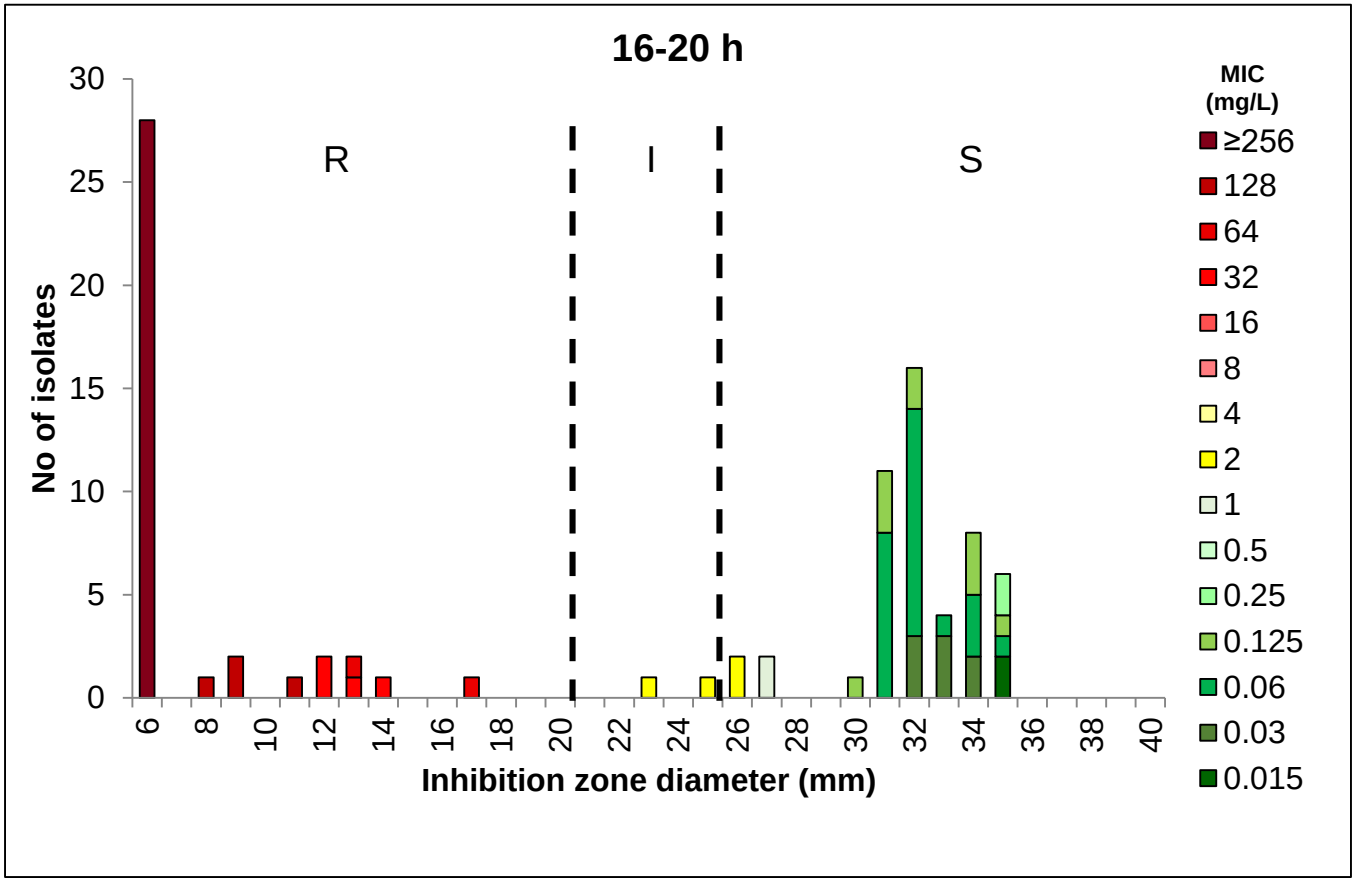




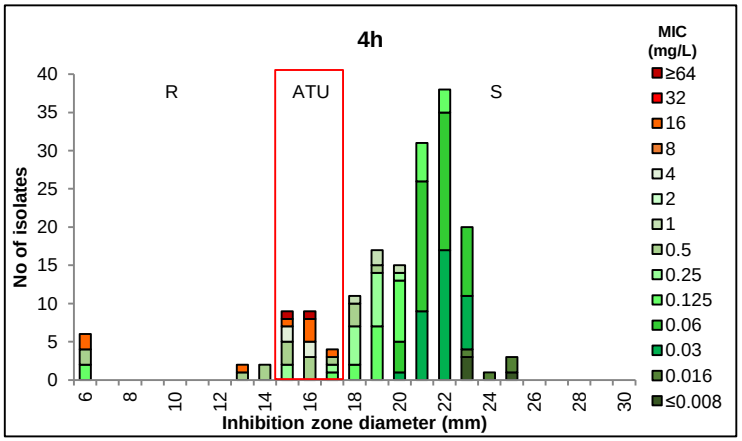


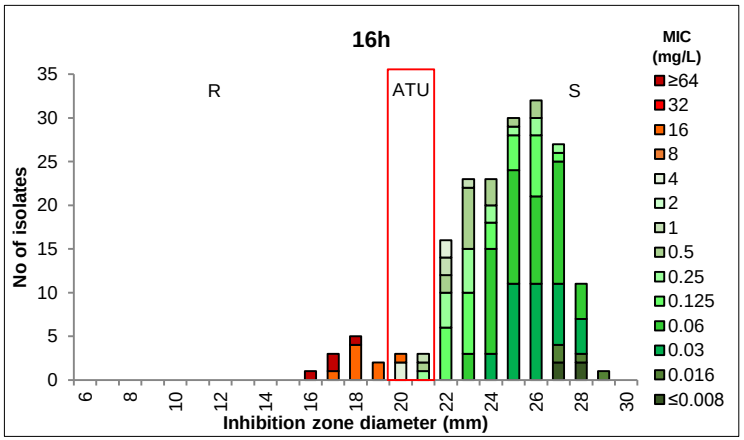
***K. pneumoniae* and aztreonam 30 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

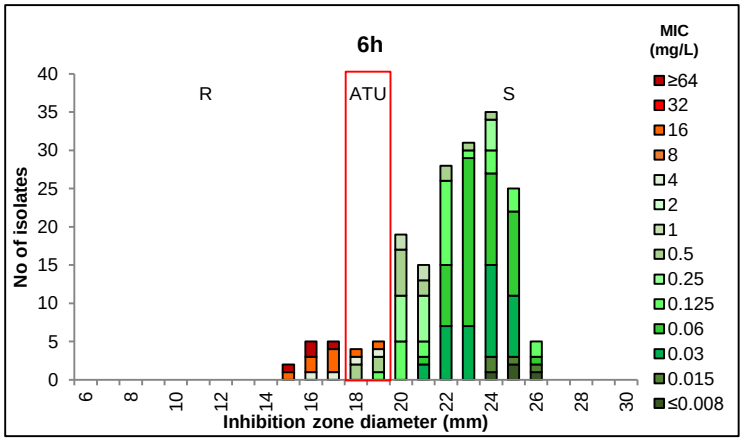
Standard disk diffusion

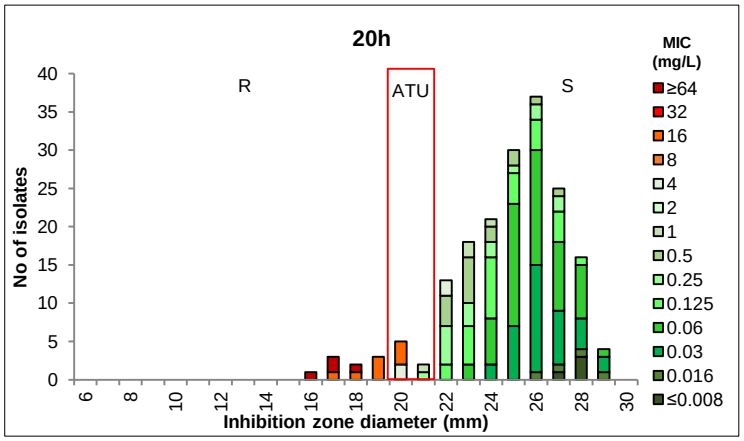


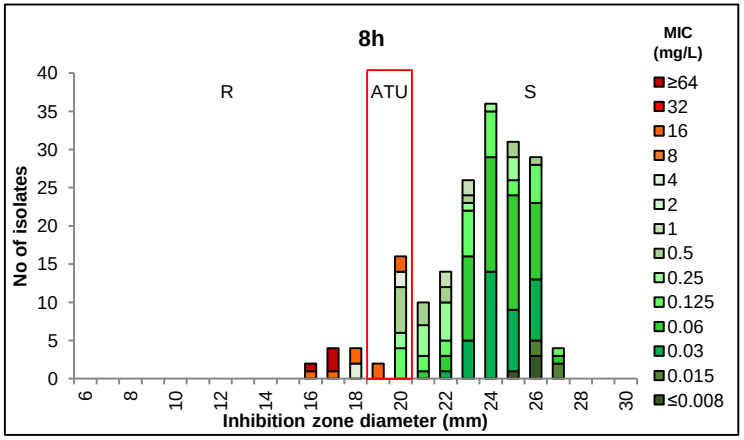
***K. pneumoniae* and aztreonam-avibactam 30-20 µg, spiked blood culture bottles**
RAST vs. broth microdilution and EUCAST disk diffusion 16-20 h





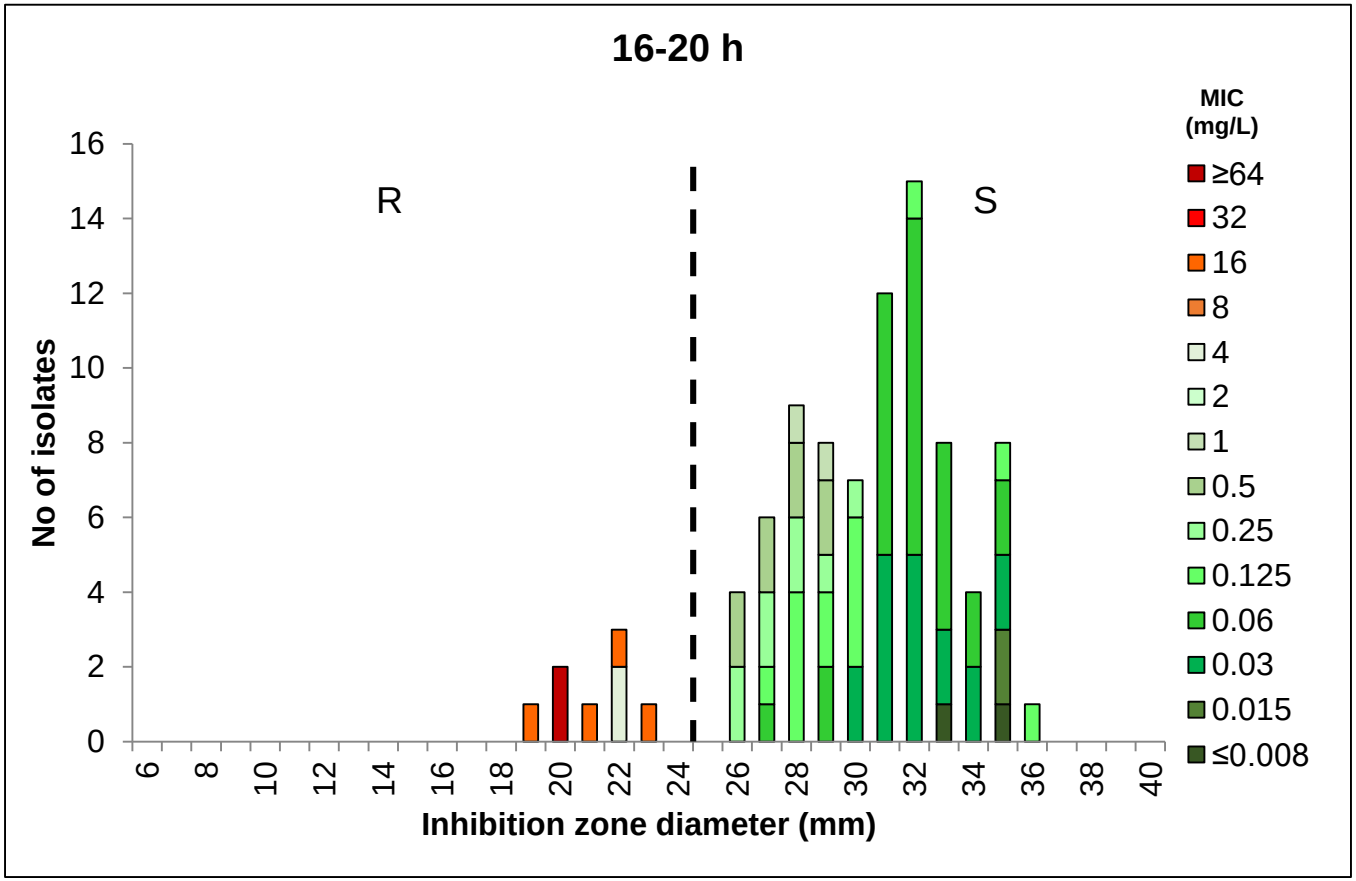




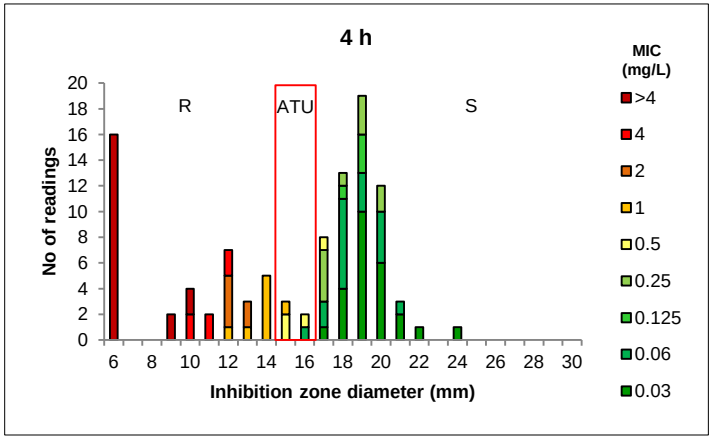


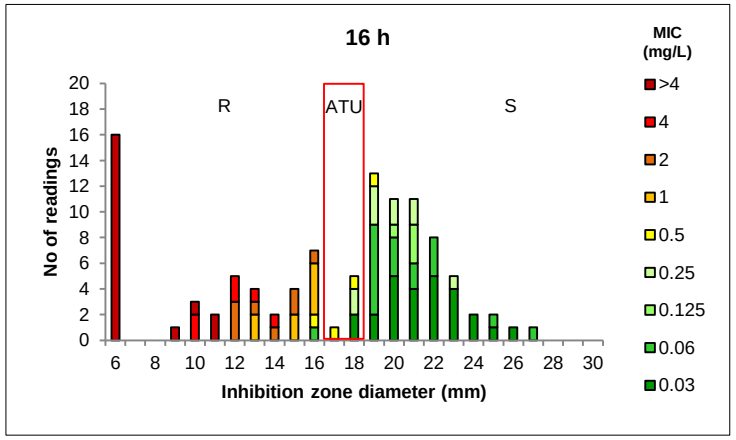
***K. pneumoniae* and aztreonam-avibactam 30-20 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

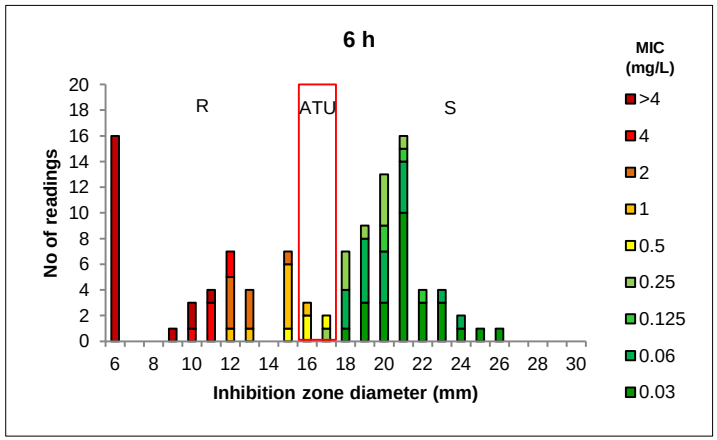
Standard disk diffusion

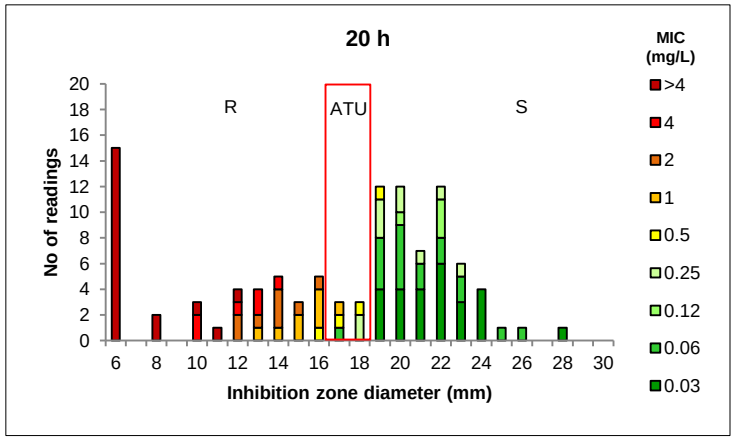


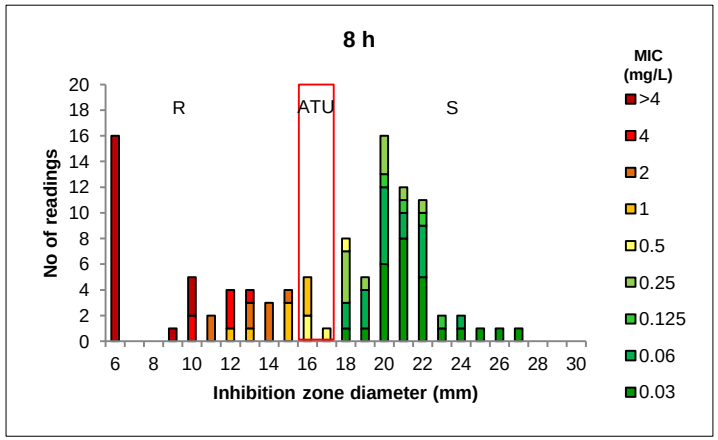
***K. pneumoniae* and ciprofloxacin 5 µg, spiked blood culture bottles**
RAST vs. broth microdilution 16-20h





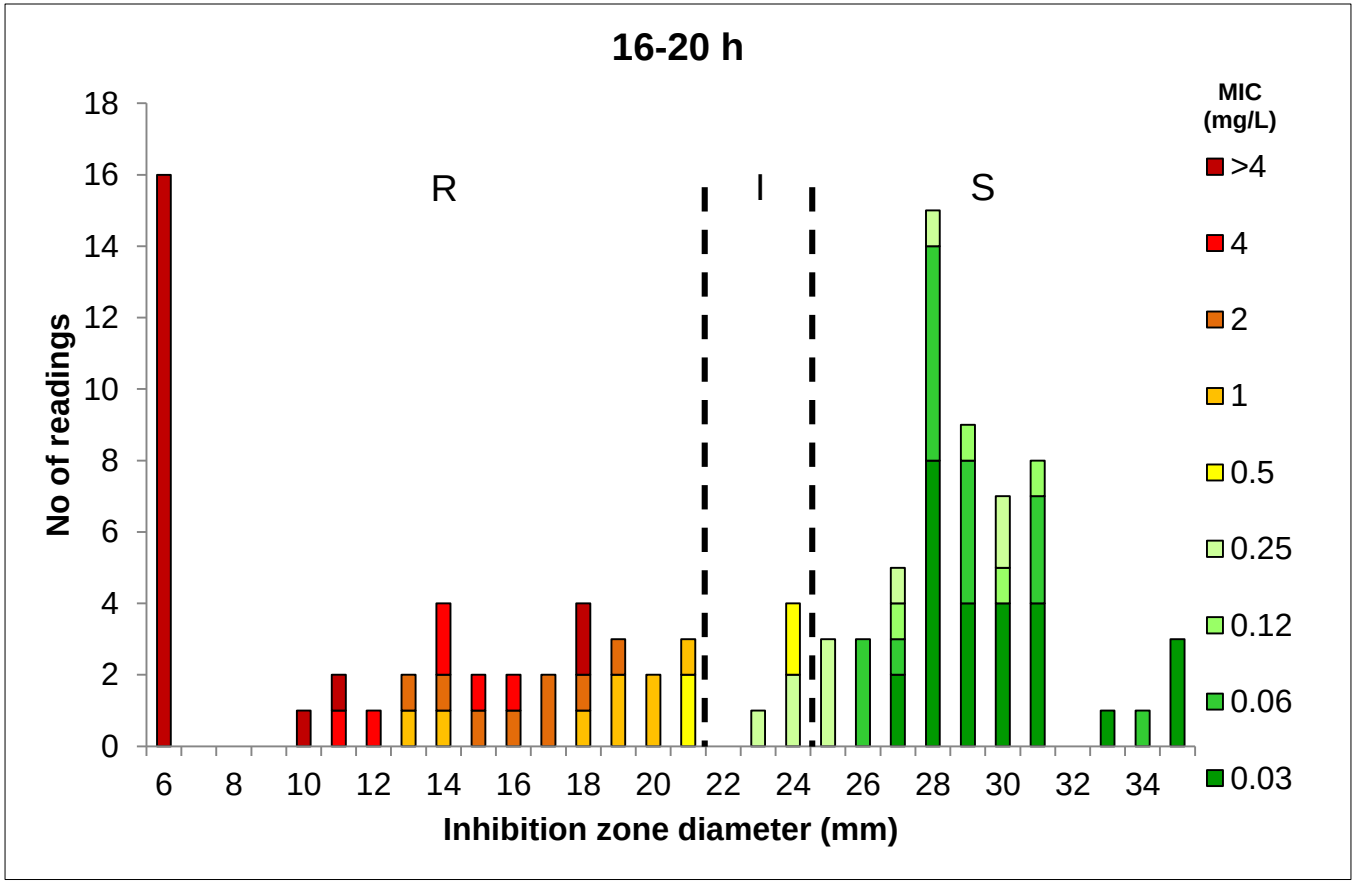




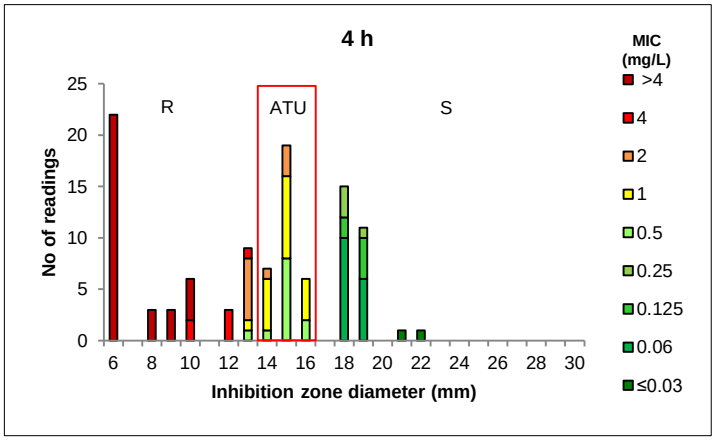


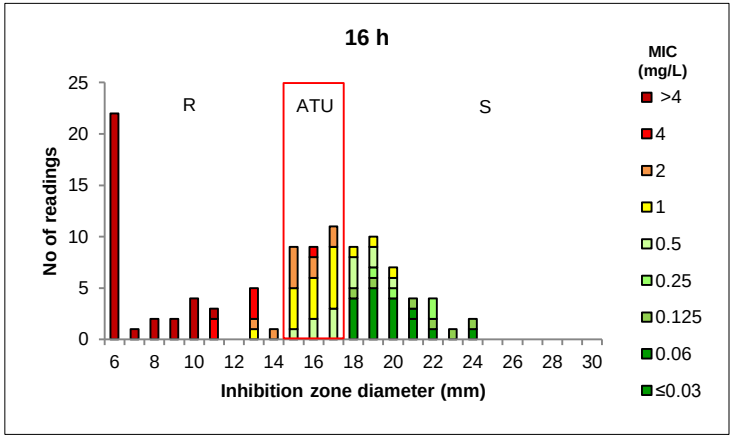
***K. pneumoniae* and ciprofloxacin 5 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

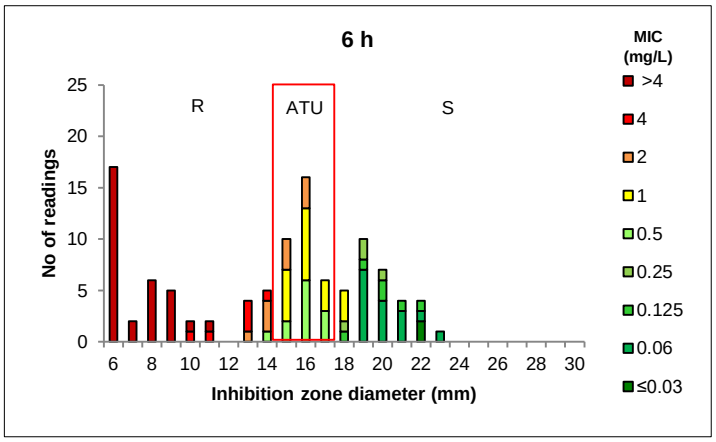
Standard disk diffusion

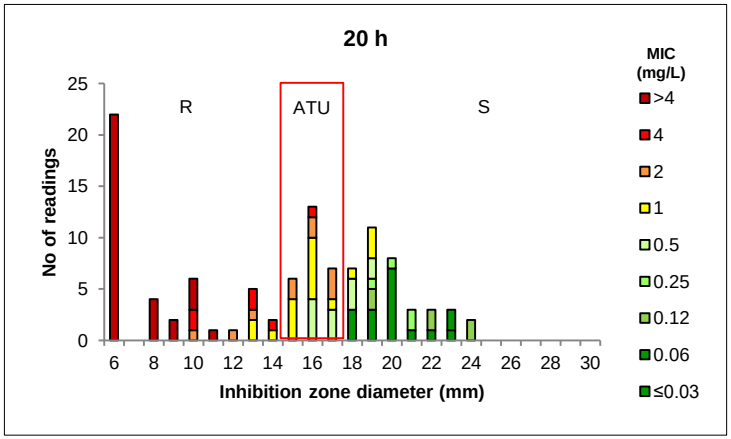


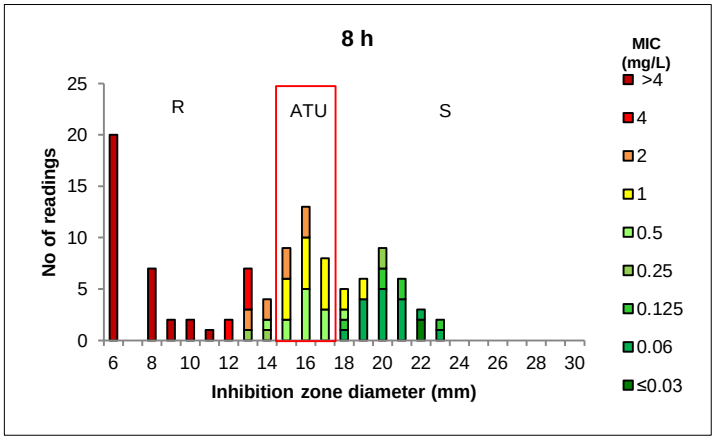
K. pneumoniae and levofloxacin 5 µg, spiked blood culture bottles
RAST vs. broth microdilution 16-20h





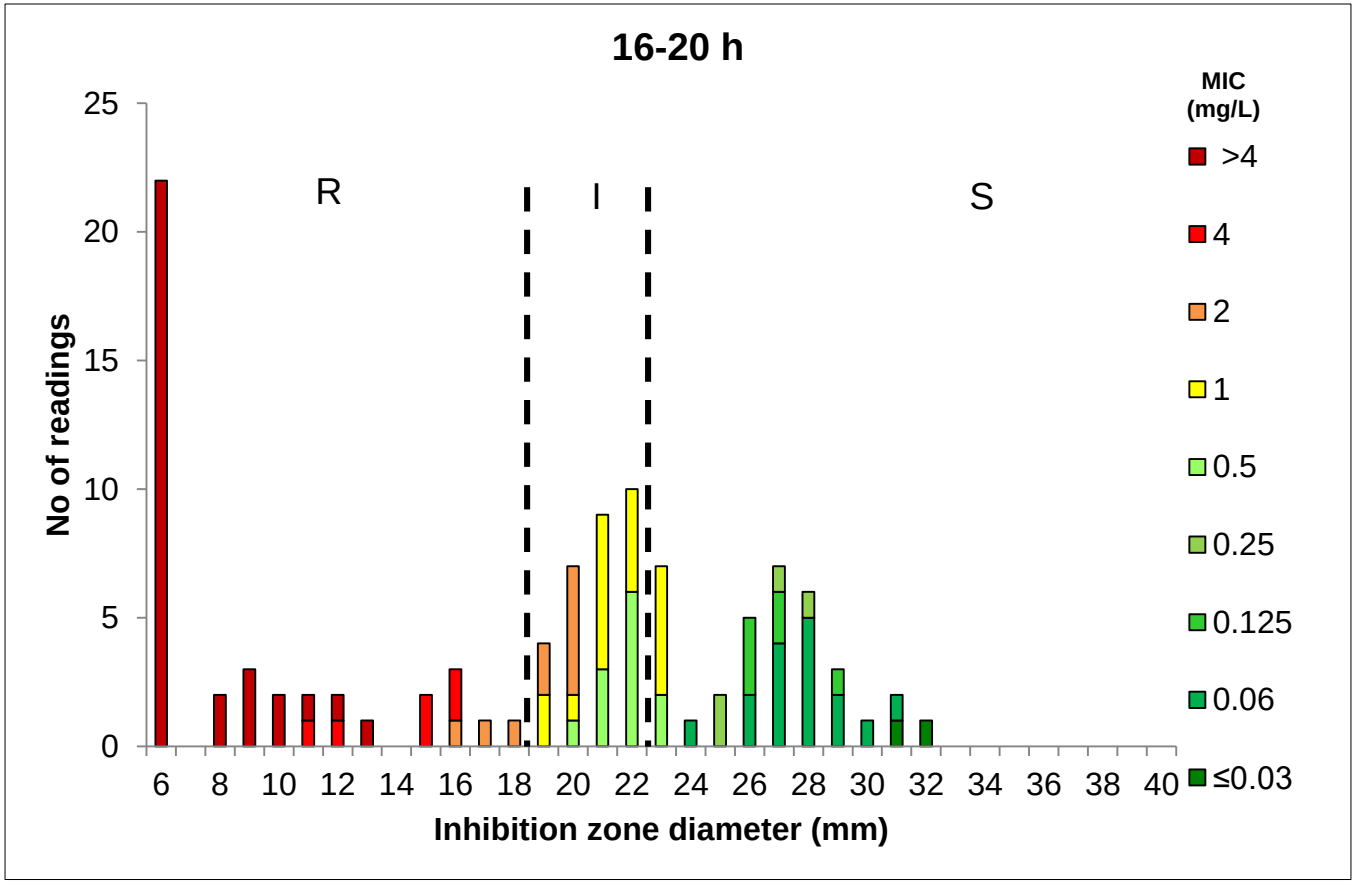




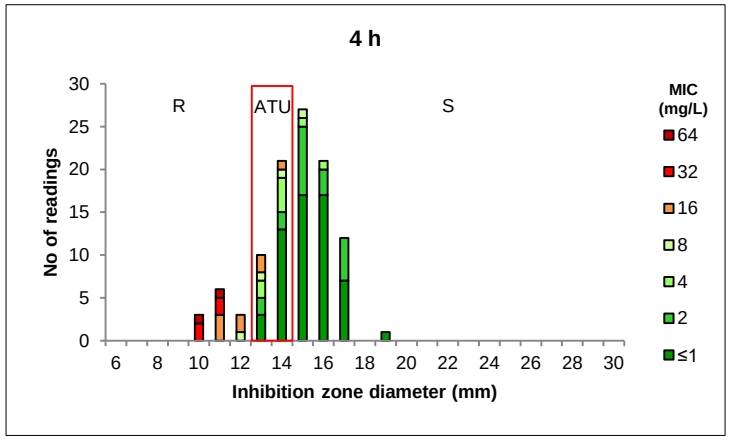


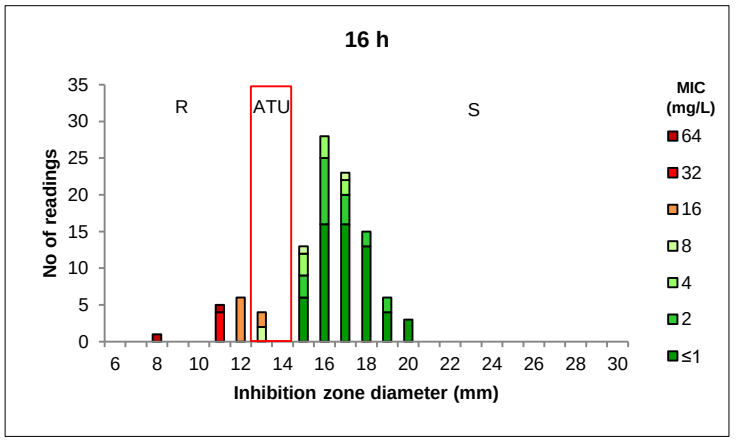
***K. pneumoniae* and levofloxacin 5 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

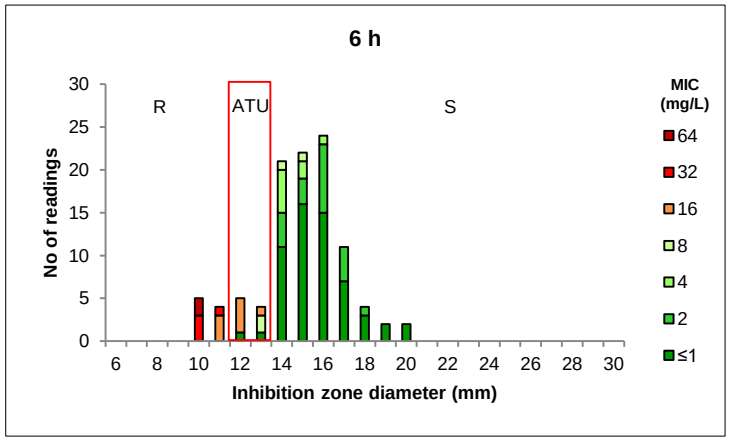
Standard disk diffusion

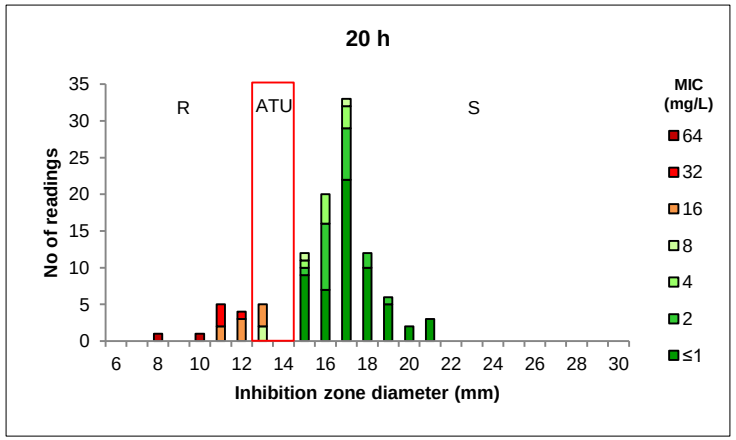


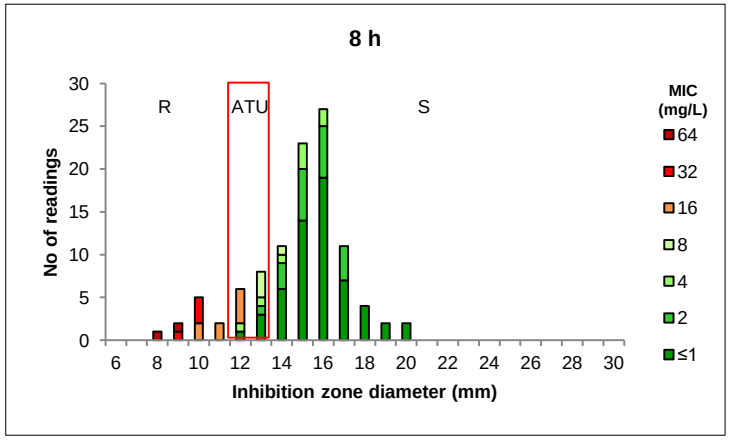
***K. pneumoniae* and amikacin 30 µg, spiked blood culture bottles**
RAST vs. broth microdilution 16-20h





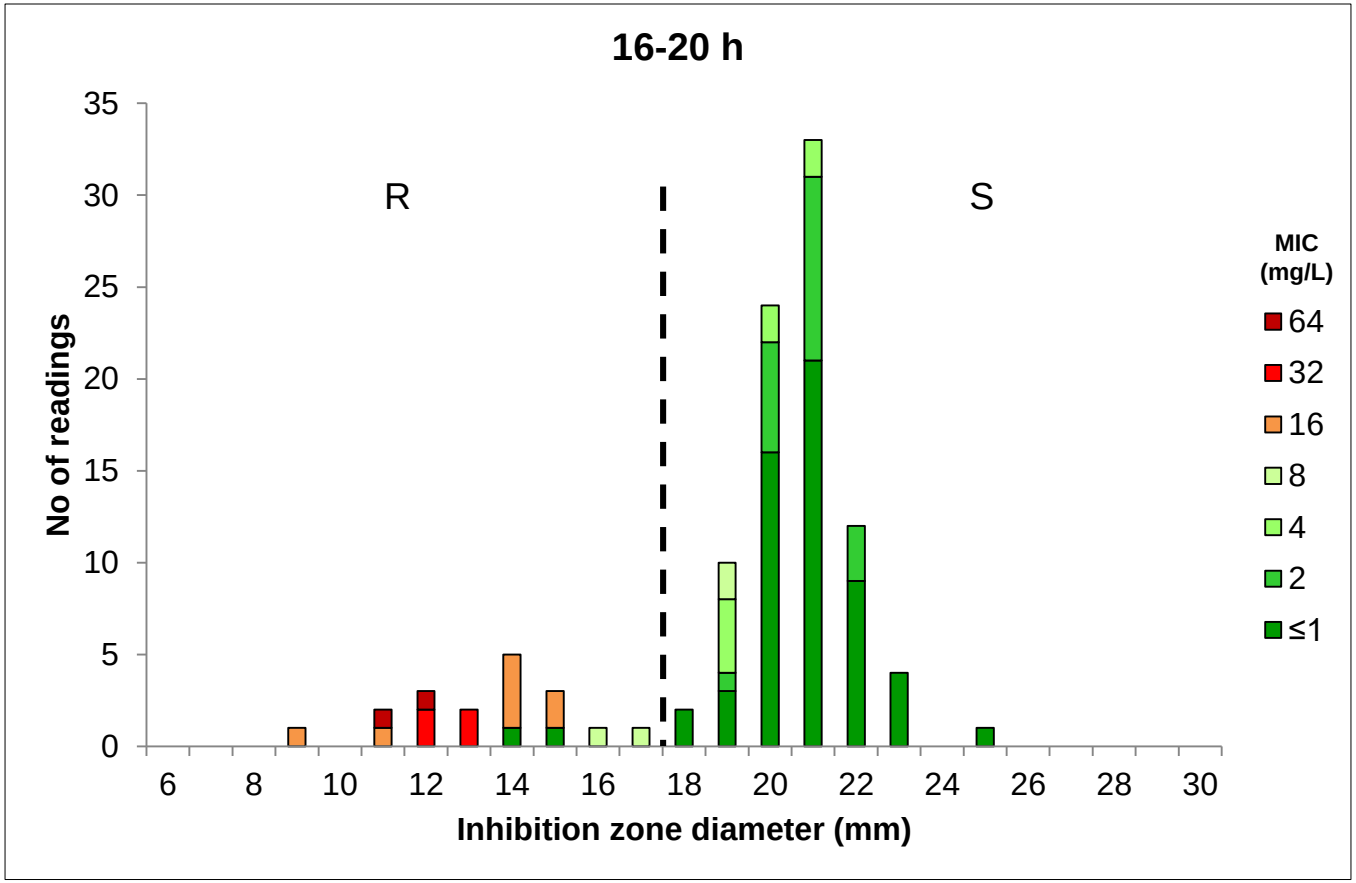




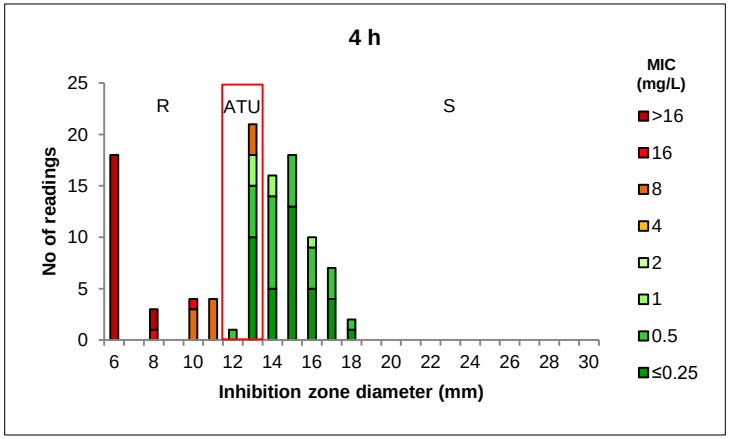


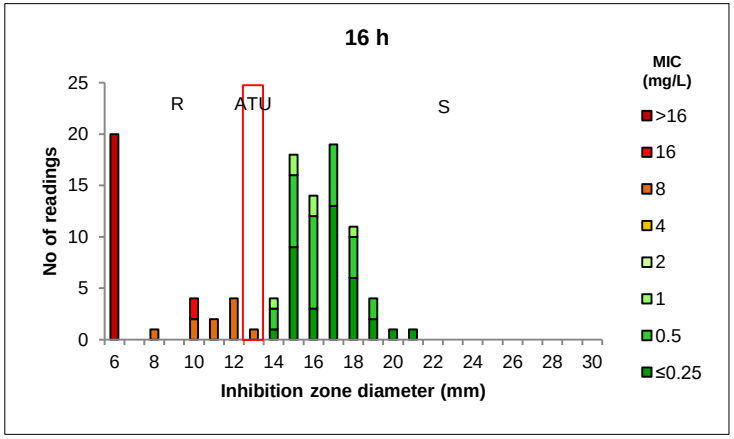
***K. pneumoniae* and amikacin 30 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

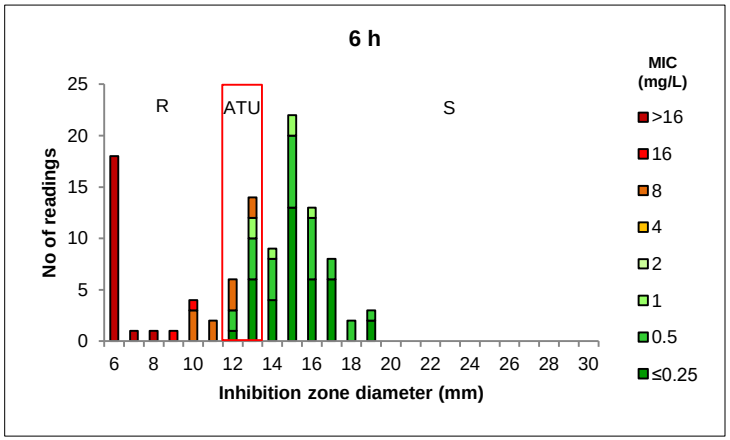
Standard disk diffusion

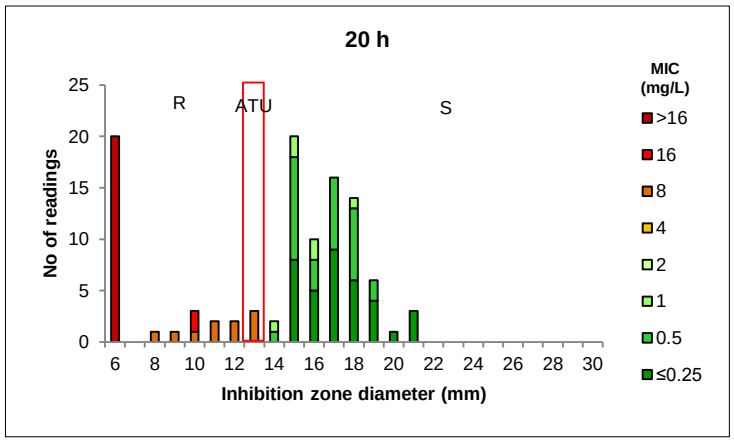


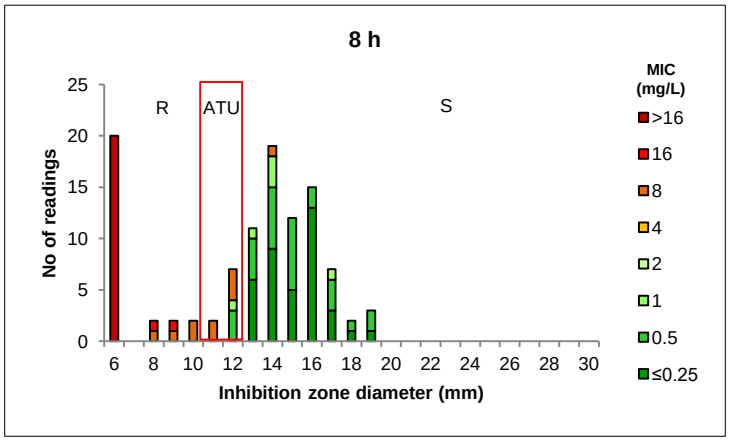
K. pneumoniae and gentamicin 10 µg, spiked blood culture bottles
RAST vs. broth microdilution 16-20h





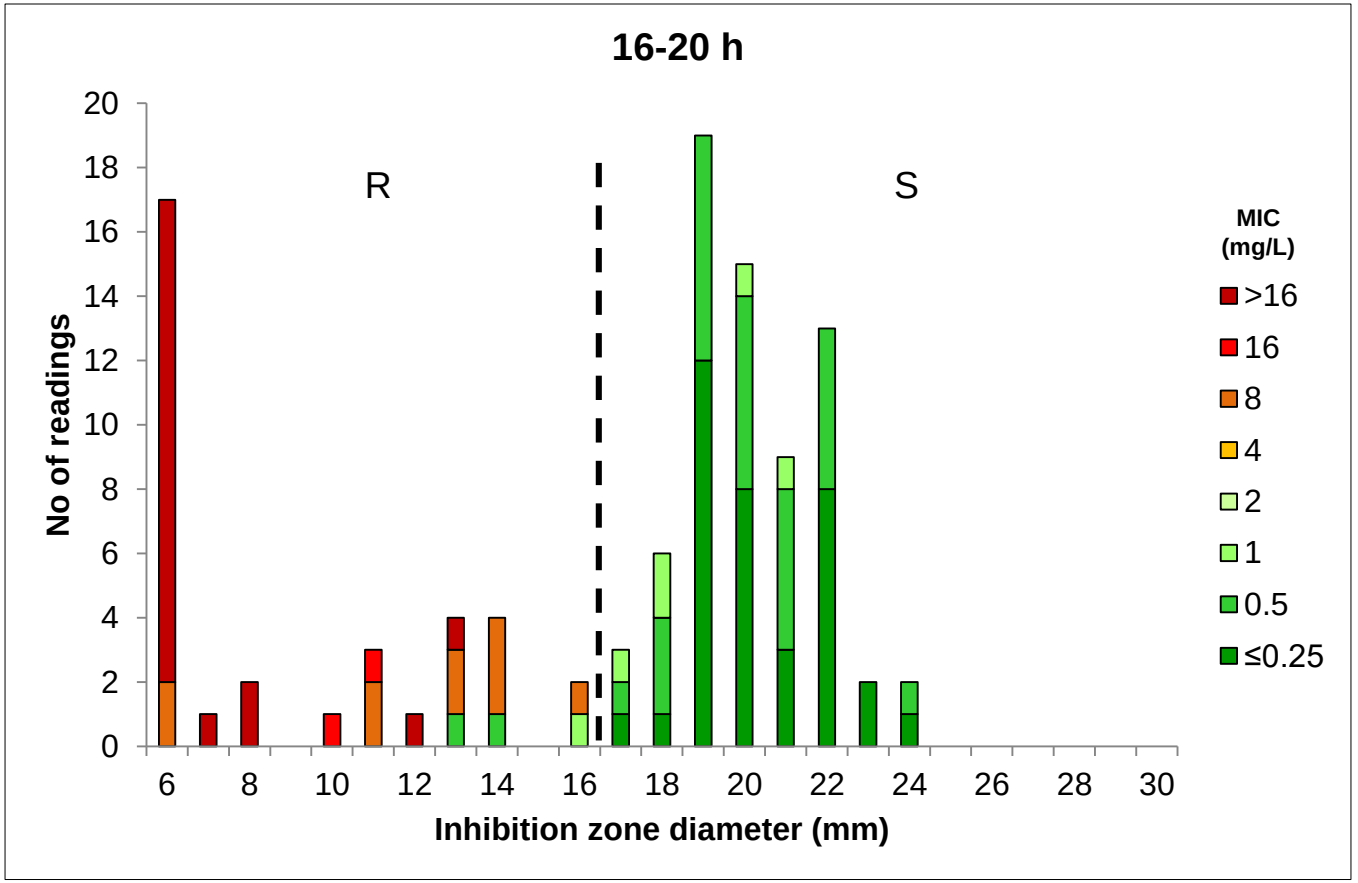




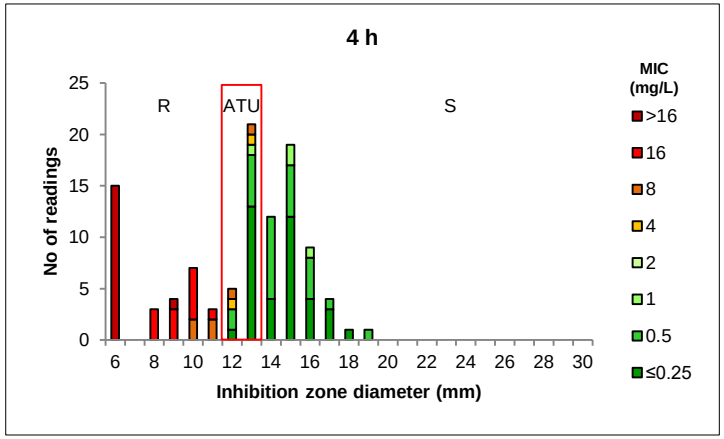


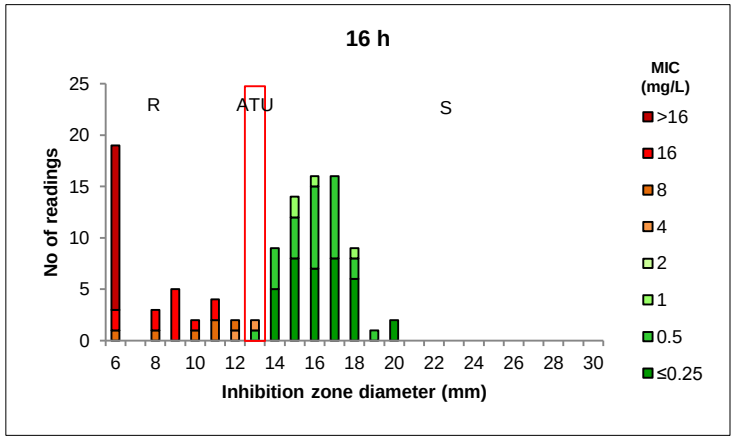
***K. pneumoniae* and gentamicin 10 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

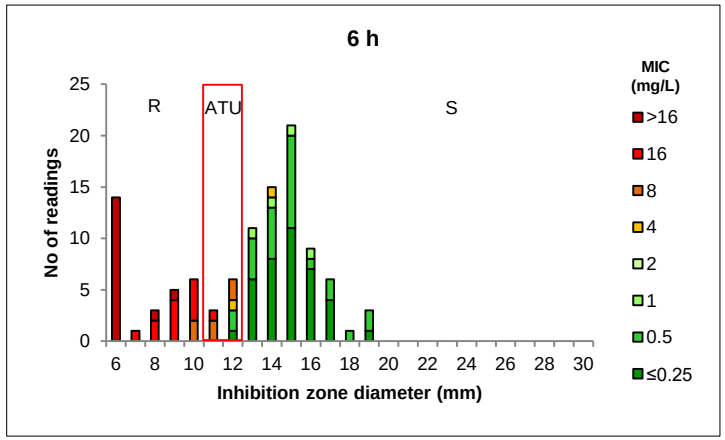
Standard disk diffusion

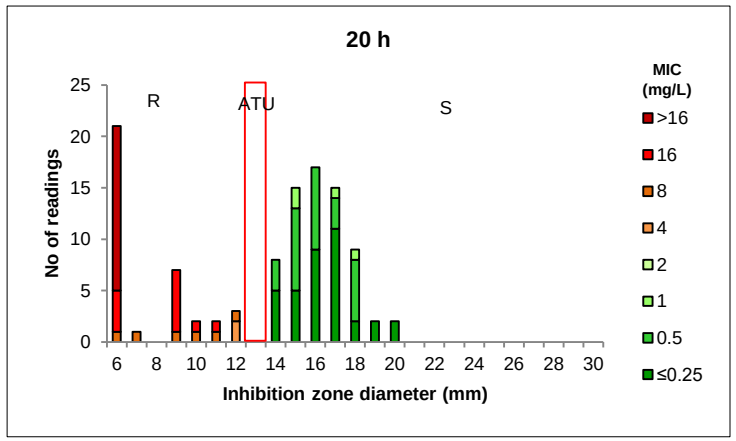


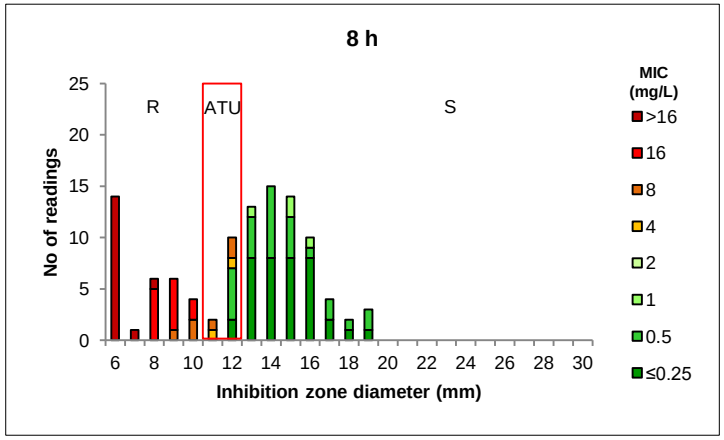
K. pneumoniae **and tobramycin 10 µg, spiked blood culture bottles**
RAST vs. broth microdilution 16-20h





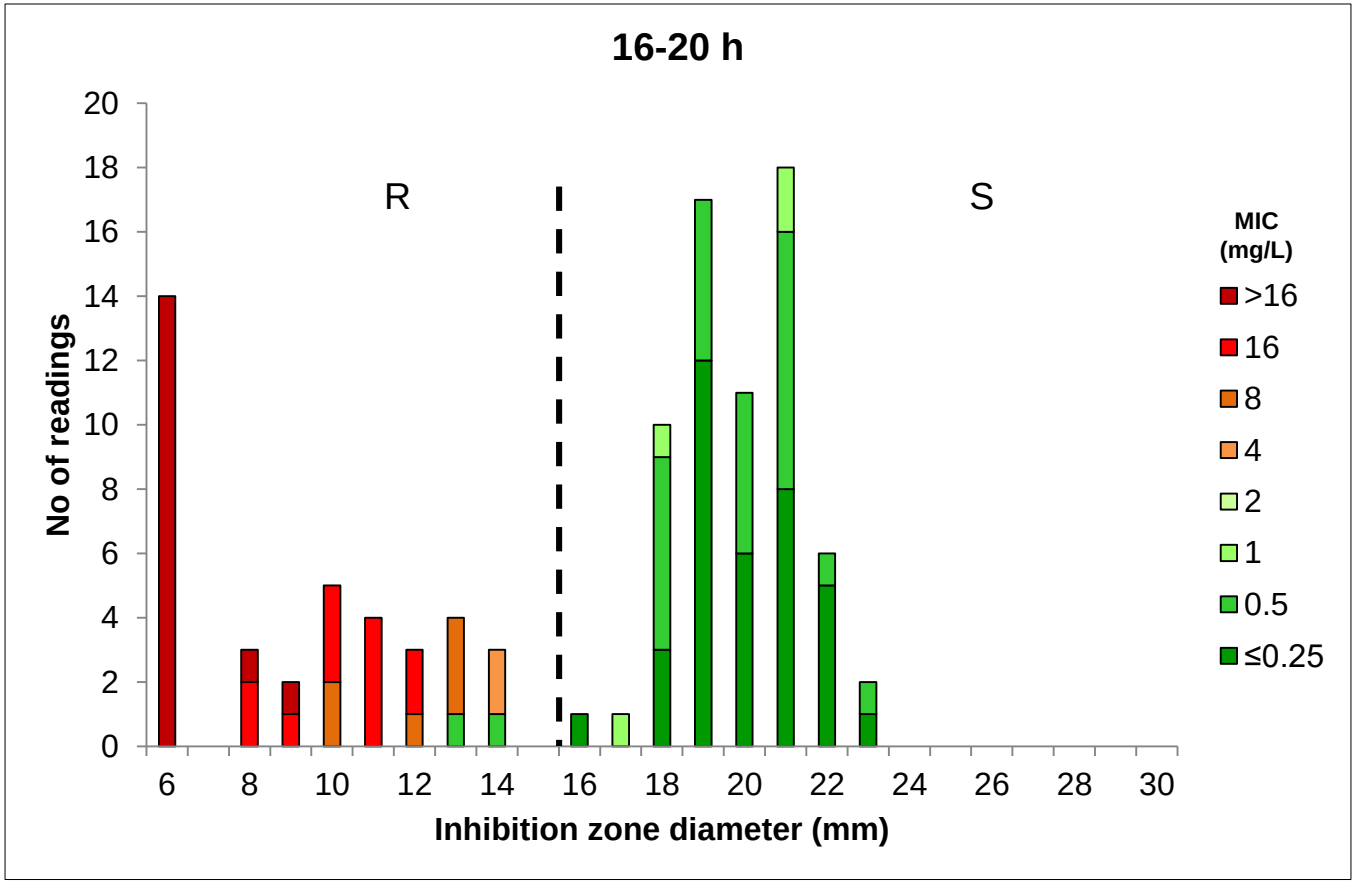




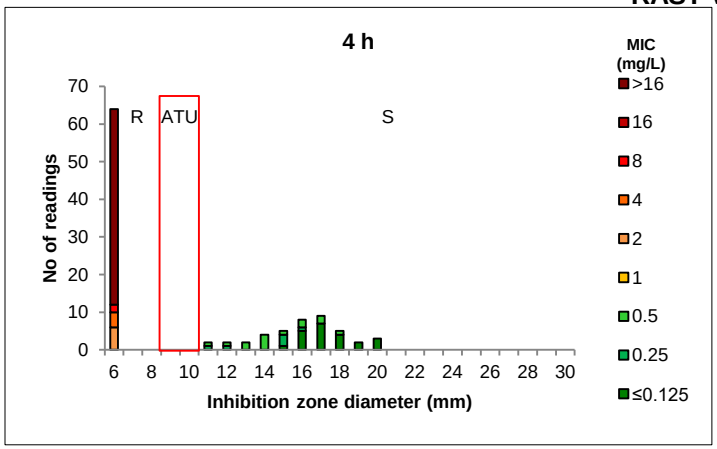


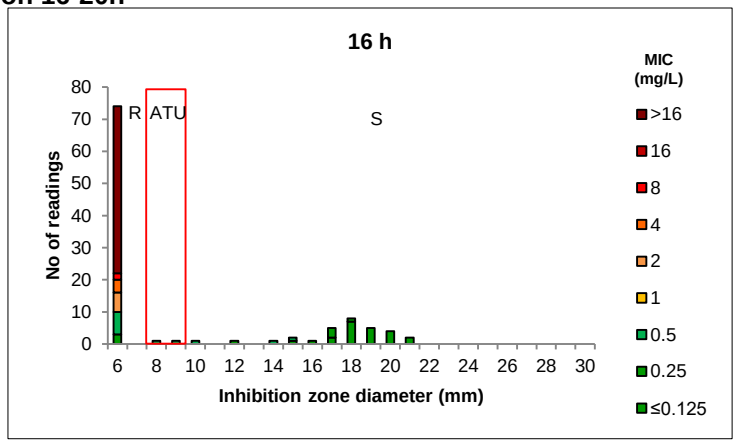
***K. pneumoniae* and tobramycin 10 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

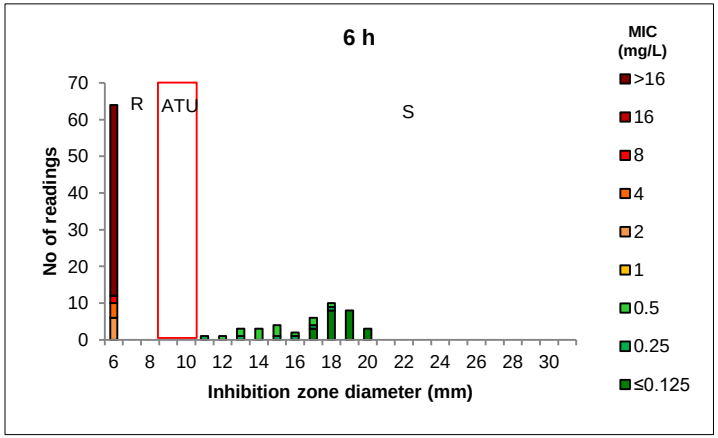
Standard disk diffusion

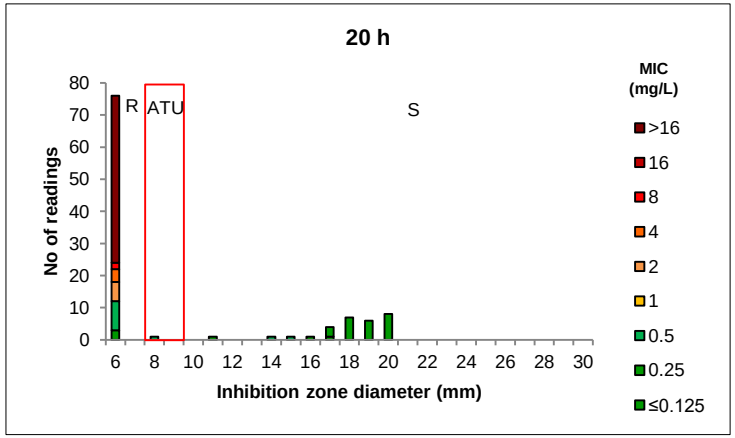


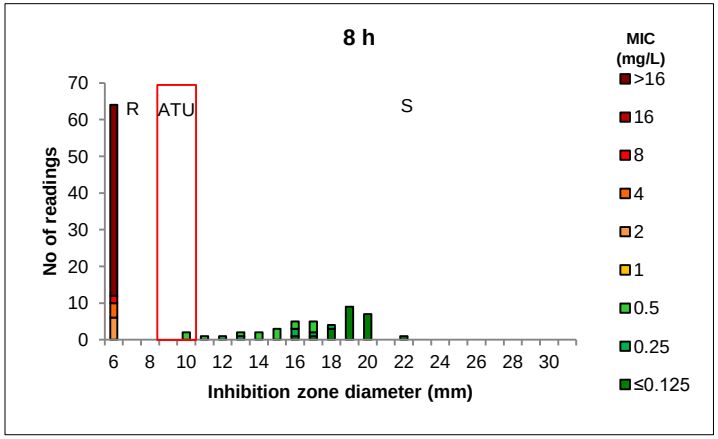
K. pneumoniae and trimethoprim-sulfamethoxazole 1.25-23.75 µg, spiked blood culture bottles
RAST vs. broth microdilution 16-20h











***K. pneumoniae* and trimethoprim-sulfamethoxazole 1.25-23.75 µg**
EUCAST disk diffusion 16-20 h vs. broth microdilution 16-20 h

Standard disk diffusion