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Significantly higher antibiotic susceptibility and invasiveness in *Klebsiella variicola* than *Klebsiella pneumoniae* suggest species identification provides valuable information to clinicians

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BACKGROUND / AIM

- MALDI-TOF's increasing discrimination power improves differentiation of *Klebsiella* species [1, 2]
- Since 2017, growing numbers of medical microbiology laboratories in Switzerland identify *Klebsiella variicola*, while others still report them as *Klebsiella pneumoniae* or *Klebsiella pneumoniae* complex.
- If clinically relevant characteristics differed, species discrimination may add important information.
- ➢ We investigated whether susceptibility rates and invasiveness of *K. variicola* isolates reported to ANRESIS differ from *K. pneumoniae* isolates.

MATERIAL & METHODS

- Data acquisition: Antibiotic susceptibility and specimen type of *K. variicola* and *K. pneumoniae* isolates were extracted from the ANRESIS database for all laboratories differentiating *K. variicola* from *K. pneumoniae*.
- Susceptibility categorisation: Isolates categorised susceptible by reporting laboratories were defined susceptible, isolates categorised intermediate or resistant were defined non-susceptible.
- Carbapenems: Isolates were rated non-susceptible if meropenem and/or imipenem tested intermediate or resistant
- Cephalosporins: Isolates were considered non-susceptible if at least one 3rd and 4th generation cephalosporin was categorised intermediate or resistant.
- Other antimicrobial groups: The most commonly reported substance of each group was included in the analysis.
- Invasiveness: Isolates obtained from blood or primarily sterile specimen types were defined as invasive strains

RESULTS: SUMMARY

- Differentiation of *K. variicola* increasing: Proportions of laboratories identifying *K. variicola* rose from 13% in 2017 to 44% in 2020.
- *K. variicola* less frequently detected than *K. pneumoniae*: From January 2017 to January 2021, 13.7% of the analysed isolates were reported as *K. variicola*.
- *K. variicola* more susceptible: All tested antibiotic classes showed significantly higher susceptibility rates in *K. variicola* than in *K. pneumoniae* (Figure 1, Table).
- *K. variicola* more invasive: *K. variicola* isolates were significantly more often reported from blood and primarily sterile specimens than *K. pneumoniae* isolates (Figure 2).

ANTIMICROBIAL SUSCEPTIBILITY

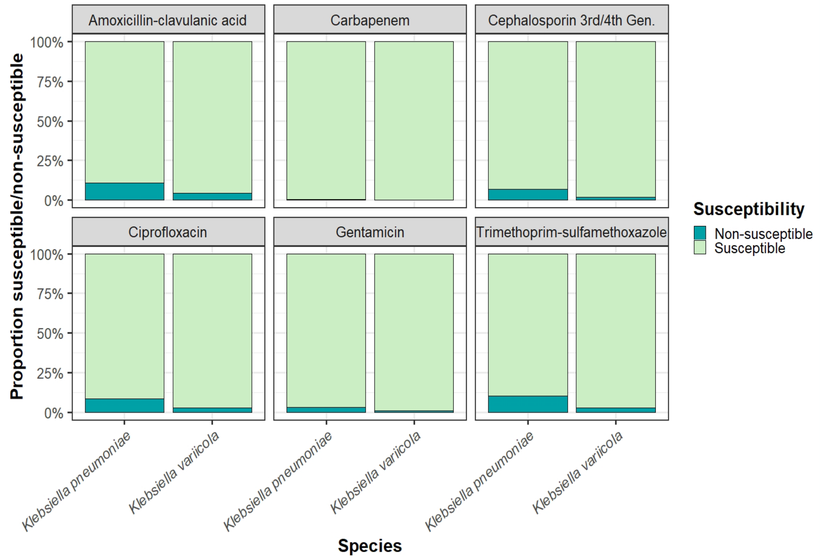

Figure 1: *Klebsiella variicola* isolates were significantly more susceptible than *Klebsiella pneumoniae* isolates. Carbapenem: grouped antibiotics including imipenem and meropenem, cephalosporin 3rd/4th gen.: including all 3rd and 4th generation cephalosporins available in the ANRESIS database.

INVASIVENESS

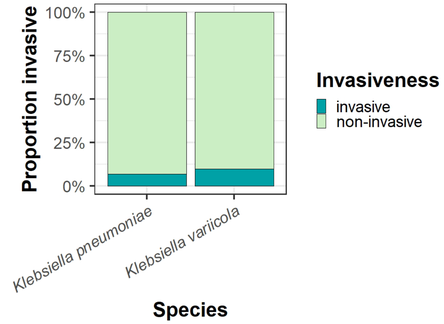

Figure 2: *Klebsiella variicola* was more often reported from invasive specimens than *K. pneumoniae*. Fisher's exact test: *K. variicola*: 9.9%, n=49330; *K. pneumoniae*: 6.9%, n=344490; OR=0.68, p<0.001. Invasive: isolates reported from blood and primarily sterile specimens, non-invasive: isolates reported from other specimens (e.g. urine, superficial wound swabs, etc)

ANTIMICROBIAL SUSCEPTIBILITY

Table: Fisher's exact tests of six antibiotic classes. P-values are given after Bonferroni corrections. CI: 95% confidence interval, carbapenem: grouped antibiotics including imipenem and meropenem, cephalosporin 3rd/4th generation including all 3rd and 4th generation cephalosporins available in the ANRESIS database.

Antibiotic	*K. pneumoniae*		*K. variicola*		Odds ratio	Lower CI	Upper CI	p-value
	Non-susceptible (%)	n (total)	Non-susceptible (%)	n (total)				
Amoxicillin-clavulanic acid	10.8	37689	4.4	5943	2.66	2.34	3.04	< 0.001
Carbapenem	0.6	28878	0.1	4708	4.94	2.07	15.46	< 0.001
Cephalosporin 3rd/4th Gen.	6.9	35023	1.9	5470	3.85	3.16	4.75	< 0.001
Ciprofloxacin	8.4	37398	2.8	5918	3.15	2.69	3.71	< 0.001
Gentamicin	3.1	25062	1.0	4040	3.14	2.33	4.53	< 0.001
Trimethoprim-sulfamethoxazole	10.3	36223	2.8	5688	3.97	3.38	4.70	< 0.001

CONCLUSION

- Differential susceptibility: Significantly higher susceptibility rates in *K. variicola than K. pneumoniae* may lead to underestimation of *K. pneumoniae* resistance rates in laboratories not identifying *K. variicola*.
- Differential invasiveness: *K. variicola* was more often obtained from blood and primarily sterile specimens than *K. pneumoniae*, indicating potentially increased invasiveness.
- ➢ **Differentiating *Klebsiella* species may add valuable information to clinicians and epidemiologists.**

REFERENCES

1. Rodrigues, C. et al., Front. Microbiol., 2018. 9:3000.
2. Potter R.F. et al., mBio, 2018. 9:e02481-18.

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