Action points to avoid antibiotic use & resistance during the life of pigs

Elke Burow[1], Anja Rostalski[2], Jürgen Harlizius[3], Bernd-Alois Tenhagen[1], Annemarie Käsbohrer[1]

[1]German Federal Institute for Risk Assessment, Unit Epidemiology, Zoonoses and Antimicrobial Resistance, Diedersdorfer Weg 1, 12277 Berlin, Germany

[2] Bavarian Animal Health Services, Senator-Gerauer-Str. 23, 85586 Poing, Germany

[3] Animal Health Services, Chamber of Agriculture of North Rhine-Westphalia, Haus Düsse, Ostinghausen, 59505 Bad Sassendorf, Germany

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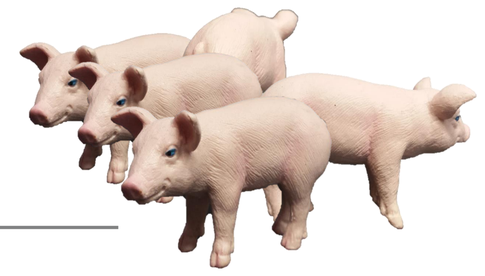

Introduction

According to a study in nine European countries, 88 % of pig production batches receive antibiotics during their life (Sarrazin et al. 2020, JAC). The purpose of our longitudinal study was to follow German pigs from birth to slaughter and to investigate antibiotic use, antibiotic resistance patterns in fecal *Escherichia coli (E. coli)* and finally risk factors for antibiotic use per production stage.

Figure 1: Scheme of 5 fecal samplings during life cycle of the focal pigs

Material & Methods

- Longitudinal study between 2014 and 2016
- 406 focus pigs = 2 dams x 7 piglets x 29 German breeding herds
- Followed from birth to end of fattening
- All their antibiotic treatments documented
- Fecal samples collected with rectal swabs 5 times during pigs' life (Fig. 1)
- *E. coli* isolated, tested for susceptibility to antibiotic agents by broth microdilution (Decision 2013/652/EU, European Commission 2013), epidemiological cut-off values (EUCAST 2015)
- Questionnaire on farm and animal related risk factors: 55, 57 and 66 variables at suckling, weaning and fattening
- All factors per production stage tested for their effect on antibiotic use (binary outcome) using univariable and multivariable logistic regression

Results

Most antibiotic treatments were applied to weaners and fewest to fatteners (Fig. 2). During suckling mainly penicillin was used, during and post weaning mainly penicillins, tetracyclines and colistin, and during fattening macrolides and tetracyclines were applied (Fig. 3).

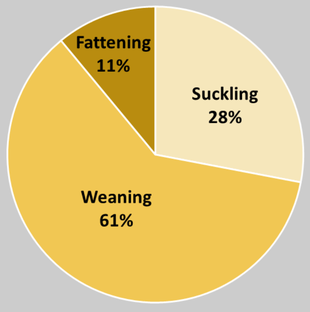

Figure 2: Proportion of antibiotic treatments per production stage *(N = 413)*

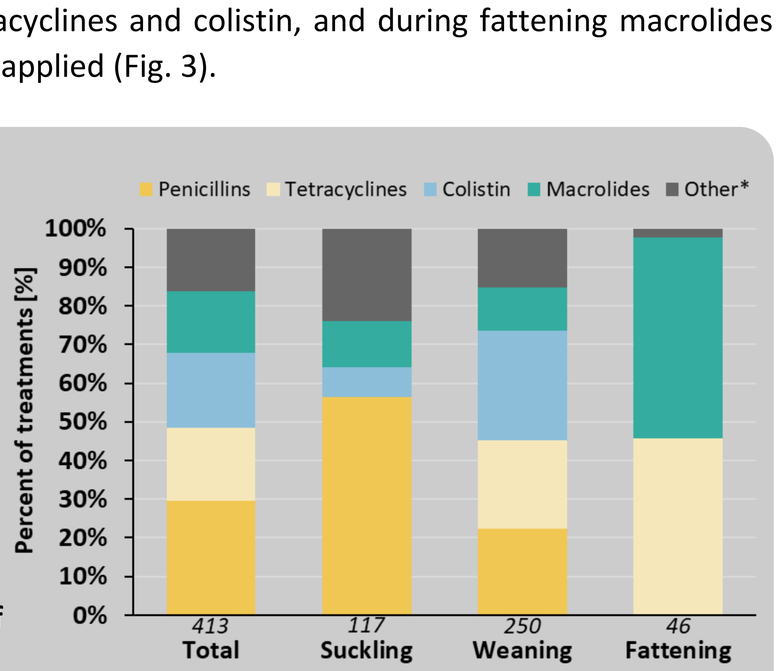

Figure 3: Proportion of administration routes per production stage *(italic numbers below the bars indicate absolute numbers)*

Accodingly, resistance levels to indicator agents for the used antibiotic classes increased especially during the weaning stage (Fig. 4).

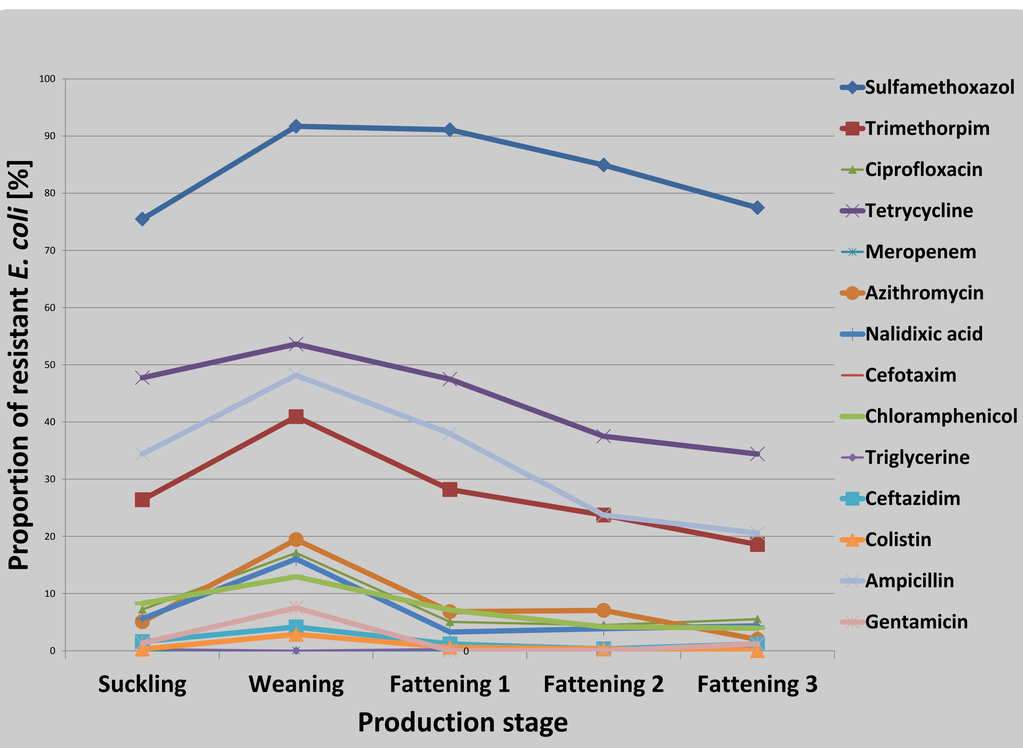

Figure 4: Proportion of isolates resistant to antibiotic agents at suckling *(N = 375)*, **weaning** *(N = 386)*, **Fattening 1-3** *(N = 337, 312, 253)*

The risk factor analyses identified several management factors (7-8) per production stage as being associated with antibiotic use at suckling, weaning and fattening. In the multivariable analysis, type of rodent control for sucklers, production type for weaners and number of weaned piglets per sow and year for fatteners showed significant association with antibiotic use.

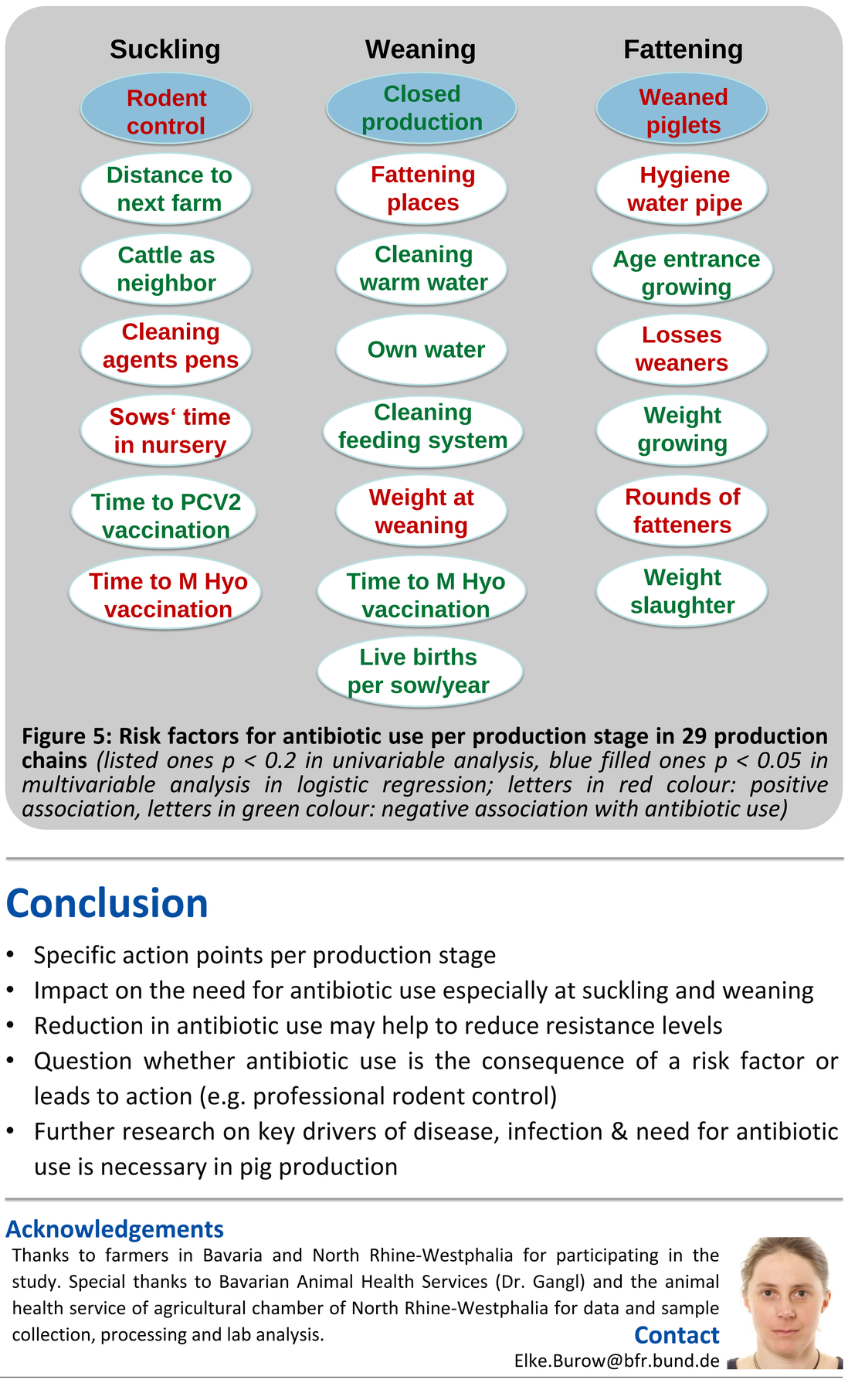

Figure 5: Risk factors for antibiotic use per production stage in 29 production chains *(listed ones p < 0.2 in univariable analysis, blue filled ones p < 0.05 in multivariable analysis in logistic regression; letters in red colour: positive association, letters in green colour: negative association with antibiotic use)*

Conclusion

- Specific action points per production stage
- Impact on the need for antibiotic use especially at suckling and weaning
- Reduction in antibiotic use may help to reduce resistance levels
- Question whether antibiotic use is the consequence of a risk factor or leads to action (e.g. professional rodent control)
- Further research on key drivers of disease, infection & need for antibiotic use is necessary in pig production

Acknowledgements

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Contact

Elke.Burow@bfr.bund.de