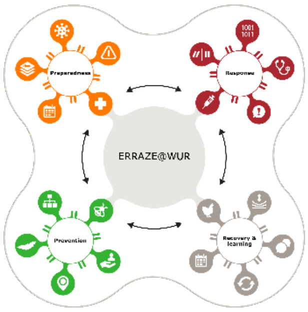
Paradigm Shifts for Global One Health

Greater resilience requires transformation and integration

Book of Abstracts

International symposium
23-25 April 2024
Wageningen, The Netherlands



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Association between antimicrobial usage and resistance in livestock and antimicrobial resistance among human Salmonella, Campylobacter and E. coli infections

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Problem statement and aims: Antimicrobial usage (AMU) promotes antimicrobial resistance (AMR) in bacterial populations. The Netherlands has substantially reduced AMU in livestock since 2009; however, it is not clear whether this reduction has influenced AMR levels among human infections. Here, we assessed the associations between AMU and AMR in livestock, and AMR in human infections caused by non-typhoidal Salmonella and Campylobacter (both zoonotic pathogens), and Escherichia coli from urinary tract infections (UTI).
Methods: An ecological registry-based study was conducted using AMU and AMR data in livestock and human infections from various Dutch national surveillance programmes. Study periods were selected according to the availability of data in each pathogen. Associations were studied per homologous antimicrobial-class, using multivariable logistic regression and correlation analysis. For Salmonella and Campylobacter, use of other antimicrobials in livestock was accounted for potential co-selection. Known travel-related cases were excluded if data was available. For Salmonella, the most common serotypes (S. Enteritidis and S. Typhimurium and its monophasic variant) were included, while for Campylobacter, the species C. jejuni/coli were included. Associations were studied per animal reservoir, serotype or species. For E. coli, only isolates from UTI samples in primary care were analysed, and besides use of other antimicrobials in livestock, age, gender, and AMU in humans were accounted for. In all pathogens, a one-year lag was explored to determine relations between distinct populations.
Results: For Salmonella, mainly positive associations were found between livestock AMU and human AMR Typhimurium/monophasic-variant infections, and between AMU and AMR among Typhimurium/monophasic-variant isolates from broilers/pigs. No significant correlations were found between AMR in broiler/pig and human isolates. For Campylobacter, AMU in livestock was inversely associated with AMR among human infections. No significant associations were observed between AMU and AMR among broiler Campylobacter isolates, while positive correlations were found between AMR in broiler and human isolates. For E. coli, several positive/negative associations between livestock AMU and human AMR were observed, but associations were generally stronger within human or animal populations.
Conclusions: Overall, the association between AMU in livestock and AMR in human zoonotic infections is ambiguous and varies according to pathogen, subtype, and animal reservoir. Confounding concerns are human infections resulting from imported meat and travel. The inverse association observed for Campylobacter stresses that reducing AMR may not be enough to tackle increasing AMR in humans. The marginal association between livestock AMU and human AMR in E. coli UTIs provides further evidence that the zoonotic spread of E. coli causing UTIs is limited.

Keywords: Antimicrobials, salmonellosis, campylobacteriosis, Escherichia coli, One Health.