ACRONYM: ARMIS

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Abstract:

Manure is one of the major sources of antimicrobial resistance (AMR) in the environment, since livestock animals consume the majority of antibiotics produced globally. Antibiotics together with antibiotic resistant bacteria are excreted to the environment via manure, and may significantly contribute to the transmission of and exposure to AMR in food, water, and air as exemplified for methicillin-resistant *Staphylococcus aureus* (MRSA). Techniques for nutrient reduction in manure, such as composting and anaerobic digestion, exist and are started to be applied in a number of countries. These techniques can also reduce antibiotic resistance. However, to date, no studies simultaneously studied the reduction of all AMR components (antibiotics, bacteria and genes) by different manure interventions.

In this project, we will measure the effectiveness of different manure treatment techniques on AMR reduction throughout the manure chain and analyse process parameters of influence. Both large-scale (centralised) treatment systems and small-scale (farm) systems will be evaluated in different national contexts with varying AMR prevalence. With culture dependent and culture independent methods, the abundance of antibiotic resistance and its mobility at different steps of the manure treatment processes is evaluated. We will focus on ESBL-producing *Enterobacteriaceae*, vancomycin-resistant Enterococci (VRE) and MRSA, as well as metagenomic and qPCR analyses of antibiotic resistance genes, and quantification of antibiotic residues. Emissions of AMR from manure and manure treatment systems will be assessed, in order to determine risks of exposure. With input from workshops on risk perception with relevant stakeholders, these risk assessment outcomes will be communicated to improve awareness on antibiotic usage, to guide prioritising intervention initiatives, and to further comprehend exposure risks. Knowledge on the effectiveness of manure interventions on AMR transmission may contribute to reducing the AMR
impact caused by the livestock industry.