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Comparison of Antimicrobial Treatment Incidence Quantification Based on Detailed Field Data on Animal Level with the Standardized Methodology of the European Medicines Agency in Veal Calves, Switzerland, 2016–2018

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Abstract: Precise quantification of antimicrobial treatment incidence (TI) is crucial for benchmarking. Two widespread methods for treatment incidence quantification were compared for agreement. Field data were obtained from 38 veal farms from 2016 to 2018 (1905 calves, 1864 treatments). Calculation of TI_{swiss} for calves was based on detailed treatment records using pharmacokinetic values from the Swiss Veterinary Medicines Compendium. The method published by the European Medicines Agency was used to calculate TI in defined daily doses (TI_{DDD}). For each calf and treatment, TI_{swiss} and TI_{DDD} were calculated on level of the antimicrobial class, drug, application route, and farm. The quotient (Q) of TI_{swiss} and TI_{DDD} was calculated. Divergence in results between the two methods of $\leq$25% was arbitrarily set as good agreement. The agreement between TI_{swiss} and TI_{DDD} was mostly good. On class level, good agreement was observed for treatments representing 71.5% of the TI_{DDD}, and 74.5% of the total TI_{DDD} on drug level. Poor agreement was mainly observed for tylosin and sulfadimidine. The agreement was better for parenteral than for oral treatments (81.6% vs. 72.3%). For practically orientated calculation on farm level, good agreement was observed (77.5% of the TI_{DDD}). The TI_{DDD} method showed mostly good agreement, especially for parenteral treatments.

Keywords: treatment intensity; antimicrobial use; standardization; agreement

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1. Introduction

Antimicrobial resistance (AMR) is likely to become an obstacle for human development, as antimicrobials may become ineffective for disease control and health care costs may rise considerably [1]. There is a large basis of evidence showing that antimicrobial use (AMU) is a major driver for the development of AMR in human and veterinary medicine through selection of resistant strains, which emphasizes the need to reduce AMU [2]. Different methods are used to quantify and compare AMU among countries, with the aim of developing strategies to monitor drug use and to identify excessive or inadequate use. Sales figures of antimicrobial therapeutic products have been published regularly for various countries for more than a decade [3–6]. However, an important limitation of the interpretation of sales figures is that antimicrobials cannot always be attributed to different animal species and production branches, and dose or duration of the treatments are rarely known. Thus, sales figures interpretation is difficult. Moreover, the amount of antimicrobials sold is not identical to the amount used, as, e.g., therapeutic products may expire before administration or packages may break. There is agreement that more detailed data than sales figures are needed to estimate AMU more precisely at the levels of the species, production branch, or farm [7].

Numerous methods and differing approaches have been developed to estimate AMU. However, comparison of the results of different methods often requires complicated conversion calculations or may be impossible. For example, the method for calculating the