

Drug and route-specific associations between antimicrobial use and prevalence of resistance in bovine non-*aureus* staphylococci

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Emergence and spread of antimicrobial resistance (AMR) are major concerns for human and animal health worldwide. Consequently, there is increasing pressure to reduce antimicrobial use (AMU) in food-producing animals. In this project, we studied the association between AMU and antimicrobial resistance (AMR) in non-*aureus* staphylococci (NAS) isolated from Canadian dairy herds. Distinct types of dry cow therapy, antimicrobials and routes of administration were compared. Specific objectives were to: 1) study herd-level associations between AMU and AMR; 2) verify whether these associations depended on the antimicrobial of interest and route of administration; and 3) study relationships between type of dry cow therapy and AMR.

A total of 1,702 NAS isolates were randomly selected and their AMR profile determined against 23 antimicrobials, following standardized guidelines. Only systemic AMU was associated with prevalence of AMR in NAS, whereas intramammary or intrauterine use were not. Herds that administered 2 antimicrobial daily doses per cow/year systemically had, on average, 30% more multi-drug resistant isolates than herds that administered 1 antimicrobial daily dose per cow/year. Systemic use of penicillins, macrolides and 3rd generation cephalosporins was associated with the prevalence of resistance against that specific drug class. Selective dry cow therapy was not associated with multidrug resistance, nor with drug-specific resistance in NAS. Systemic use of macrolides was associated with prevalence of *erm* genes whereas prevalence of *tet* genes was associated with tetracycline use.

An association between AMR in NAS and use of antimicrobials in dairy herds was only present when antimicrobials were administered systemically. Hence, based on our results, the impact of decreased use of antimicrobials on AMR in NAS following successful implementation of selective dry cow therapy is going to be minimal due to a weak or a lack of an association between AMR and antimicrobials administered intramammarily. Moreover, our study identified drug classes that may pose an additional threat. This summary of evidence is crucial and necessary for discussion and implementation of strategies aimed to mitigate the emergence of AMR in the dairy industry.