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Antimicrobial Resistance in Young New Zealand Horses

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Abstract

The emergence of bacteria that are resistant to antibiotics used in horses has been reported worldwide, including in Australia, the USA and United Kingdom. There is a lack of published comparative scientific information on the New Zealand equine population. However, recent individual cases of multi-drug resistant (MDR) bacterial infections reported by veterinarians have raised concerns about the situation in New Zealand. The use of antimicrobials coupled with less than ideal prescription practice in the horse industry may have led to inadvertent selection for MDR bacteria. An initial perspective on antimicrobial resistance in NZ is gleaned through a retrospective description of laboratory submissions in the form of a database analysis from 2004 to 2013/2014. In neonates (foals less than three weeks of age), the presence of MDR bacteria was identified in 37.5% (24/64) of foals; although 81.6% (102/125) of bacteria cultured from foals included in the study were sensitive to either penicillin or gentamicin. Of the respiratory samples from horses three-years-old and younger, the most commonly cultured bacteria were *Staphylococcus* species accounting for 40.1% (310/774) of isolates. These bacteria were sensitive to penicillin, ceftiofur and gentamicin for > 90% of isolates. Of all respiratory equine submissions, MDR bacteria were recovered from 39.2% (93/237) of horses. Using multiple correspondence analysis, MDR was associated with submissions from 2009-2014 and two-year-old horses from the Waikato region.

These two population groups were targeted specifically for examination due to the potentially severe consequences of bacterial disease in neonates (**Chapter 3**), and the anecdotal experience of high clinical use of antimicrobials in young horses, especially in the treatment of clinically apparent respiratory disease (**Chapter 4**). Multi-drug resistance was assessed as part of this work, and is presented in the systematic literature review (**Chapter 2**), and in both descriptive studies (**Chapters 3 and 4**). The results of the two retrospective descriptive studies presented show that there is a substantial proportion of submissions from young horses in New Zealand that grow multi-resistant bacterial isolates, and that there is decreased efficacy of commercially available antimicrobials in this country. The antimicrobial resistance reported in this study has potential clinical implications, and reflects the first step in a multifactorial approach to improve and maintain horse and human health.

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And of course, thank you to my mum!

Abbreviations

ACVIM	American college of veterinary internal medicine
AMR	Antimicrobial resistance
CC	Clonal complex
CI	Confidence interval
CIA	Critically important antimicrobial
ESBL	Extended-spectrum beta-lactamase
OR	Odds ratio
MCA	Multiple correspondence analysis
MDR	Multi-drug resistance
MIC	Minimum inhibitory concentration
MLST	Multi-locus sequence typing
MPI	Ministry for primary industries
MRCoNS	Methicillin resistant coagulase-negative <i>Staphylococcus</i> species
MRS	Methicillin resistant <i>Staphylococcus</i> species
MRSA	Methicillin resistant <i>Staphylococcus aureus</i>
NZ	New Zealand
OIE	World organisation for animal health (<i>office internationale des epizooties</i>)
PCR	Polymerase-chain reaction
PFGE	Pulse-field gel electrophoresis
PMQR	Plasmid-mediated quinolone resistance
PRISMA	Preferred reporting items for systematic reviews and meta-analysis
SVARM	Swedish veterinary antimicrobial resistance monitoring
TMPS	Trimethoprim-sulfonamide combination (i.e. trimethoprim-sulfamethoxazole, trimethoprim-sulphadiazine)
VRE	Vancomycin resistant <i>Enterococcus</i>
WHO	World health organisation

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