

# Antibiotic resistance in bacteria associated with equine respiratory disease in the United Kingdom

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## Introduction

Bacteria are important causes of upper and lower respiratory tract diseases in horses, which often result in poor performance and exercise intolerance. Cytological examination and bacterial culture of respiratory samples are useful tools for the diagnosis of these infections, the determination of their aetiology and the selection of adequate antibiotic treatment. However, culture and antimicrobial sensitivity testing is not always performed, and treatment is often initiated on an empirical basis when a bacterial infection is suspected.

As knowledge of the most likely bacterial agents and their susceptibilities is necessary to inform the selection of empirical therapy, this study aimed to provide evidence on the aetiology and antibiotic resistance profiles of bacteria isolated from horses with respiratory disease using both retrospective and prospective data.

## Approach

The laboratory records for 615 respiratory tract samples collected from horses suspected of respiratory disease and processed at a commercial laboratory in the UK between May 2002 and May 2012 were retrospectively evaluated. The information extracted included data on bacterial culture, antibiotic susceptibility testing results, cytology reports and the age and sex of the patients. In addition, 14 lower respiratory tract samples collected

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## KEY FINDINGS

- *Streptococcus equi* subspecies *zooepidemicus*, *Pseudomonas aeruginosa*, *Pasteurella* species and *Escherichia coli* were the bacterial species most frequently isolated from horses with respiratory disease.
- *S equi* was susceptible to ceftiofur (100 per cent) and erythromycin (99 per cent). However, resistance to penicillin (12.5 per cent) and tetracycline (62.7 per cent) was detected.
- Gram-negative isolates showed resistance to gentamicin, trimethoprim-sulfamethoxazole and tetracycline but susceptibility to enrofloxacin (except *Pseudomonas* species, where 46.2 per cent were resistant).
- Multidrug resistance was detected in 1 per cent of isolates.

from horses with clinical signs of lower respiratory disease in May and June 2012 were prospectively analysed.

## Results

In samples from the upper respiratory tract, *Streptococcus equi* subspecies *zooepidemicus* (22.9 per cent) *Escherichia coli* (17.5 per cent), coagulase-negative staphylococci (17.3 per cent) and *S equi* subspecies *equi* (14.1 per cent) were the bacterial species most frequently isolated. In lower respiratory samples, *Pasteurella* species (28.6 per cent), *S equi* subspecies *zooepidemicus* (25.3 per cent), *Pseudomonas* species (20.9 per cent) and *E coli* (13.2 per cent) were the bacterial species most frequently isolated.

*S equi* subspecies *zooepidemicus* and subspecies *equi* were found to be susceptible to ceftiofur (100 per cent) and erythromycin (99 per cent). However, 62.7 per cent of *S equi* isolates were resistant to tetracycline, and 12.5 per cent of *S equi*

subspecies *equi* from upper respiratory tract samples were resistant to penicillin. Isolates of Gram-negative bacterial species showed resistance to gentamicin, trimethoprim-sulfamethoxazole and tetracycline. Most of the Gram-negative species were susceptible to enrofloxacin, with the exception of *Pseudomonas* species, where 46.2 per cent were resistant. Multidrug resistance was detected in 1 per cent of isolates.

## Interpretation

The findings of this study are largely in agreement with previous reports on the detection of bacteria in the respiratory tracts of horses with respiratory disease. However, a considerable proportion of cytology-positive samples (41.2 per cent) in the present study only yielded the growth of small numbers of bacteria, so it is unclear whether this represents true infection or environmental contamination. Most isolates belonged to environmental or commensal species capable of opportunistic infection when the host's defence mechanisms are compromised, which further complicates the interpretation of these culture results.

Resistance to several commonly used antibiotics was observed in the isolated bacteria. The emergence of penicillin-resistant strains of *S equi* subspecies *equi* is a particular concern as penicillin is currently the drug of choice for the treatment of non-pneumococcal streptococci infections in horses. However, while information on susceptibility patterns is useful in observing trends, care should be taken in their interpretation as they may not be clinically relevant to specific cases.

## Significance of findings

The findings of this study will assist clinicians in selecting the best empirical antibiotic regimen to treat horses with respiratory disease. They will also help guide antibiotic stewardship efforts to combat the emergence and spread of resistance.