



Evaluation of an active surveillance system for methicillin-resistant *Staphylococcus aureus* colonization in horses at a veterinary teaching hospital

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Introduction

Methicillin-resistant *Staphylococcus aureus* (MRSA) is an important problem in hospitalized horses. Infection and colonization of horses can occur, with transmission to horses and people. In order to reduce hospital-associated MRSA transmission, active surveillance for colonized horses with subsequent infection control procedures can be used. The objective of this study was to evaluate an active surveillance system in-place at a veterinary teaching hospital.

Materials and Methods

- Active MRSA surveillance is used at the Ontario Veterinary College (OVC), with nasal swabs collected from horses on admission, every 7 days in hospital, and on discharge. Swabs are screened for MRSA using enrichment broth and inoculation onto Chromogenic agar (CHROMagar™ MRSA).
- Spa typing is performed on available isolates.
- Surveillance data were analyzed for horses admitted between June 1, 2009 and April 30, 2011.
- Cases were classified as:
 - Community-associated (CA): colonization detected at admission
 - Community onset-hospital associated (CO-HA): colonization detected at admission from a horse who was admitted to the OVC within the previous 12 weeks
 - Hospital-associated (HA): first sample negative and MRSA detected on subsequent sample
 - Indeterminate (IN): first sample positive but taken greater than 48 hrs after admission.
- Compliance was calculated by comparing the frequency of sample submissions to ideal frequency based on the duration of stay for each admission.
- Period and monthly CA, CO-HA, and HA MRSA prevalence were calculated. Foaling (February – May, inclusive) versus non-foaling season prevalence were compared with the Fisher's exact test. Statistical significance was based on a *P*-value <0.05.

Results

- During the study period there were 2235 admissions, consisting of 1705 different horses.
- A total of 2783 MRSA surveillance samples were obtained. For admissions with a duration of at least one day (n=1277), 38 horses (3%) were not screened, 511 (40%) were screened, but less frequently than indicated by protocol (Figure 1). Compliance varied by duration of stay.
- MRSA was isolated from 80 samples during 50 visits by 40 horses (first positive visits: CA–19; CO-HA–3; HA–17; IN–1). The period prevalence of MRSA in samples was 2.9% and in horses was 3.0%, with large monthly variation (Table 1). Colonization at admission (CA and CO-HA; 1.7%) and HA (1.3%) showed similar temporal fluctuations (Figure 2).
- Although five pairs of mares and foals were colonized (25% of the colonized horses), a significant seasonal variation was not observed (3.4% vs. 2.7%; *P*=0.4).
- Three horses had MRSA infections at admission [eye (CA), leg wound (CA), umbilical infection (CO-HA)] and all were also colonized. No HA clinical MRSA infections were identified.
- 18 isolates were available for *spa* typing; 16 (89%) were *spa* type t064, an ST8 strain commonly found in horses. *spa* types t002 and t1779 were also identified. Two different *spa* types were detected in the horse with a MRSA ocular infection [*spa* types t002 (eye) and t064 (nose)].
- Turnaround time from the diagnostic laboratory was often long, and results for first-time positive animals were available for only seven (18%) prior to discharge (Table 1).
- Eleven (28%) colonized horses were later re-admitted during the study period, seven (64%) remained positive with 2-234 days (mean=67.9, median=25) between positive re-admissions.
- Within six months after the first positive result, five owners of MRSA-positive horses brought 14 additional horses to the OVC (range 1-4). Three horses from one of these owners were also colonized.

Table 1: Descriptive statistics for MRSA-colonized horses

	Sample size	Mean	Median	Range
Monthly MRSA prevalence in surveillance samples	2783	2.7%	1.8%	0-9.8%
Monthly MRSA prevalence in unique screened horses	1322	2.9%	2.1%	0-8.6%
Time between sample collection and reporting of MRSA-positive results (days)	80	5.3	5.0	2-9
Duration of stay for MRSA-positive horses (days)	50	8.2	6	<1-35
Duration of hospitalization after identification of first-time MRSA colonization (days)	7	NA	5	1-25
Number of visits for MRSA-colonized horses during study period	50	1.3	1	1-3

Discussion

- Overall, compliance with MRSA surveillance sample submissions was good, with at least one sample collected from the majority of horses. Compliance with collection of the full set of swabs could be improved, and methods such as automated reminders may be of use.
- The prevalence of MRSA colonization varied throughout the study period with temporal variations, however the 1.7% admission prevalence is similar to previous reports from this facility. *spa* t064 (Canadian epidemic MRSA-5) continues to predominate in horses in Canada. Multiple *spa* types may co-exist at different anatomical locations in the same animal.
- Turnaround time is a limitation of culture-based screening, and results were often not available until after discharge. However, data are still useful because of the frequency of repeat visits among equine patients, the ability to identify high-risk farms and for assessment of MRSA risk and transmission in the hospital. Identifying high risk cases (e.g. previously positive, from a farm with a colonized horse) can allow for use of enhanced infection control practices at admission in those cases while awaiting test results.
- Ultimately, rapid testing is required to optimize MRSA screening in horses.

Acknowledgment

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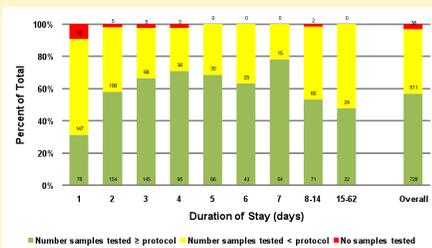


Figure 1: Compliance of MRSA surveillance testing for horses admitted for at least 1 day. Protocol: nasal swabs collected on admission, every 7 days in hospital, and on discharge

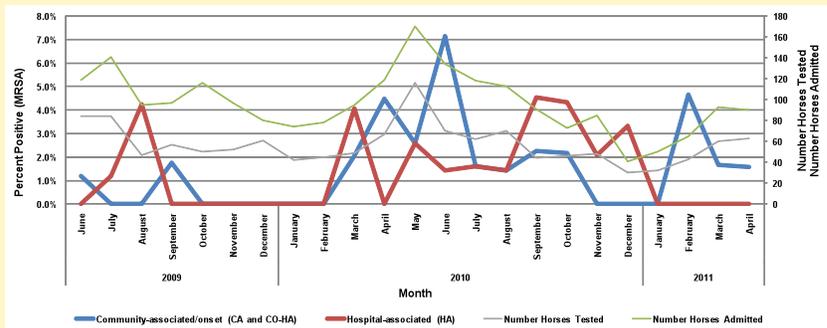


Figure 2: Prevalence of MRSA-colonized horses, first positive visit

