Identification of Livestock-Associated Methicillin-Resistant Staphylococcus aureus (LA-MRSA) in Community Hospitals In Southern Ontario, Canada

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INTRODUCTION
Reports of LA-MRSA in hospitalized individuals in Canada have been rare, despite its presence in animals and food in the country. However, the majority of human surveillance involves tertiary-care facilities in metropolitan areas that may not be representative of community hospitals. Since LA-MRSA may be more likely in milder community-associated disease, particularly in rural areas, tertiary-care hospital data may not adequately represent the situation with LA-MRSA.

To determine if LA-MRSA strains are present in community hospitals, surveillance studies were conducted in parallel.

MATERIALS AND METHODS
In 2010, three community hospitals (A, B, and C) located in southern Ontario, Canada, were enrolled. These healthcare facilities offer a wide spectrum of care and have >150 beds and >100,000 patient visits on an annual basis. All hospitals use targeted screening for MRSA, focusing on patients with designated risk factors (e.g., admission from long-term care, previous hospitalization), but screening of all admitted patients is not performed.

Study #1
- Patients specimens from MRSA infections and colonization were collected, prospectively, for one year. Only one MRSA isolate from infection and colonization sites was collected per patient.

Study #2
- In 2010, sampling of environmental surfaces located in the general environment and patient rooms in the medical and surgical wards were sampled once a week for four consecutive weeks.
- A sterile electrostatic cloth was wiped over the surface to be sampled up to a maximum area of 20 cm x 20 cm. Cloths were then placed in individual sterile bags.
- MRSA isolates from patients in the medical and surgical wards during the study periods were also collected. Participating hospitals conduct targeted screening for MRSA colonization.

Sampling Processing
- Enrichment culture methods for electrostatic cloths and patient swabs that were selective for MRSA were used. All isolates were spa typed and LA-MRSA strains underwent Apal PFGE. 1 PCR for the presence of the genes encoding the Panton-Valentine leukocidin (PVL) toxin was also performed.
- PFGE patterns were analyzed using the Tenero criteria.
- LA-MRSA isolates were investigated for susceptibility to tiamulin and tetracycline using broth microdilution.

RESULTS
- 763 MRSA isolates from patients have been analyzed for study #1. One (0.13%) patient isolate, a nasal specimen from Hospital C, was identified as the ST398-associated spa type t034 (Table 1).
- Overall, 12.8% (13/881) of environmental samples were contaminated with MRSA (Table 1). Of these, 13 (11.5%) were spa type t034, which was identified in Hospitals A and B only. Data on t034 isolates are presented in Table 2. None of the MRSA isolates of the positive samples were positive for PVL toxin genes. No patient (n=43) was identified with this spa type during the study period.

OBJECTIVES

Study 1
To determine the types of MRSA present in patients in selected community hospitals over a one year period.

Study 2
To determine the prevalence of MRSA in the hospital environment and compare MRSA strains between patients and the environment.

CONCLUSIONS
- To our knowledge, this is the first report of t034 MRSA in the hospital environment in Canada. This spa type is associated with ST398 and the predominant spa type found in pigs and pig farmers in Canada. This strain has also been found in a limited number of human infections in the country.
- spa type t539 was not identified in any hospitalized patient during the environmental surveillance study. The discordance between patient MRSA strains and MRSA strains suggest unidentified reservoirs or sources, such as hospital staff, visitors, or unscreened patients. The presence of LA-MRSA in the hospital in the absence of recognized disease is not particularly surprising because of the lower transmissibility of this clone in hospitals compared to other strains.
- All LA-MRSA strains were resistant to tetracycline, as is typical. However, only one strain was resistant to tiamulin, in contrast to a recent report of widespread tiamulin resistance in porcine ST398 from Canada.

- LA-MRSA identified here are closely related on PFGE to LA-MRSA isolated from pigs in the province. The participating hospitals serve rural communities where pig farming is present, which may increase the likelihood of LA-MRSA exposure. The role of livestock contact on the presence of LA-MRSA in patients and the environment in community-hospitals requires further study.
- Further surveillance is required for a better understanding of LA-MRSA strains in Canadian community hospitals.

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REFERENCES