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Suspected transmission of methicillin-resistant *Staphylococcus aureus* between domestic pets and humans in veterinary clinics and in the household

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Abstract

Objective: To describe MRSA infection and colonization in household pets, and transmission of MRSA between animals and humans.
Methods: MRSA infection and colonization in household pets and human contacts were evaluated during investigations initiated after identification of MRSA infection or colonization of a household pet in order to determine if there had been transmission between animals and humans. All MRSA isolates were screened for Panton–Valentine leukocidin (PVL) genes by use of polymerase chain reaction, and isolate relatedness was determined by use of pulsed-field gel electrophoresis (PFGE).
Results: Investigations of six situations where MRSA was identified in one or more animals in a household or veterinary facility were performed. MRSA was isolated from 8 animals (5 dogs and 3 cats) with clinical infections, 1 cat that was in contact with 2 infected cats and 14/88 (16%) of household contacts or veterinary personnel. Both animal-to-human and human-to-animal transmission were suspected. An indistinguishable MRSA isolate was recovered from at least one human that was in contact with each animal case. All isolates were classified as Canadian epidemic MRSA-2, the predominant community-associated MRSA clone in humans in Canada. No isolates possessed genes encoding for the PVL.

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Conclusions: Transmission of MRSA between humans and animals, in both directions, was suspected. MRSA appears to be an emerging veterinary and zoonotic pathogen.

Keywords: Zoonosis; Antimicrobial resistance; *Staphylococcus aureus*

1. Introduction

Methicillin-resistant *Staphylococcus aureus* (MRSA) is an established pathogen in most human healthcare facilities. In the United States, MRSA is reported to be associated with over 125 000 hospitalizations annually (Kuehnert et al., 2005). In addition, MRSA infection has been associated with increased morbidity and mortality compared to methicillin-sensitive *S. aureus* infections (Engemann et al., 2003). Recently, infections due to MRSA have been documented in children and adults who lack traditional risk factors (Centers for Disease Control and Prevention, 1999; Herold et al., 1998; Nguyen et al., 2005). Most infections caused by these community-associated (CA) MRSA appear to involve the skin and soft tissues, however life-threatening infections can develop in otherwise healthy patients (Centers for Disease Control and Prevention, 1999). Perhaps associated with dissemination of MRSA in the community in humans has been the identification of MRSA infection in household pets (Baptiste et al., 2005; Boag et al., 2004; Loeffler et al., 2005; Pak et al., 1999; Rankin et al., 2005; Rich and Roberts, 2004; Tomlin et al., 1999; van Duijkeren et al., 2004a). The emergence of MRSA in household pets is of concern in terms of animal health, and perhaps more importantly, the potential for animals to act as sources of infection or colonization of human contacts.

Most reports of MRSA in pets have involved clinical cases or outbreaks, and less is known about colonization rates in pets in the community. At this point, MRSA colonization appears to be uncommon in this group. A study of dogs and cats presented to primary care veterinary clinics did not identify MRSA in 188 dogs and 39 cats (Murphy et al., 2005). Similarly, a study of dogs that visit human hospitals did not identify MRSA in any of 102 dogs (Lefebvre et al., in press) while a study of dogs presented to a tertiary care veterinary hospital only identified MRSA colonization in 2/203 (1%) dogs (Hanselman et al., 2005).

There are previous case reports of suspected interspecies transmission of MRSA. In one, a colonized dog was identified as a source of re-infection of a household contact (Cefai et al., 1994), while in another, recurrent MRSA colonization in two humans in a household was only eliminated after identification and treatment of colonization of their dog (Manian, 2003). A colonized dog was also suspected as being a source of recolonization in a nurse in the Netherlands (van Duijkeren et al., 2004b). A recent study reported isolation of MRSA from the nasal or oral mucosae of 17.9% of staff in a veterinary teaching hospital, suggesting that veterinary staff may be at higher risk for MRSA colonization (Loeffler et al., 2005), while another study reported concurrent colonization of dogs and veterinary hospital staff with indistinguishable strains (Baptiste et al., 2005). By itself, identification of concurrent colonization with indistinguishable MRSA isolates suggests interspecies transmission, however it cannot actually confirm interspecies transmission nor can it confirm the direction of transmission. Epidemiological data are required to provide a better understanding of the dynamics of MRSA transmission in households and veterinary clinics. This study describes evaluation of MRSA infection and colonization in household pets, and transmission of MRSA between animals and humans.

2. Materials and methods

2.1. Case investigations

Investigations were instigated following reports from primary care veterinarians of MRSA infection in household pets. Initial isolation of MRSA was made by the referring veterinarian through submission of specimens to veterinary diagnostic laboratories. Following identification of MRSA, the veterinarian or laboratory personnel contacted the authors, who initiated an investigation. Veterinary personnel and