



Occurrence of Methicillin Resistant *Staphylococcus aureus* among Dogs and their Handlers in Jammu

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ABSTRACT

The study explored the prevalence of *Staphylococcus aureus* and methicillin-resistant *Staphylococcus aureus* (MRSA) in dogs and their handlers. Samples comprised of dogs wound (n = 50), dogs nasal (n = 22), dogs skin behind ears (n = 50) and hand swabs of dogs owners (n = 40). Out of these 162 samples, 2 (1.23%) were positive for *S. aureus*, of which 1 (0.61%) was MRSA. *S. aureus* isolates were of wound and skin samples each and isolate from wound was MRSA. None of the dogs nasal and owners' hand swabs were positive for *S. aureus* and MRSA. Study revealed resistance of *S. aureus* to ampicillin (100%) while sensitivity to clindamycin (100%), doxycycline (100%), vancomycin (100%), linezolid (100%), teicoplanin (100%) and amoxycylav (100.0%). MRSA observed high resistance to ceftiofuran (100%) and vancomycin (100%) while isolates were sensitive to clindamycin (100%), amoxycylav (100.0%), ceftriaxone (100%), gentamicin (100%), ampicillin (100%) and linezolid (100%).

Keywords: Dogs, MRSA, prevalence, *Staphylococcus aureus*

MRSA is an emerging antimicrobial resistant pathogen which has the origin in human hospitals; although, later, the community adapted strains transmissible within the communities emerge (CDC, 1981). Infected and colonized humans are reservoir of MRSA. In India, approximately 20-40 percent of nosocomial infections are due to MRSA (Velasco *et al.*, 2005). The pathogen has similar disease spectrum to that of *Staphylococcus aureus* but owing to wide antibiotic resistance the treatment becomes difficult; the antibiotic resistance is the manifestation of Staphylococcal chromosomal cassette. The bacterium has adapted to numerous animal species including pigs (Pletinckx *et al.*, 2012), dogs (Beck *et al.*, 2012), chickens (Nemati *et al.*, 2008) and equines (Vincze *et al.*, 2014). Incidentally, new strains of bacterium have emerged in animals who may have the zoonotic potential; the most widely known is ST398. The incidence of MRSA in companion animals is increasing (Weese and Duijkeren, 2009). Among dogs, there have been few community and hospital based studies conducted which reported wide variation in prevalence ranging from zero to nine percent (Kottler *et al.*, 2008; Hanselman *et al.*, 2007; Loeffler

et al., 2005) from region to region. The majority of these infections are associated with postoperative infections and open wounds (Leonard and Markey, 2006). There have also been case reports worldwide of colonisation and transmission of *S. aureus*, including MRSA, between owners and their dogs (Kottler *et al.*, 2008; Loeffler *et al.*, 2005). This has led to concern about the role of dogs as possible reservoirs of MRSA in the community. The present study analyzed the occurrence of MRSA in dogs and their handlers in Jammu area.

MATERIALS AND METHODS

The dogs and dog handlers sampled in the study were those who visited the Teaching Veterinary Clinical Complex (TVCC), FVSc & AH, R.S.Pura. From dogs, a total of 122 swabs from different body locations viz., wounds (n = 50), nasal (n = 22) and skin behind ear pinna (n = 50) were collected, and the dog categories sampled included those visited TVCC for vaccination, wound examination, surgical procedures and routine examination. Also, forty hand swabs from dog handlers were collected. For sample



collection, the sterile swabs moist in sterile normal saline solution samples were used; the swabs were transported within 2 hours of collection to the Division of Veterinary Public Health and Epidemiology, FVSc & AH, R.S.Pura, for further processing.

Each sample was enriched in peptone water broth by incubating at 37°C for 24 hrs. From each broth, the inoculum was streaked on mannitol salt agar followed by incubation at 37°C for 24-48 hrs. The yellow colonies on mannitol salt agar were considered as presumptive *S. aureus*. The presumed colonies were subjected to Gram staining. The colonies having Gram positive cocci arranged like bunches of grapes were purified on nutrient agar and were subjected to biochemical tests *viz.*, catalase, oxidase, IMViC, coagulase and hemolysis. The isolates observing Gram positive, non-spore forming, non-motile cocci clustered in bunches, catalase positive, oxidase negative, indole negative, methyl red positive, voges proskauer positive, citrate positive, coagulase positive and double-hemolysis on blood agar were considered to be confirmed *S. aureus* isolates. The *S. aureus* isolates were analyzed for MRSA by cefoxitin disk diffusion assay (using cefoxitin 30 µg; HiMedia) (CLSI, 2008) and oxacillin resistance screening agar assay (using oxacillin resistance screening agar; HiMedia). Zone size ≤ 21 mm in cefoxitin disk diffusion assay or blue colonies on oxacillin resistance screening agar was confirmatory for MRSA. The isolates positive in any of cefoxitin disk diffusion and oxacillin resistance screening agar was considered MRSA. The confirmed *S. aureus* and MRSA isolates were subjected to disc diffusion antibiotic sensitivity test (Bauer *et al.*, 1966).

RESULTS

Notably, out of 122 dog samples, only 2 samples were positive for *S. aureus*; among them one was MRSA. The two *S. aureus* isolates were from wound and skin behind ear pinna each. The positive MRSA was that of wound. None of the samples from dog handlers was positive for *S. aureus* and so MRSA. The only MRSA isolate in antibiotic sensitivity test was resistant to vancomycin while was sensitive to amoxyclav (30 µg), ceftriaxone (30 µg), ampicillin (10 µg), gentamicin (10 µg), cotrimoxazole (25 µg), cephalixin (30 µg), cefixime (5 µg), doxycycline (30 µg), linezolid (30 µg), teicoplanin (30 µg) and clindamycin (2 µg). *S. aureus* isolated from skin was resistant to ampicillin (10 µg) while was sensitive to rest of antibiotics.

DISCUSSION

MRSA is the pathogen of concern for human medicine amid the emergence of livestock associated MRSA (LA-MRSA). Anterior nares of humans are considered the niche of *S. aureus*; the same is not true for animals and the colonization of MRSA in animals varies with species, area and body site. Pletinckx *et al.* (2011) reported the skin behind ears in pigs to be the most common colonized site while in poultry it was nose shells and cloaca (Pletinckx *et al.*, 2012). Further, the incidence of MRSA in companion animals is high with open wounds and postoperative implications (Leonard and Markey, 2006). Consequently, the present study analyzed the samples from skin, nasal and wound sites of dogs.

In our study, none of the dogs nasal swabs (n = 22) was positive for *S. aureus* and MRSA. Many workers have reported zero prevalence in nasal samples (Bagcigil *et al.*, 2007; Griffeth *et al.*, 2008). Hanselman *et al.* (2007) reported MRSA nasal colonization in 2/203 (1%) dogs. Kottler *et al.* (2009) reported 4 percent MRSA in dog samples. Loeffler *et al.* (2010) reported the colonization to be higher (9/45; 8.9 %) than others. Weese and Duijkeren (2009) suggested that the colonization of MRSA in nares of dogs is transient in nature and the bacterium abolishes within weeks from nasal cavity of dogs (Loeffler *et al.*, 2010). There may be other risk factors for infection and colonization in animals such as close contact with persons harbouring the bacterium, immune system status, administration of immunosuppressive drugs etc.

In study, Out of 50 dogs wound samples, only one (2%) was positive for MRSA. In study by Vincze *et al.* (2014) 3.6 per cent dog wounds samples harboured MRSA. Bergstrom *et al.* (2012) did not isolate *S. aureus* from surgical wound of hospitalized dogs despite being the organism being present in the hospital environment. In our study, one isolate of *S. aureus* was found from dog a skin sample which was not MRSA. Beck *et al.* (2012) yielded 3 (1.7 %) MRSA from dogs skin cultures while 11 (6.4 %) from dogs nose and rectum.

As the human index finger has been implicated in transmission of *S. aureus* from humans (Mulligan *et al.*, 1993), we also analyzed the hand swabs of dog owners. Notably, *S. aureus* was not isolated from hands of dog handlers in present study which may have been due to good personal hygiene measures of owners. The results

present a rosy picture for veterinary public health, however in case of low prevalence as is attained in present study the surveillance on a larger sample size becomes essential.

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