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Human infection associated with methicillin-resistant *Staphylococcus pseudintermedius* ST71

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Sir,

Staphylococcus pseudintermedius is one of the most common pathogens isolated from skin and post-operative infections in dogs and cats[1,2] and can also occasionally cause infections in humans.[3,4] People working or living with animals are more likely to be colonized with *S. pseudintermedius* in their nasal cavities[5] and human infection acquired from dogs has been recently reported.[4] In recent years, there have been increasing numbers of infections in dogs and cats caused by methicillin-resistant *S. pseudintermedius* (MRSP) and a predominant MRSP clone is disseminating in dogs and cats throughout Europe.[1,2] This MRSP clone belongs to the multilocus sequence type (MLST) ST71, *spa* type t02 and SmaI PFGE group J (ST71-t02-J) and contains the staphylococcal cassette chromosome element SCC*mec* II–III.[1] It displays resistance to many classes of antibiotics and represents a challenge for therapy. Here, we report, to our knowledge, the first case of a human infection caused by MRSP ST71 emphasizing its zoonotic potential and therapeutic challenge.

An adult patient presented to the doctor in 2009 with headache, watery eyes and a small oedema over the right eye. The patient had a history of recurrent rhinosinusitis and three surgical interventions had been performed over the previous 6 years, the last one in 2005. CT illustrated an obliteration of the right sinus frontalis with an expansive mucocele. Yet another surgical intervention was absolutely essential and post-operative treatment for 3 weeks with 500 mg of ciprofloxacin twice per day and 300 mg of clindamycin three times per day was given. Five weeks post-operatively, a purulent infection appeared. After 10 days of treatment with 875 mg of amoxicillin/125 mg of clavulanic acid twice daily and 300 mg of clindamycin three times daily and no improvement, a sample was sent for bacteriological analysis. The laboratory identified a multidrug-resistant

Table 1. MICs of 22 antibiotics and antibiotic resistance genes in *S. pseudintermedius* ST71, strain 27366

Antibiotics	Resistance breakpoints[a] (mg/L)	MICs (mg/L)	Resistance genes
Amikacin	≥64	≤16	—
Amoxicillin/clavulanic acid	≥8/4	8/4	*mecA*
Cefalotin	≥32	32	*mecA*
Chloramphenicol	≥32	8	—
Clindamycin	≥4	>8	*erm*(B)
Enrofloxacin	≥4	>16	*grlA* (Ser80Ile); *gyrA* (Ser84Leu)
Erythromycin	≥8	>16	*erm*(B)
Fusidic acid	NA	≤0.12	—
Gentamicin	≥16	16	*aac(6′)-Ie-aph(2)-Ia*
Kanamycin	≥64	>128	*aph(3′)-III*
Linezolid	≥8	≤1	—
Mupirocin	NA	≤4	—
Nitrofurantoin	≥128	≤16	—
Oxacillin	≥0.5[b]	>8	*mecA*
Penicillin	≥0.25	8	*blaZ*; *mecA*
Quinupristin/dalfopristin	≥4	1	—
Rifampicin	≥4	≤0.12	—
Streptomycin	≥32	>32	*ant(6)-Ia*
Tetracycline	≥16	>32	*tet*(K)
Trimethoprim/sulfamethoxazole	≥4/76	>8/152	*dfr*(G)/ND
Trimethoprim	≥16	>128	*dfr*(G)
Vancomycin	≥32[b]	≤1	—

NA, not available; ND, not determined; —, no gene was detected.
[a]Resistance breakpoints were those recommended for *Staphylococcus* spp. in the CLSI Informational Supplement M100-S20 (www.clsi.org), except for streptomycin, for which the breakpoint from the French Society for Microbiology (www.sfm.asso.fr) was used.
[b]This breakpoint is applicable to CoNS.

Staphylococcus belonging to the *Staphylococcus intermedius* group (SIG) using the ID 32 STAPH system (bioMérieux, Marcy l'Étoile, France) and disc diffusion susceptibility testing (Oxoid Ltd, Basingstoke, UK). Based on these results, a local treatment with fusidic acid gauze and application of 2% mupirocin ointment four times a day for 8 days followed by a topical glucocorticoid/antibiotic combination therapy (0.5 mg/g fluocinonide, 2.5 mg/g neomycin, 0.25 mg/g gramicidin and 100 000 IU/g nystatin) packing for 4 days improved the local condition. Six weeks after the purulent infection, the wound had healed with scarring and no bacterium was detectable in a repeat smear. Local follow-up treatment with steroids and routine check-ups confirmed the absence of residual infection.

The multidrug-resistant *Staphylococcus* isolate was further identified as MRSP ST71-t02-J containing SCC*mec* II–III using MLST typing, *spa* typing, PFGE and SCC*mec* typing methods described previously.[1] MICs of antibiotics were determined in Mueller–Hinton broth using custom Sensititre susceptibility NLV73 plates (Trek Diagnostics System, East Grinstead, UK) except for rifampicin, trimethoprim, kanamycin and fusidic acid, which were tested using home-made microbroth dilution plates. Antibiotic resistance genes were detected using a microarray.[6] Mutations in topoisomerase genes *gyrA* and *grlA* were identified by sequencing of PCR products[7] (Table 1). The isolate was susceptible to the antibiotics amikacin, chloramphenicol, fusidic acid, linezolid, nitrofurantoin, the combination quinupristin/dalfopristin, rifampicin and vancomycin (Table 1).

The patient owned a male dog that needed home care because of various clinical problems such as diabetes, recurrent warts and abdominal tumour. The dog had consultations in various clinics and underwent several antibiotic treatments (details of substances could not be ascertained). The dog was euthanized before samples could be taken to determine whether it was a carrier of the strain. The patient also owned horses and cats; all of them were in good health without clinical signs. Even if the ultimate source of the MRSP infection could not be identified, the patient was infected with the same MRSP clone (ST71-t02-J with SCC*mec* II–III) that has been disseminating in dogs over Europe in recent years.[1]

A case similar to the one reported here has been described in the USA, where a woman developed sinusitis caused by a methicillin-resistant SIG whose origin could be attributed to her pet dog.[8] In that case, vancomycin and linezolid were used for treatment.

The increasing number of dogs carrying MRSP constitutes a risk for pet owners to become colonized with MRSP, and MRSP infections in humans may also increase in the near future. It is therefore important to recognize MRSP as a zoonotic pathogen and have antibiotics available for the treatment of MRSP infections in humans. Therefore, antibiotics such as mupirocin, linezolid, quinupristin/dalfopristin, rifampicin and vancomycin that are used for decolonization or as 'last resort antibiotics' against methicillin-resistant staphylococci in humans should not be used for treatment in animals.

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Transparency declarations

None to declare.

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Successful treatment with tigecycline of two patients with complicated urinary tract infections caused by extended-spectrum β-lactamase-producing *Escherichia coli*

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