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Community-Acquired *Staphylococcus argenteus* Sequence Type 2250 Bone and Joint Infection, France, 2017

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We report a rare case of *Staphylococcus argenteus* bone and joint infection in a 9-year-old boy in France. His finger arthritis was complicated by osteitis 5 weeks later, which resulted in a secondary intervention. This case indicates the virulence of *S. argenteus*, an emerging pathogen whose clinical effects are poorly described.

Staphylococcus argenteus (formerly *S. aureus* clonal complex 75) is an emerging species in the *S. aureus* complex (*1*). Several studies reported sporadic cases of *S. argenteus* infections mainly in Asia, Oceania, and the Pacific Islands (*2*) but rarely in Europe (*3*). We report the clinical characteristics of a community-acquired bone and joint infection with *S. argenteus* in a child living in France.

At the end of July 2017, a 9-year-old boy with no unusual medical history or previous local trauma was hospitalized because of acute signs of infection of the third finger on his right hand. He was first seen in a local hospital and given an initial diagnosis of cellulitis (arthritis). Two days later, he was admitted to the emergency pediatric ward of a tertiary care hospital where a surgical joint exploration was performed and confirmed the diagnosis of arthritis associated with an abscess of the extensor tendon sheath (Table).

Surgical microbiological samples cultured on blood agar plates (aerobic conditions at 37°C for 24 h) grew a strain that was identified by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (Microflex LT, Bruker, France) as having log scores ranging from 1.39 to

1.87 (corresponding to *S. aureus*, *S. simiae*, or *S. epidermidis*). These scores were lower than those required for reliable identification of species (2.3) or genus (2.1) levels. Antimicrobial drug susceptibility testing (Vitek2; bioMérieux, Marcy l'Etoile, France) identified resistance to penicillin G.

Because there was no initial reliable identification of this strain, we performed molecular tests. The strain was negative for *nuc*, *lukS*-PV, *mec*A, *mec*C, *tst*-1, and *spa* genes. The V3 region sequence of the gene coding for 16S rRNA showed 100% identity with that for *S. aureus*.

Table. Clinical characteristics and timeline for patient with community-acquired *Staphylococcus argenteus* sequence type 2250 bone and joint infection, France, 2017*

Characteristic	Jul 30	Aug 2	Aug 8	Sep 5	Nov 2
Hospital	Local	Tertiary care	Tertiary care	Tertiary care	Tertiary care
Clinical features	Pain in third finger of right hand	Fever (temperature 38.6°C); pain and functional impotence in flexion of finger	Poor tolerance of antimicrobial drugs	Fever (temperature 38.4°C); pain in finger	Stiffness in finger; no pain
Signs at physical examination	Inflammatory edema of finger; no inoculation lesion	Phlegmon of finger: inflammatory skin; edema on second phalanx	ND	Misalignment of second phalanx	No signs of infection
Laboratory findings					
Leukocytes, ×1 0^9 cells/L†	20	7.2	ND	11.6	7.2
C-reactive protein, mg/L‡	58	17.7	ND	ND	0.3
Microbiological	Culture of infection site not performed (no pus); blood culture not performed	Surgical samples: neutrophils and gram-positive cocci (identified as *S. argenteus*); blood cultures sterile	ND	Surgical samples: few neutrophils and negative gram staining results; culture remained sterile after 10 d; negative 16S rDNA PCR result; blood cultures not performed	ND
Radiologic findings	Not performed	Radiograph of hand: no signs of osteitis	ND	MRI of hand: osteitis	ND
Histologic findings			ND	Chronic osteitis	ND
Diagnosis considered	Cellulitis of finger	Arthritis of second phalanx; abscess of extensor tendon sheath	ND		ND
Treatment					
Antimicrobial drugs	AMX (1,000 mg/d) and CLA (125 mg/d)	CFZ (2,200 mg/d) and GEN (400 mg/d) for 2 d; AMX (2,000 mg/d), CLA (250 mg/d), RIF (600 mg/d) for 6 wk	Stop AMX and CLA; FUS (1.5 g/d) and RIF (600 mg/d) for 5 wk	Sep 8: CLI (900 mg/d) and OFX (400 mg/d) for 6 wk	ND
Surgery		Surgical joint lavage and débridement for massive purulent abscess that reached the extensor tendon and joint capsule of second phalanx; no articular cartilage lesion	ND	Surgical lavage and realignment of phalanxes with implantation of external fixator on Sep 8	ND
Outcome	Discharged	Improvement at discharge on Aug 4; patient seen on Aug 6, 8, 10, and 12	Good outcome	Discharged on Sep 11; patient seen on Sep 13, 15, and 22, and Oct 6; external fixator removed on Oct 6	Good outcome and functional rehabilitation; patient seen on Dec 27 and had similar findings

*AMX, amoxicillin; CFZ, cefazolin; CLA, clavulanic acid; CLI, clindamycin; FUS, fusidic acid; GEN, gentamicin; MRI, magnetic resonance imaging; ND, not determined; OFX, ofloxacin; RIF, rifampin.
†Reference range 4.5–13.5 × 10^9 cells/L.
‡Reference value <5 mg/L.

Microarray analysis (*S. aureus* Genotyping Kit 2.0; Alere Technologies GmbH, Jena, Germany) assigned this strain to the clonal complex 2250/2277 of one of the main clusters of *S. argenteus* (*2*,*4*). The patient was discharged and received an oral antimicrobial regimen for 6 weeks; healing was closely monitored (Table).

Five weeks later, the patient was hospitalized because of recurrent signs of infection (Table). Magnetic resonance imaging of the right hand showed osteitis (online Technical Appendix Figure, panel A, https://wwwnc.cdc.gov/EID/article/23/10/18-0727-Techapp1.pdf). A second surgical procedure was performed (Table). Cultures of surgical samples remained sterile after 10 days and a 16S rDNA PCR result was negative. Histologic analysis showed chronic osteitis (online Technical Appendix Figure, panel B). An oral drug regimen, including clindamycin and ofloxacin for 6 weeks, was prescribed. Long-term outcome was good (Table), despite persistence of stiffness in the finger.

This rare case of osteomyelitis caused by *S. argenteus* highlights the difficulties in correctly identifying this species. As with *S. schweitzeri, S. argenteus* is an emergent species that has been described as part of the *S. aureus* species complex (*5*). *S. argenteus* was first described in 2002 as a CC75/sequence type T1223 clone of *S. aureus* in Aboriginal communities in Australia (*6*). This species was named *S. argenteus* in 2011 because of its lack of staphyloxanthin production (*1*). Most studies reported prevalence rates for *S. argenteus* among strain collections of 0.16%–18.6% according to geographic distribution, with a clear predominance in Asia and the West Pacific region (*1,5–7*) and a rare description in Europe (*3*).

In our case, no epidemiologic link to Asia or the West Pacific region was observed. The clinical spectrum of infections with *S. argenteus* remains poorly described, but varies from asymptomatic nasal carriage (*8*) to community-acquired infections, including skin and soft tissue infections (*1*,*6*), bacteremia (*1,9*), and foodborne illness (*8*). Apart from 2 cases of bacteremia reported by Dupieux et al. (*9*), clinical data for *S. argenteus* infections have been poorly detailed (online Technical Appendix Figure). To the best of our knowledge, only 1 case of osteomyelitis has been reported (*7*).

Previous cases and the case we report indicate that *S. argenteus* could be responsible for invasive infections that are difficult to manage. *S. argenteus* was initially considered to be less virulent than *S. aureus* on the basis of a study in Australia, which reported that this species was associated mainly with skin and soft tissue infections and rarely with bacteremia (3/220 cases) (*1*). However, a comparative study of 311 cases of *S. argenteus* and *S. aureus* sepsis in Thailand showed a similar outcome after 28 days (*10*). Moreover, virulence factors, such as Panton-Valentine leucocidin and enterotoxins, have been described in *S. argenteus* isolates (*4*,*8–10*). In contrast to reports from Aboriginal communities in Australia (*6*) and remote populations in the West Pacific region (online Technical Appendix Table), resistance to methicillin was not detected in strains from the case-patients in this study.

In contrast to *S. aureus*, the effect of carriage of *S. argenteus* has not been studied. For our case-patient, screening for *S. argenteus* nasal carriage was not performed. However, a recent study of foodborne illness outbreaks reported the ability of this bacterium to spread in the environment and colonize food handlers (*8*).

S. argenteus is an emerging species for which its clinical spectrum remains poorly described. Further studies are needed to better address the global prevalence and clinical role of this bacterium, including its potential effects in chronic human infections.

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J.R., S.G., and F.F. performed clinical imaging and collected histologic data; E.H. performed surgery; F.G., A.C., and A.T. analyzed the bacterial strain; and F.L., E.B.-N., and P.O.V. critically revised the manuscript and made final corrections. All authors approved the final manuscript.

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Circulation of Influenza A(H5N8) Virus, Saudi Arabia

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Highly pathogenic avian influenza A(H5N8) viruses have been detected in several continents. However, limited viral sequence data are available from countries in the Middle East. We report full-genome analyses of highly pathogenic H5N8 viruses recently detected in different provinces in Saudi Arabia.

On December 19, 2017, a high number of dead birds from various species was reported in a live bird market in Riyadh, Saudi Arabia, by the Department of Animal Resources Services, Ministry of Environment, Water, and Agriculture. Oropharyngeal and cloacal swab samples were collected from affected birds and investigated for highly pathogenic avian influenza (HPAI) viruses in Riyadh Veterinary Diagnostic Laboratory using reverse transcription PCR (RT-PCR) (*1*). These tests detected HPAI A(H5N8) virus. After this index outbreak, HPAI was reported in adjacent provinces. Surveillance studies were performed in all provinces (≥1 major poultry market and 10 backyard farms per province) to estimate disease prevalence. As of May 2018, a total of 7,273 birds had been investigated; 805 were positive for H5N8, which was detected in 7 provinces (Riyadh, Eastern, Al-Qasim, Makkah, Al-Madinah, Asir, and Jizan). The highest number of positive results was reported in Riyadh (693 samples), in which different commercial poultry farms (22 farms for laying hens, 2 for broiler breeders, and 1 for quail) were affected. A contingency plan, based on a stamping-out policy, was implemented to control the disease. More than 8.8 million birds were depopulated.

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Community-Acquired *Staphylococcus argenteus* Sequence Type 2250 Bone and Joint Infection, France 2017

Technical Appendix

Technical Appendix Table. Characteristics of reported cases of infection with *Staphylococcus argenteus**

Reference	No. cases	Patients	Signs/symptoms	Diagnostic method	Bacterial strain characteristics	Treatment	Prognosis
Holt et al., 2011 (*1*)	1	Woman from Australia	Necrotizing fasciitis and bacteremia	WGS	Resistant to methicillin	Not described	Not reported
Dupieux et al., 2015 (*2*)	2	25-year-old woman	Pulmonary and bacteremia	Microarray, MLST	Susceptible to methicillin, positive for PVL	Amoxicillin/clavulanic acid, roxithromycin, ceftriaxone, spiramycin, oxacillin, clindamycin, linezolid	Recovered
		18-month-old child	Knee arthritis, bacteremia, and multiple pulmonary abscesses			Amoxicillin/clavulanic acid, gentamicin, clindamycin, linezolid, oxacillin, rifampin, polyvalent immunoglobulin	
Thaipadungpanit et al., 2015 (*3*)	10	270 in Thailand	2 with bacteremia; 7 with SST; 1 with osteomyelitis (2 healthcare-associated infections	SNP	All resistant to methicillin; none positive for PVL	Not described	Same prognosis as *S. aureus* infections for death and illness
Chantratita et al., 2016 (*4*)	58	311 in Thailand	23 with bacteremia	PFGE, MLST	No strain resistant to methicillin; 15 strains positive for PVL	Not described	Same death rate as for *S. aureus* infections
Suzuki et al., 2017 (*5*)	2	Intoxicated 3 h after eating lunch	Food poisoning	WGS	Both strains produced SEB; no SCCmec elements	Not described	Not described
Wakabayashi et al., 2018 (*6*)	4 in 2014; 13 in 201	3 patients and 1 food handler in 2014; 12 patients and 1 food handler in 2015	Food poisoning	PFGE, MLST	All strains positive for SEB	Not described	Not described

Reference	No. cases	Patients	Signs/symptoms	Diagnostic method	Bacterial strain characteristics	Treatment	Prognosis
This study	1	9-year-old boy in France	Finger arthritis and osteomyelitis	Microarray	Susceptible to methicillin	Amoxicillin/clavulanic acid, ceftazolin, gentamicin, rifampin, fusidic acid, clindamycin, ofloxacin	Recovered

*MLST, multilocus sequence typing; PFGE, pulsed-field gel electrophoresis; PVL, Panton-Valentine leukocidin; SCCmec, staphylococcal cassette chromosome mec; SEB, staphylococcal enterotoxin B; SNP, single-nucleotide polymorphism; SSTI, skin and soft tissue infection; WGS, whole-genome sequencing.

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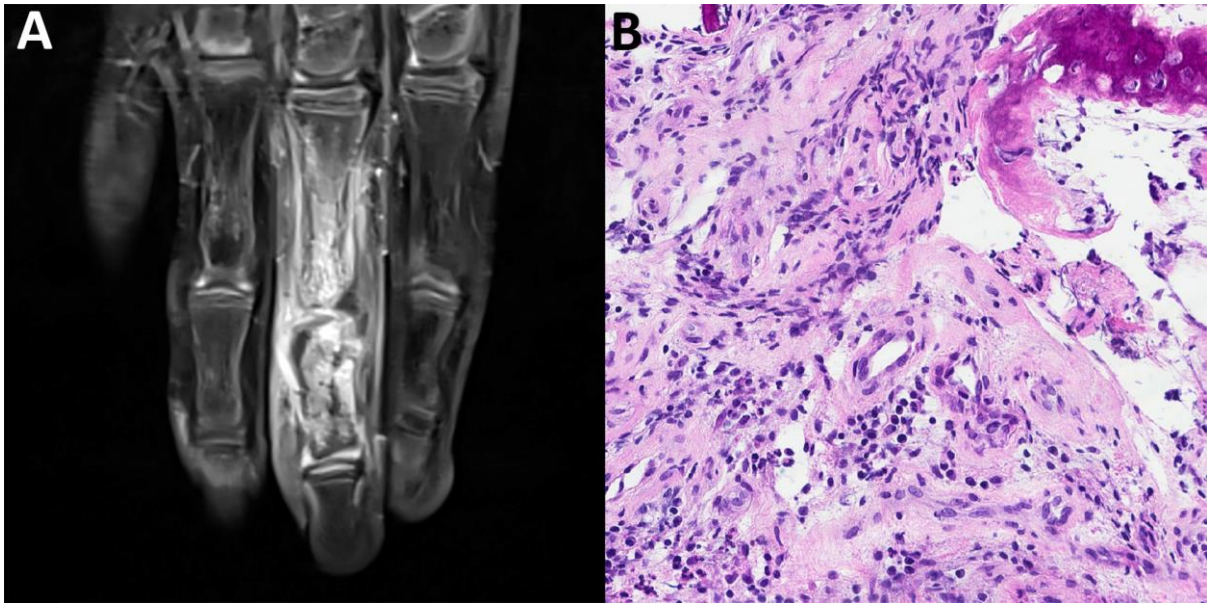

Technical Appendix Figure. Community-acquired *Staphylococcus argenteus* sequence type 2250 bone and joint infection in a 9-year-old boy, France 2017. A) Fat-saturated, T1-weighted, magnetic resonance image after gadolinium injection in coronal plane of the right hand, showing evidence of osteitis at the base of middle phalanx up to cartilaginous growth plate of third finger with local necrosis at the time of infection. B) Infected bone tissue showing infiltration with numerous plasmocytes and lymphocytes on the left at the time of infection (hematoxylin and eosin stained, original magnification ×100).