SCC*mec* Typing in Methicillin-Resistant *Staphylococcus aureus* Strains of Animal Origin

To the Editor: Van Loo et al. described the presence of staphylococcal cassette chromosome *mec* (SCC*mec*) type III in some methicillin-resistant *Staphylococcus aureus* sequence type (ST) 398 isolates related to pig farming (*1*). SCC*mec* types are based on the allotype of *ccr* genes and the *mec* gene complex. Class A *mec* has intact *mecI/R* regulator genes. Type III SCC*mec* has type 3 *ccr* genes and class A *mec* complex, whereas type V SCC*mec* contains *ccrC* and class C *mec* (*2*,*3*). The authors typed SCC*mec* of the isolates by the method of Zhang et al. (*4*), in which type III is defined by amplification of a 280-bp fragment located in the junkyard region. This fragment is found in SCC*mer* that is associated with SCC*mec* type III.

We have typed SCC*mec* of the same 4 isolates that were reported to be SCC*mec* type III positive by using the primer sets defined by Ito et al. (*2*,*3*) and Lim et al. (*5*) for *ccr* types 1–3 and *ccrC* and 4 additional primers developed at our institute (Table) in single PCRs. All ST398 isolates were PCR negative when primers specific for SCC*mec* type III were used, but PCR positive with the *ccrC*-specific primers. DNA sequencing confirmed the product as *ccrC*. Further, the isolates did not have a class A *mec* complex, a requisite for SCC*mec* type III, because a *mecI*-specific PCR was negative for these isolates. In addition, Southern hybridizations with digoxigenin-dUTP–labeled PCR fragments obtained with our primer pair specific for *ccr3* and primers for *ccrC* (*3*) showed no hybridization with the *ccrA/B3* probe (except for the positive control). All of the ST398 isolates hybridized with the *ccrC*-specific probe.

We conclude that on the basis of generally accepted definitions SCC*mec* type V is present in these ST398 pig-farming–related isolates, not SCC*mec* type III. Therefore, researchers should be aware that some typing methods may lead to inadequate results.

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References

1. van Loo I, Huijsdens X, Tiemersma E, de Neeling A, van de Sande-Bruinsma N, Beaujean D, et al. Emergence of methicillin-resistant *Staphylococcus aureus* of animal origin in humans. Emerg Infect Dis. 2007;13:1834–9.
2. Ito T, Katayama Y, Asada K, Mori N, Tsutsumimoto K, Tiensasitorn C, et al. Structural comparison of three types of staphylococcal cassette chromosome *mec* integrated in the chromosome in methicillin-resistant *Staphylococcus aureus.* Antimicrob Agents Chemother. 2001;45:1323–36 [erratum in Antimicrob Agents Chemother, 2001;45:3677]. DOI: 10.1128/AAC.45.5.1323-1336.2001
3. Ito T, Ma XX, Takeuchi F, Okuma K, Yuzawa H, Hiramatsu K. Novel type V staphylococcal cassette chromosome *mec* driven by a novel cassette chromosome recombinase, *ccrC.* Antimicrob Agents Chemother. 2004;48:2637–51. DOI: 10.1128/AAC.48.7.2637-2651.2004
4. Zhang K, McClure JA, Elsayed S, Louie T, Conly JM. Novel multiplex PCR assay for characterization and concomitant subtyping of staphylococcal cassette chromosome *mec* types I to V in methicillin-resistant *Staphylococcus aureus.* J Clin Microbiol. 2005;43:5026–33. DOI: 10.1128/JCM.43.10.5026-5033.2005
5. Lim TT, Chong FN, O'Brien FG, Grubb WB. Are all community methicillin-resistant *Staphylococcus aureus* related? A comparison of their *mec* regions. Pathology. 2003;35:336–43. DOI: .1080/0031302031000150498

Table. Primers used to type SCC*mec* of MRSA ST398 isolates*

Genes	Primer name	Primer sequence (5′ → 3′)
*ccrA/B*1	ccr1B-for	CTT TCA CGA TAG ACA CAG
	ccr1B-rev	TAA AAG AAG TTC ATA GCC GTT AAA TTG G
*ccrA/B*2	ccr2B-for	GCA TTC ATC ATC AAT CAA AAT G
	ccr2B-rev	CTA TAA CCT TCT GTG CTT TGC A
*ccrA/B*3	ccr3B-for	TCC GTA ATA AGA AGC AAC TTC AC
	ccr3B-rev	ACT ATA GCC TTC AGT ACT TTG GA
*ccrA/B*4	ccr4B-for	TGA AGA AGC ACA AGA GCG GC
	ccr4B-rev	CTG CAC CAC ATT TTG GGC AC

*SCC*mec*, staphylococcal cassette chromosome *mec*; MRSA, methicillin-resistant *Staphylococcus aureus*; ST, sequence type.

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In Response: We thank Jansen et al. for their comments about the SCC*mec* types of sequence type (ST) 398 methicillin-resistant *Staphylococcus aureus* (MRSA) isolates (*1*). For SCC*mec* typing of MRSA, several different PCR methods have been published. We originally chose the SCC*mec* PCR developed by Zhang et al. (*2*) because at that time it was the method of choice in many published papers. Fluit et al. questioned whether the SCC*mec* type III isolates were correctly typed (*1*). To prove that the results of typing these 4 isolates were incorrect, these researchers performed several different SCC*mec* PCRs, including a PCR with

primers they developed themselves. In addition, Southern hybridization was done. The results showed that SCC*mec* III ST398 MRSA isolates should be typed as SCC*mec* type V. In this conclusion we agree with the authors. It seems clear that Zhang's method incorrectly identified 4 of the animal-related ST398 isolates as SCC*mec* type III instead of SCC*mec* type V. Whether all ST398 MRSA are SCC*mec* type IV or V remains unclear. Recently, an article by Nemati et al. was published in which ST398 MRSA was also typed as SCC*mec* III (*3*). However, in that study the SCC*mec* typing method of Zhang was also used.

In conclusion, the choice of SCC*mec* typing method is directly related to obtaining accurate SCC*mec* results for ST398 isolates. To date, almost all animal-related ST398 MRSA isolates are SCC*mec* types IV and V.

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References

1. Jansen MD, Box ATA, Fluit AC. SCC*mec* typing in methicillin-resistant *Staphylococcus aureus* strains of animal origin. Emerg Infect Dis. 2009;15:136.
2. Zhang K, McClure JA, Elsayed S, Louie T, Conly JM. Novel multiplex PCR assay for characterization and concomitant subtyping of staphylococcal cassette chromosome *mec* types I to V in methicillin-resistant *Staphylococcus aureus*. J Clin Microbiol. 2005;43:5026–33. DOI: 10.1128/JCM.43.10.5026-5033.2005
3. Nemati M, Hermans K, Lipinska U, Denis O, Deplano A, Struelens M, et al. Antimicrobial resistance of old and recent *Staphylococcus aureus* isolates from poultry: first detection of livestock-associated methicillin-resistant strain ST398. Antimicrob Agents Chemother. 2008;52:3817–9. DOI: 10.1128/AAC.00613-08

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School Closure to Reduce Influenza Transmission

To the Editor: Cowling et al. reported on the effects of school closure in Hong Kong, People's Republic of China, during March 2008 in response to influenza-related deaths of children (*1*). The influenza epidemic started in January 2008 and peaked in late February, but the 2-week school closure did not begin until March 12. Consequently, the school-based epidemic was on the decline by the time officials closed schools. Other studies have suggested that early school closures can help reduce influenza illness in the community and among school children, especially during a pandemic (*2–6*). However, surveillance systems that rely on school absenteeism or deaths would likely provide information too late during the outbreak for school closure to effectively reduce influenza transmission.

The Centers for Disease Control and Prevention (CDC) has recommended early closure of schools as a community mitigation measure in the event of a severe pandemic (*7*). Specifically, CDC recommends rapidly initiating activities such as advising sick persons to stay home, dismissing children from schools, closing childcare facilities, and initiating further social distancing measures within a state or a community at the beginning of the upslope of a pandemic wave (acceleration interval), i.e., when cases are initially identified and community transmission begins to occur (*8*). We concur with the authors that the 2007–08 influenza season was already waning by the time the decision was made to close schools (deceleration interval).

School closure used as a single pandemic control measure is predicted to be less effective than early, concurrent use of multiple measures. Socially disruptive measures like early school closure and keeping children from congregating in the community would likely reduce community transmission of pandemic disease, but would also create secondary challenges (*9*,*10*). Therefore, to ensure maximal benefit for reducing disease transmission, interventions should be implemented early and concomitantly with other nonpharmaceutical and pharmaceutical measures, accompanied by public education, and used judiciously based on pandemic severity.

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References

1. Cowling BJ, Lau EH, Lam CL, Cheng CK, Kovar J, Chan KH, et al. Effects of school closures, 2008 winter influenza season, Hong Kong. Emerg Infect Dis. 2008;14:1660–2. DOI: 10.3201/eid1410.080646
2. Heymann A, Chodick G, Reichman B, Kokia E, Laufer J. Influence of school closure on the incidence of viral respiratory diseases among children and on health care utilization. Pediatr Infect Dis J. 2004;23:675–7. DOI: 10.1097/01.inf.0000128778.54105.06
3. Ferguson NM, Cummings DA, Fraser C, Cajka JC, Cooley PC, Burke DS. Strategies for mitigating an influenza pandemic. Nature. 2006;442:448–52. DOI: 10.1038/nature04795