Supplementary Materials

Multidrug-resistant Methicillin-Resistant Coagulase-Negative Staphylococci in Healthy Poultry for Human Consumption

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Table S1. Antimicrobial resistance phenotype and genotype, and SCC*mec* typing of CoNS isolated from poultry.

Isolate	CoNS species	Origin	Antimicrobial resistance	
			Phenotype	Genotype
VS3026	*S. lentus*	Homebred chicken	CIP, TOB, KAN, ERY, CD, TET	*erm*B, *aph*(3′)-IIIa, *ant*(4′)-Ia, *tet*L
VS3027	*S. lentus*	Homebred chicken	CIP, TOB, ERY, CD, TET	*erm*C, *ant*(4′)-Ia, *tet*K
VS3028	*S. lentus*	Homebred chicken	CIP, TOB, KAN, ERY, CD, SXT	*erm*B, *aph*(3′)-IIIa, *ant*(4′)-Ia, *dfr*K
VS3029	*S. lentus*	Homebred chicken	CIP, TOB, KAN, ERY, CD	*erm*C, *mph*C, *aph*(3′)-IIIa, *ant*(4′)-Ia
VS3030	*S. lentus*	Homebred chicken	CIP, ERY, CD, C, SXT	*erm*A, *erm*C, *mph*C, *dfr*D, *dfr*K, cat_{p194}
VS3031	*S. lentus*	Homebred chicken	CIP, ERY, CD	*mph*C
VS3032	*S. lentus*	Homebred chicken	PEN, CIP, ERY, CD, TET	*erm*C, *tet*L
VS3033	*S. lentus*	Homebred chicken	PEN, CIP, ERY, CD, TET	*erm*C, *mph*C, *tet*K
VS3034	*S. lentus*	Homebred chicken	PEN, TOB, KAN, ERY, CD, TET, FD	*erm*B, *erm*C, *mph*C, *aph*(3′)-IIIa, *ant*(4′)-Ia, *tet*L, *tet*K
VS3035	*S. lentus*	Homebred chicken	PEN, CIP, ERY, CD	*erm*C, *mph*C
VS3036	*S. sciuri*	Homebred chicken	PEN, TOB, KAN, ERY, CD, TET	*erm*B, *aph*(3′)-IIIa, *ant*(4′)-Ia, *tet*L, *tet*K
VS3037	*S. lentus*	Commercial chicken	CIP, ERY, CD, TET	*mph*C, *tet*L

VS3038	*S. lentus*	Commercial chicken	CIP, ERY, CD, FD	*erm*A, *erm*C, *mph*C
VS3039	*S. lentus*	Commercial chicken	PEN, CIP, ERY, CD	*erm*C
VS3040	*S. lentus*	Commercial chicken	PEN, FOX, CIP, CN, TOB, KAN, ERY, CD, TET	*erm*A, *erm*C, *aph*(3′)-IIIa, *tet*L, *tet*M
VS3041	*S. lentus*	Commercial chicken	PEN, FOX+D19:D21, ERY, CD, FD	*erm*C, *mph*C
VS3042	*S. lentus*	Commercial chicken	PEN, CIP, ERY, CD	*erm*A, *erm*C, *mph*C,
VS3043	*S. lentus*	Commercial chicken	PEN, CIP, ERY, CD	*erm*A, *erm*B, *erm*C, *mph*C
VS3044	*S. lentus*	Commercial chicken	PEN, ERY, CD	*erm*C, *mph*C
VS3045	*S. lentus*	Commercial chicken	PEN, ERY, CD, TET	*erm*A, *erm*C, *mph*C, *tet*L, *tet*M,
VS3046	*S. lentus*	Commercial chicken	PEN, FOX, CIP, TOB, KAN, TET, C, SXT	*erm*A, *erm*C, *mph*C, *aph*(3′)-IIIa, *ant*(4′)-Ia, *tet*L, *dfr*D, *dfr*K, *fex*A
VS3047	*S. lentus*	Commercial chicken	PEN, ERY, CD, TET	*erm*C, *mph*C, *tet*L
VS3048	*S. cohnii* spp. *urealyticus*	Commercial chicken	PEN, FOX, ERY, CD, TET, FD	*erm*B, *mph*C
VS3049	*S. cohnii* spp. *urealyticus*	Commercial chicken	PEN, ERY, CD, TET	*erm*A, *erm*C, *mph*C, *tet*L, *tet*M, *tet*K
VS3050	*S. lentus*	Quail	PEN, TOB, ERY, CD, TET, FD	*erm*A, *erm*B, *mph*C, *aph*(3′)-IIIa, *ant*(4′)-Ia, *tet*L, *tet*K
VS3051	*S. lentus*	Quail	PEN, FOX, CIP, CN, TOB, KAN, ERY, CD, TET, FD	*erm*C, *mph*C, *str*, *tet*K, *tet*O
VS3052	*S. lentus*	Quail	PEN, CIP, ERY, CD, TET, FD, SXT	*erm*C, *mph*C, *tet*L, *dfr*K
VS3053	*S. lentus*	Quail	CIP, ERY, CD, TET, C, FD	*mec*A, *erm*C, *mph*C,
VS3054	*S. lentus*	Quail	PEN, CIP, ERY, CD, TET, FD	*erm*C, *mph*C, *tet*K
VS3055	*S. lentus*	Quail	PEN, CIP, ERY, CD, TET, FD	*erm*C, *mph*C, *tet*K, *tet*L
VS3056	*S. lentus*	Quail	PEN, CIP, ERY, CD, TET, FD	*erm*C, *mph*C, *tet*K
VS3057	*S. lentus*	Quail	PEN, CIP, ERY, CD, TET, C, FD, SXT	*erm*C, *mph*C, *tet*L, *dfr*K

VS3058	*S. lentus*	Quail	PEN, CIP, TOB, ERY, CD, TET	*erm*B, *mph*C, *ant*(4′)-Ia, *tet*L, *tet*K
VS3059	*S. lentus*	Quail	PEN, ERY, CD, TET, FD	*erm*C, *tet*L, *tet*K
VS3060	*S. lentus*	Quail	PEN, CIP, TOB, ERY, CD, TET	*erm*B, *mph*C, *ant*(4′)-Ia, *tet*L, *tet*K
VS3061	*S. lentus*	Quail	PEN, TOB, ERY, CD, TET	*erm*C, *mph*C, *ant*(4′)-Ia, *tet*L, *tet*K
VS3062	*S. lentus*	Quail	PEN, TOB, KAN, ERY, CD, TET	*erm*C, *mph*C, *aph*(3′)-IIIa, *ant*(4′)-Ia, *tet*K, *tet*L
VS3063	*S. lentus*	Quail	PEN, ERY, CD, TET	*erm*C, *mph*C, *tet*L, *tet*K
VS3064	*S. lentus*	Quail	PEN, CIP, TOB, KAN, ERY, CD, TET, SXT	*erm*B, *mph*C, *aph*(3′)-IIIa, *ant*(4′)-Ia, *str*, *tet*L, *dfr*K
VS3065	*S. sciuri*	Quail	PEN, TOB, ERY, CD, TET, FD	*erm*B, *ant*(4′)-Ia, *tet*L, *tet*K
VS3066	*S. sciuri*	Quail	PEN, TOB, KAN, ERY, CD, TET, FD	*erm*B, *aph*(3′)-IIIa, *ant*(4′)-Ia, *tet*L, *tet*K, *tet*O
VS3067	*S. sciuri*	Quail	PEN, FOX, CD, TET, FD	*tet*K
VS3068	*S. sciuri*	Quail	PEN, CIP, TOB, ERY, CD, TET, FD	*erm*C, *tet*L, *tet*K
VS3069	*S. sciuri*	Quail	PEN, CIP, TOB, ERY, CD, TET, FD	*erm*C, *ant*(4′)-Ia, *str*
VS3070	*S. sciuri*	Quail	PEN, TOB, KAN, ERY, CD, TET, FD	*erm*B, *mph*C, *ant*(4′)-Ia, *ant*(4′)-Ia, *tet*L, *tet*K
VS3071	*S. sciuri*	Quail	PEN, CIP, ERY, CD, TET	*erm*C, *mph*C, *tet*K
VS3072	*S. sciuri*	Quail	PEN, FOX, ERY, CD, TET, C, FD	*erm*B, *erm*C, *mph*C, *tet*L, *tet*K, *tet*M
VS3073	*S. sciuri*	Quail	PEN, TOB, ERY, CD, TET	*erm*B, *mph*C, *ant*(4′)-Ia, *tet*L, *tet*K
VS3074	*S. sciuri*	Quail	PEN, CIP, TOB, KAN, ERY, CD, TET, SXT	*erm*C, *mph*C, *aph*(3′)-IIIa, *ant*(4′)-Ia, *tet*K
VS3075	*S. sciuri*	Quail	ERY, CD, TET, SXT	*ermB*, *mph*C, *tet*L, *dfr*K
VS3076	*S. sciuri*	Quail	PEN, FOX, ERY, CD, TET, FD	*erm*B, *erm*C, *mph*C, *tet*L, *tet*K, *tet*O, *tet*M
VS3077	*S. sciuri*	Quail	PEN, FOX, LNZ, ERY, CD, TET, C, FD	*cfr*, *erm*B, *erm*C, *mph*C, *tet*L, *tet*K, *tet*M

VS3078	*S. sciuri*	Quail	PEN, FOX, CD, TET, FD	*mph*C, *tet*L
VS3079	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, ERY, CD, TET	*erm*C, *mph*C, *tet*L, *tet*K,
VS3080	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, CIP, CN, ERY, CD, TET, C, FD	*erm*B, *erm*C, *mph*C, *tet*K, *tet*O
VS3081	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, CN, TOB, ERY, CD, TET, FD	*erm*B, *erm*C, *mph*C, *ant*(4′)-Ia, *str*, *tet*K, *tet*L, *tet*O
VS3082	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, ERY, CD, TET, FD	*erm*C, *tet*L, *tet*K, *tet*O
VS3083	*S. cohnii* spp. *urealyticus*	Quail	PEN, TOB, KAN, ERY, CD, TET	*erm*C, *mph*C, *aph*(3′)-IIIa, *ant*(4′)-Ia, *tet*K, *tet*L
VS3084	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, ERY, CD, TET, FD	*erm*B, *mph*C, *tet*L, *tet*K, *tet*O, *tet*M
VS3085	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, ERY, CD, TET, FD	*erm*C, *mph*C, *tet*L, *tet*K
VS3086	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, CIP, CN, TOB, KAN, ERY, CD, TET, FD	*erm*B, *erm*C, *mph*C, *aph*(3′)-IIIa
VS3087	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, ERY, CD, TET, FD	*erm*B, *erm*C, *mph*C, *tet*L, *tet*K, *tet*O, *tet*M
VS3088	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, ERY, CD, TET, FD	*erm*C, *mph*C, *tet*L, *tet*K, *tet*O
VS3089	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, ERY, CD, TET, FD	*erm*B, *erm*C, *mph*C, *tet*L, *tet*K, *tet*O
VS3090	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, CN, TOB, KAN, ERY, CD, TET, FD	*erm*C, *mph*C, *aph*(3′)-IIIa, *str*, *tet*L, *tet*K, *tet*O
VS3091	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, ERY, CD, TET, FD	*erm*C, *mph*C, *tet*L, *tet*K, *tet*O
VS3092	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, ERY, CD, TET	*erm*C, *mph*C
VS3093	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, ERY, CD, TET, FD	*erm*C, *tet*L, *tet*K, *tet*O
VS3094	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, TOB, KAN, ERY, CD, TET, C, FD	*erm*C, *aph*(3′)-IIIa, *tet*L, *tet*K
VS3095	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, ERY, CD, TET, FD	*erm*C, *mph*C, *tet*L, *tet*K, *tet*O, *tet*M
VS3096	*S. cohnii* spp. *urealyticus*	Quail	PEN, FOX, TOB, KAN, ERY, CD, TET, C, FD	*erm*C, *aph*(3′)-IIIa, *tet*L, *tet*K, *tet*O
VS3097	*S. cohnii* spp. *urealyticus*	Quail	PEN, CIP, ERY, CD, TET, FD	*erm*C, *tet*L, *tet*K, *tet*O

VS3098	*S. haemolyticus*	Quail	PEN, CIP, TOB, TET, FD	*aph*(3′)-IIIa, *tet*L
VS3099	*S. haemolyticus*	Quail	PEN, CIP, TOB, KAN, ERY, CD, TET, SXT	*erm*C, *mph*C, *aph*(3′)-IIIa, *ant*(4′)-Ia, *str*, *tet*L, *dfr*K
VS3100	*S. haemolyticus*	Quail	PEN, FOX, ERY, CD, TET, FD	*erm*B, *erm*C, *mph*C, *tet*L, *tet*K

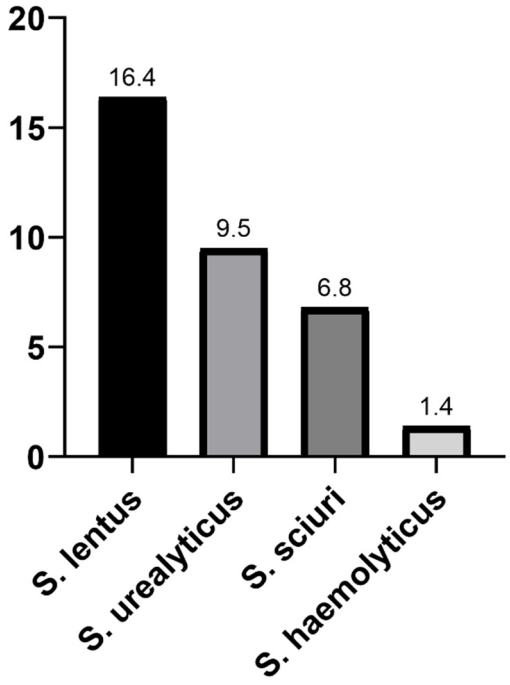

Figure S1. Prevalence of each staphylococci specie in poultry samples.

Table S2. Primer pairs used for molecular typing and detection of antimicrobial resistance genes in MRSA strains.

Gene (amplicon size)	Sequence (5′ › 3′)	Conditions	Reference
*mec*A (527 bp)	F: GGGATCATAGCGTCATTATTC R: AACGATTGTGACACGATAGCC	94 ºC 5 min 1 cycle 94 ºC 30 sec 55 ºC 30 sec 30 cycles 72 ºC 1 min 72 ºC 10 min 1 cycle	[56]
*bla*Z (772 bp)	F: CAGTTCACATGCCAAAGAG R: TACACTCTTGGCGGTTTC	94 ºC 3 min 1 cycle 94 ºC 1 min 50 ºC 1 min 30 cycles 72 ºC 2 min	[57]

		72 ºC 5 min 1 cycle	
*erm*A (645 bp)	F: TCTAAAAAGCATGTAAAAGAA R: CTTCGATAGTTTATTAATATTAG	93 ºC 3 min 1 cycle	[58]
*erm*B (639 bp)	F: GAAAAGTACTCAACCAAATA R: AGTAACGGTACTTAAATTGTTTA	93 ºC 1 min 52 ºC 1 min 35 cycles 72 ºC 1 min	[59]
*erm*C (642 bp)	F: TCAAAACATAATATAGATAAA R: GCTAATATTGTTTAAATCGTCAAT	72 ºC 5 min 1 cycle	[58]
		94 ºC 3 min 1 cycle	
*erm*T (200 bp)	F: CCGCCATTGAAATAGATCCT R: TTCTGTAGCTGTGCTTTCAAAAA	94 ºC 1 min 55 ºC 1 min 30 cycles 72 ºC 1 min	[60]
		72 ºC 5 min 1 cycle 95 ºC 3 min 1 cycle	
msr(A/B) (399 bp)	F: GCAAATGGTGTAGGTAAGACAACT R: ATCATGTGATGTAAACAAAAT	93 ºC 30 sec 55 ºC 2 min 35 cycles 72 ºC 1,5 min	[61]
		72 ºC 5 min 1 cycle 94 ºC 3 min 1 cycle	
mph(C) (900 bp)	F: ATGACTCGACATAATGAAAT R: CTACTCTTTCATACCTAACTC	94 ºC 1 min 45 ºC 1 min 30 cycles 72 ºC 1 min	[57]
		72 ºC 5 min 1 cycle 94 ºC 2 min 1 cycle	
lnu(A) (323 bp)	F: GGTGGCTGGGGGGTAGATGTATTAACTGG R: GCTTCTTTTGAAATACATGG-TATTTTTCGATC	94 ºC 30 sec 57 ºC 30 sec 30 cycles 72 ºC 1 min	[62]
		72 ºC 10 min 1 cycle 94 ºC 5 min 1 cycle	
lnu(B) (944 bp)	F: CCTACCTATTGTTTGTGGAA R: ATAACGTTACTCTCCTATTC	94 ºC 45 sec 54 ºC 45 sec 30 cycles 72 ºC 1 min	[63]
		72 ºC 5 min 1 cycle 94 ºC 3 min 1 cycle	
vga(A) (1264 bp)	F: AGTGGTGGTGAAGTAACACG R: GGTTCAATACTCAATCGACTGAG	94 ºC 1 min 56 ºC 1 min 30 cycles 72 ºC 1 min	[64]

		72 ºC 5 min 1 cycle 94 ºC 1 min 1 cycle	
vga(B) (576 pb)	F: TGACAATATGAGTGGTGGTG R: GCGACCATGAAATTGCTCTC	94 ºC 1 min 55 ºC 2 min 30 cycles 72 ºC 2 min	[65]
*tet*K (697 bp)	F: TTAGGTGAAGGGTTAGGTCC R: GCAAACTCATTCCAGAAGCA	72 ºC 10 min 1 cycle 94 ºC 3 min 1 cycle	[66]
*tet*M (576 bp)	F: GTTAAATAGTGTTCTTGGAG R: CTAAGATATGGCTCTAACAA	94 ºC 1 min 54 ºC 1 min 30 cycles 72 ºC 1 min	[66]
*tet*O (615 bp)	F: GATGGCATACAGGCACAGAC R: CAATATCACCAGAGCAGGCT	72 ºC 5 min 1 cycle 94 ºC 1 min 1 cycle	[66]
*tet*L (456 bp)	F: CATTTGGTCTTATTGGATCG R: ATTACACTTCCGATTTCGG	94 ºC 1 min 50 ºC 1 min 30 cycles 72 ºC 1 min	[66]
aac(6′)-Ie-*aph*(2′′)-Ia (220 bp)	F: CCAAGAGCAATAAGGGCATA R: CACTATCATAACCACTACCG	72 ºC 10 min 1 cycle 94 ºC 5 min 1 cycle 94 ºC 30 sec 60 ºC 45 sec 30 cycles 72 ºC 2 min 72 ºC 7 min 1 cycle 94 ºC 3 min 1 cycle	[67] [67]
ant(4′)-Ia (160 bp)	F: GCAAGGACCGACAACATTTC R: TGGCACAGATGGTCATAACC	94 ºC 30 sec 60 ºC 45 sec 30 cycles 72 ºC 2 min 72 ºC 5 min 1 cycle 94 ºC 3 min 1 cycle	 [57]
str (646 bp)	F: TATTGCTCTCGAGGGTTC R: CTTTCTATATCCATTCATCTC	94 ºC 1 min 50 ºC 1 min 30 cycles 72 ºC 1 min 72 ºC 5 min 1 cycle 94 ºC 3 min 1 cycle	 [67]
aph(3′)-III (292 bp)	F: GCCGATGTGGATTGCGAAAA R: GCTTGATCCCCAGTAAGTCA	94 ºC 30 sec 60 ºC 45 sec 30 cycles 72 ºC 2 min	
*fex*A (1272 bp)	F: GTACTTGTAGGTGCAATTACGGCTGA	72 ºC 5 min 1 cycle 94 ºC 1 min 1 cycle 94 ºC 1 min	[68]

	R: CGCATCTGAGTAGGACATAGCGTC	48 ºC 2 min 34 cycles 72 ºC 3 min 72 ºC 7 min 1 cycle 94 ºC 7min min 1 cycle	
*fex*B (816 bp)	F: TTCCCACTATTGGTGAAAGGAT R: GCAATTCCCTTTTATGGACGTT	94 ºC 1 min 55 ºC 1 min 30 cycles 72 ºC 1 min 72 ºC 10 min 1 cycle	[69]
cat_{pC194} (570 bp)	F: CGACTTTTAGTATAACCACAGA R: GCCAGTCATTAGGCCTAT	94 ºC 3 min 1 cycle	[57]
cat_{pC221} (434 bp)	F: ATTTATGCAATTATGGAAGTTG R: TGAAGCATGGTAACCATCAC	94 ºC 1 min 50 ºC 1 min 30 cycles 72 ºC 1 min	[57]
cat_{pC223} (283 bp)	F: GAATCAAATGCTAGTTTTAACTC R: ACATGGTAACCATCACATAC	72 ºC 5 min 1 cycle 94 ºC 3 min 1 cycle	[57]
cfr (746 bp)	F: TGAAGTATAAAGCAGGTTGGGAGTCA R: ACCATATAATTGACCACAAGCAGC	94 ºC 1 min 56 ºC 1 min 30 cycles 72 ºC 1 min	[70]
*fus*B (431 bp)	F: CTATAATGATATTAATGAGATTTTTGG R: TTTTTACATATTGACCATCCGAATTGG	72 ºC 5 min 1 cycle 94 ºC 3 min 1 cycle 94 ºC 30 sec 57 ºC 30 sec 25 cycles 72 ºC 45 sec 72 ºC 7 min 1 cycle 94 ºC 7 min 1 cycle	[70]
*fus*C (332 bp)	F: TTAAAGAAAAAGATATTGATATCTCGG R: TTTACAGAATCCTTTTACTTTATTTGG		
*fus*D (456 bp)	F: AATTCGGTCAACGATCCC R: GCCATCATTGCCAGTACG	94 ºC 30 sec 57 ºC 30 sec 30 cycles 72 ºC 30 sec 72 ºC 10 min 1 cycle 94 ºC 3 min 1 cycle	[71]
*dfr*A (374 bp)	F: CCTTGGCACTTACCAAATG R: CTGAAGATTCGACTTCCC	94 ºC 1 min 50 ºC 1 min 30 cycles 72 ºC 1 min	[57]
*dfr*D (582 bp)	F: TTCTTTAATTGTTGCGATGG R: TTAACGAATTCTCTCATATATATG	72 ºC 5 min 1 cycle 94 ºC 3 min 1 cycle	[60]
*dfr*G (323 bp)	F: TCGGAAGAGCCTTACCTGACAGAA R: CCCTTTTTGGGCAAATACCTCATTCCA	94 ºC 1 min	

		58 ºC 1 min 30 cycles 72 ºC 1 min 72 ºC 5 min 1 cycle 94 ºC 3 min 1 cycle
*dfr*K (423 bp)	F: GAGAATCCCAGAGGATTGGG R: CAAGAAGCTTTTCGCTCATAAA	94 ºC 1 min 56 ºC 1 min 30 cycles 72 ºC 1 min 72 ºC 5 min 1 cycle

[56] Zhang, K., Sparling, J., Chow, B.L., Elsayed, S., Hussain, Z., Church, D.L., Gregson, D.B., Louie, T., Conly, J.M., 2004, New quadriplex PCR assay for detection of methicillin and mupirocin resistance and simultaneous discrimination of Staphylococcus aureus from coagulase-negative staphylococci. J Clin Microbiol 42, 4947-4955.

[57] Schnellmann, C., Gerber, V., Rossano, A., Jaquier, V., Panchaud, Y., Doherr, M.G., Thomann, A., Straub, R., Perreten, V., 2006, Presence of new mecA and mph(C) variants conferring antibiotic resistance in Staphylococcus spp. isolated from the skin of horses before and after clinic admission. J Clin Microbiol 44, 4444-4454.

[58] Sutcliffe, J., Grebe, T., Tait-Kamradt, A., Wondrack, L., 1996, Detection of erythromycin-resistant determinants by PCR. Antimicrob Agents Chemother 40, 2562-2566.

[59] Shopsin, B., Mathema, B., Alcabes, P., Said-Salim, B., Lina, G., Matsuka, A., Martinez, J., Kreiswirth, B.N., 2003, Prevalence of agr specificity groups among Staphylococcus aureus strains colonizing children and their guardians. J Clin Microbiol 41, 456-459.

[60] Gomez-Sanz, E., Torres, C., Lozano, C., Fernandez-Perez, R., Aspiroz, C., Ruiz-Larrea, F., Zarazaga, M., 2010, Detection, molecular characterization, and clonal diversity of methicillin-resistant Staphylococcus aureus CC398 and CC97 in Spanish slaughter pigs of different age groups. Foodborne Pathog Dis 7, 1269-1277.

[61] Wondrack, L., Massa, M., Yang, B.V., Sutcliffe, J., 1996, Clinical strain of Staphylococcus aureus inactivates and causes efflux of macrolides. Antimicrob Agents Chemother 40, 992-998.

[62] Lina, G., Quaglia, A., Reverdy, M.E., Leclercq, R., Vandenesch, F., Etienne, J., 1999. Distribution of genes encoding resistance to macrolides, lincosamides, and streptogramins among staphylococci. Antimicrob. Agents Chemother. 43, 1062–1066.

[63] Bozdogan, B., Berrezouga, L., Kou, M.S., Yurek, D.A., Farley, K.A., Stockman, B.J., Leclercq, R., 1999. A new resistance gene, linB, conferring resistance to lincosamides by nucleotidylation in Enterococcus faecium HM1025. Antimicrob. Agents Chemother. 43, 925–929.

[64] Lozano C, Aspiroz C, Rezusta A, Gómez-Sanz E, Simon C, Gómez P, Ortega C, Revillo MJ, Zarazaga M, Torres C. Identification of novel vga(A)-carrying plasmids and a Tn5406-like transposon in meticillin-resistant Staphylococcus aureus and Staphylococcus epidermidis of human and animal origin. Int J Antimicrob Agents. 2012 Oct;40(4):306-12.

[65] Hammerum, A.M., Jensen, L.B., Aarestrup, F.M., 1998. Detection of the satA gene and transferability of virginiamycin resistance in Enterococcus faecium from food- animals. FEMS Microbiol. Lett. 168, 145–151.

[66] Aarestrup, F.M., Agers, L.Y., Ahrens, P., JC, J.L., Madsen, M., Jensen, L.B., 2000, Antimicrobial susceptibility and presence of resistance genes in staphylococci from poultry. Vet Microbiol 74, 353-364.

[67] Van de Klundert, J.A.M., Vliegenthart, J.S., 1993. PCR detection of genes coding for aminoglycoside-modifying enzymes, in: Persing, D.H., Smith, T.F., Tenover, F.C., White, T.J. (Eds.), Diagnostic Molecular Microbiology: Principles and Applications. American Society for Microbiology, Washington D.C., pp. 547–552.

[68] Kehrenberg, C., Schwarz, S., 2006. Distribution of Florfenicol Resistance Genes fexA and cfr among Chloramphenicol-Resistant Staphylococcus Isolates. Antimicrob. Agents Chemother. 50, 1156–1163.

[69] Liu, H., Wang, Y., Wu, C., Schwarz, S., Shen, Z., Jeon, B., Ding, S., Zhang, Q., Shen, J., 2012. A novel phenicol exporter gene, fexB, found in enterococci of animal origin. J. Antimicrob. Chemother. 67, 322–325.

[70] Mclaws, F., Chopra, I., O'Neill, A.J., 2008. High prevalence of resistance to fusidic acid in clinical isolates of Staphylococcus epidermidis. J. Antimicrob. Chemother. 61, 1040–1043.

[71] Chen, H.J., Hung, W.C., Tseng, S.P., Tsai, J.C., Hsueh, P.R., Teng, L.J., 2010. Fusidic acid resistance determinants in Staphylococcus aureus clinical isolates. Antimicrob. Agents Chemother. 54, 4985– 4991.