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Bacterial Resistance Surveillance

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Antimicrobial susceptibility of gram－positive organisms: Results from China antimicrobial resistance surveillance trial (CARST) program, 2023－2024

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摘要:目的 监测我国主要城市三级甲等医院感染患者分离革兰氏阳性菌的耐药状况,掌握耐药流行趋势,为抗菌药物合理使用提供科学数据。**方法** 定点收集全国 18 家医院临床分离细菌,由中心实验室统一用琼脂/肉汤二倍稀释法测定抗菌药物最低抑菌浓度(MIC)值。**结果** 对 2023 年 7 月至 2024 年6 月间来自全国 18 座城市 18 家医院的 2 311 株临床分离致病菌进行了 MIC 测定。结果显示,甲氧西林耐药金黄色葡萄球菌(MRSA)和甲氧西林耐药表皮葡萄球菌(MRSE)检出率分别为 30.6% 和 76.3%。未发现万古霉素不敏感葡萄球菌,金黄色葡萄球菌对利奈唑胺和替考拉宁 100% 敏感。粪肠球菌和屎肠球菌对氨苄西林的耐药率分别为 0.6% 和 89.1%。检出 18 株万古霉素耐药肠球菌(VRE),均为屎肠球菌,屎肠球菌中 VRE 检出率为 5.5%。青霉素不敏感肺炎链球菌(PNSSP)检出率按非脑膜炎、非肠道系统给药折点计算为 9.9%,按口服青霉素 V 折点计算为 73.1%,较前次监测变化不大。来自儿童的肺炎链球菌对头孢菌素类、大环内酯类、克林霉素耐药率略高于成人和老年人,但不同病房、不同年龄、不同标本来源金黄色葡萄球菌、表皮葡萄球菌、粪肠球菌、屎肠球菌及肺炎链球菌耐药率比较,在统计学上差异均无统计学意义(均 $P>0.05$)。**结论** MRSA 检出率持续下降,VRE 检出率呈上升趋势,需持续关注。

关键词:细菌耐药监测;革兰氏阳性菌;最低抑菌浓度;敏感率;耐药率;最低抑菌浓度分布
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Abstract: Objective To investigate the gram－positive coccus resistance in nationwide tietiary hospitals, understand the trend of antimicrobial resistance and provide scientific data for the rational use of antibiotis. **Method** All the clinical isolates were collected from 18 hospitals and the minimal inhibitory concentrations (MICs) were tested using agar/broth dilution method recommended by Clinical and Laboratory Standards Institute (CLSI) in central laboratory. **Results** A total of 2 311 pathogenic gram－positive coccus from 18 tertiary hospitals in 18 cities nationwide over the period from July 2023 to June 2024 were studied. Based on the MIC results, the prevalence of methicillin resistant *Stapylococcus aureus* (MRSA) and methicillin resistant *Stapylococcus epidermidis* (MRSE) were 30.6% and 76.3%, respectively. No vancomycin insensitivitive *Staphylococcus* was detected. *Stapylococcus aureus* were 100% susceptible to linezolid and teicoplanin. Antibiotic resistance

rates of *Enterococcus faecalis* and *Enterococcus faecium* to ampicillin were 0.6% and 89.1%, respectively. 18 strains of vancomycin-resistant *Enterococcus* (VRE) were detected, all of which was *Enterococcus faecium*. The detection rate of VRE among *Enterococcus faecium* was 5.5%. The prevalence of penicillin non-susceptible *Streptococcus pneumoniae* (PNSSP) was 9.9% based on non-meningitis and parenteral administration criterion, while for cases of oral penicillin, the rate was 73.1%, showing similar to last time. The resistance rates of *Streptococcus pneumoniae* from children to cephalosporins, macrolides and clindamycin were slightly higher than those of adults and the elderly, while there were no statistic significant differences of resistance rates of *Stapylococcus aureus*, *Stapylococcus epidermidis*, *Enterococcus faecalis*, *Enterococcus faecium* and *Streptococcus pneumoniae* among various groups such as different departments, ages, or specimen sources (all $P>0.05$). **Conclusion** The detection rate of MRSA has continued to decline, while the detection rate of VRE has been on the rise. This situation requires continuous monitoring.

Key words: antimicrobial resistance surveillance; gram-positive cocci; minimum inhibitory concentration; susceptibility; resistance; minimal inhibitory concentration distribution

抗菌药物为我国临床应用最为广泛的一类药物，住院患者抗菌药物使用率平均约30%，不合理应用将导致大量药物相关的药物不良反应发生以及细菌耐药的产生与流行。合理使用抗菌药物涉及多个领域，其中细菌耐药监测结果是抗菌药物合理应用的依据，也是管理部门制定相应政策与指导原则时的重要参考。常规性、周期性的开展细菌耐药监测，有助于了解细菌耐药的变化。由于细菌耐药监测意义重大，世界卫生组织(World Health Organizatioin, WHO)及很多国家、组织都建立有自己相应的细菌耐药监测网络，如：WHO的全球抗菌药物耐药监测系统(Global Antimicrobial Resistance Surveillance System, GLASS)，我国的全国细菌耐药监测网(China Antimicrobial Resistance Surveillance System, CARSS)等，这些细菌耐药监测网为促进抗菌药物合理使用发挥了积极作用。北京大学临床药理研究所自1998年起开展全国性耐药监测工作，现将2023至2024年度革兰氏阳性菌监测结果汇报如下。

材料与方法

1 材料

药品 青霉素、苯唑西林、阿莫西林、头孢唑林、头孢西丁、头孢呋辛、头孢曲松、头孢吡肟、美罗培南、庆大霉素、阿米卡星、四环素、米诺环素、左氧氟沙星、红霉素、阿奇霉素、克林霉素、万古霉素、替考拉宁、呋喃妥因和链霉素，均购自中国食品药品研究院(或中国药品生物制品检定所)；氨苄西林、利福平、氯霉素，均购自意大利INALCO公司；头孢硫脒，由广州白云山医药集团股份有限公司白云山制药总厂生产；亚胺培南，由美国Asta Tech公司生产；厄他培南，由杭州默沙东公司生产；依拉环素，由云顶新耀医药科技有限公司生产；环丙沙星，由上虞京新药业有限公司生产；莫西沙星，由杭州洋洋康生物技术有限公司生产；奈诺沙星，由浙江医药股份有限公司新昌制药厂生产；吉米沙星，由韩国LG化学公司生产；利奈唑胺，由德国拜耳医药保健有限公司生产；磺胺甲噁唑，由美国Sigma-Aldrich公司生产；甲氧苄啶，由山东淄博新达制药厂生产；磷霉素氨丁三醇，由西藏仟源药业有限公司生产；替加环素、达托霉素药敏板，由温州市康泰生物科技有限公司生产。其中复方制剂甲氧苄啶/磺胺甲噁唑(trimethoprim/sulfamethoxazole, SXT)配比为1∶19。

标准菌株 金黄色葡萄球菌ATCC29213，粪肠球菌ATCC29212，肺炎链球菌ATCC49619。

临床收集菌株 菌株收集时间为2023年7月1日至2024年6月30日。同一患者分离的相同菌株取第一株。

2 培养基与孵育条件

琼脂二倍稀释法 葡萄球菌和肠球菌在MH琼脂(Mueller-Hinton agar, MHA)培养基，35 ℃空气环境孵育16~20 h(苯唑西林和万古霉素培养24 h，含苯唑西林培养基中加入2% NaCl)；肺炎链球菌在血培养基(MHA培养基中加入5%脱纤维羊血制成)，35 ℃ 5% CO_2环境(CO_2培养箱)孵育20~24 h；其他链球菌在血培养基35 ℃空气环境孵育20~24h。

微量肉汤二倍稀释法 替加环素、依拉环素测定培养液为阳离子调节MH肉汤(cation-adjusted Mueller-Hinton broth, CAMHB)，达托霉素测定培养液为钙离子浓度调整到50 mg·L^{-1}的CAMHB。链球菌需额外添加5%裂解马血。35 ℃空气环境孵育

16 ~ 20 h(链球菌孵育 20 ~ 24 h)。

3 最低抑菌浓度(minimal inhibitory concentration, MIC)测定

琼脂二倍稀释法 被试菌悬液用多点接种仪接种, 每点接种量为 1.0×10^4 CFU。

微量肉汤二倍稀释法 菌液终浓度为 5.0×10^5 CFU · mL^{-1},反应体积 100 μL。替加环素、依拉环素和达托霉素采用微量肉汤稀释法,其他药物采用琼脂稀释法。每株细菌在试验前经平板转活分纯,以新鲜菌体用于试验。每次实验均用标准菌株作为敏感实验质控菌;用不含抗菌药物的平皿或菌液做为试验菌株生长对照。

4 结果处理

用 SPSS 20.0 统计软件处理 MIC 测定结果,计算 MIC_{50} 和 MIC_{90}。根据美国临床和实验室标准化协会(Clinical and Laboratory Standards Institute, CLSI) 2025[1] 颁布的抗菌药物折点,计算细菌敏感率、耐药率。没有判定标准的药物,参考欧洲抗微生物药物敏感性试验委员会(European Committee on Antimicrobial Susceptibility Testing, EUCAST) 2025[2] 或相似药物标准或不予以计算。替加环素根据美国食品及药物管理局(US Food and Drug Administration, FDA)[3] 颁布标准计算,依拉环素根据中国国家药敏专委会(Expert Committee of the National Health Commission on Antimicrobial Susceptibility Testing and Standard Research, ChinaCAST)[4] 颁布标准计算,详见表后注解。

结 果

1 菌株收集情况

共对 2023 年 7 月 1 日至 2024 年 6 月 30 日期间临床分离的 2 311 株革兰氏阳性菌进行了 MIC 分析。前 5 位标本来源依次为:血标本 861 份(37.3%),分泌物 497 份(21.5%),痰标本 310 份(13.4%),尿标本 308 份(13.3%)和引流液 300 份(13.0%)。每家医院提供菌株数量在 110 ~ 190 株之间,患者男女比例为 1.49∶1.00,年龄范围 1 h ~ 101 岁,中位年龄 58 岁。

2 抗菌药物对葡萄球菌的 MIC 结果

甲氧西林耐药金黄色葡萄球菌(methicillin resistant *Stapylococcus aureus*, MRSA)、甲氧西林耐药表皮葡萄球菌(methicillin resistant *Stapylococcus epidermidis*, MRSE)检出率分别为 30.6% 和 76.3%。葡萄球菌属敏感率 > 90% 的药物有 11 个,依次为万古霉素(100.0%)、依拉环素和达托霉素(均为 99.7%)、利奈唑胺(99.2%)、替加环素(99.1%)、替考拉宁(97.2%)、米诺环素(96.2%)、利福平(94.7%)、SXT(93.0%)、奈诺沙星(92.6%)和氯霉素(92.1%)。其中对利奈唑胺耐药菌株集中于头状葡萄球菌,替考拉宁和利福平不敏感菌株集中于溶血葡萄球菌,奈诺沙星耐药菌株集中于人葡萄球菌,SXT 对金黄色葡萄球菌活性相较除金黄色葡萄球菌外的其他葡萄球菌更好,见表 1 和表 2。金黄色葡萄球菌及表皮葡萄球菌中,抗菌作用基本不受甲氧西林耐药与否影响的药物如下:糖肽类、利奈唑胺、新型四环素类(替加环素和依拉环素)和达托霉素,见表 3。金黄色葡萄球菌与表皮葡菌球菌的 MIC 分布见表 4 和表 5。

3 抗菌药物对肠球菌的 MIC 结果

粪肠球菌和屎肠球菌对氨苄西林敏感性分别为 96.9% 和 10.0%,见表 6。对粪肠球菌体外敏感率较好的药物依次为:达托霉素、万古霉素、替考拉宁、依拉环素、氨苄西林、呋喃妥因、磷霉素氨丁三醇、青霉素和高浓度链霉素,细菌敏感率均 > 96%。对屎肠球菌抗菌作用较好的药物依次为:高浓度链霉素、利奈唑胺、替考拉宁、氯霉素和万古霉素,细菌敏感率均 > 90%,达托霉素未检测到耐药菌株。检出万古霉素耐药肠球菌(vancomycin resistant *Enterococcus*, VRE) 18 株,均为屎肠球菌,屎肠球菌中 VRE 检出率 5.5%,全部肠球菌中 2.8%。粪肠球菌和屎肠球菌的 MIC 分布见表 7 和表 8。

4 抗菌药物对链球菌的 MIC 结果

肺炎链球菌对口服青霉素的敏感率为 26.9%,对非脑膜炎,青霉素静脉给药的敏感率为 90.2%。其他被测药物中,糖肽类、利奈唑胺及奈诺沙星 100% 敏感;其他喹诺酮类药物也有很好抗菌活性,细菌敏感率在 98.5% ~ 98.9%;利福平、替加环素和厄他培南细菌敏感率分别为 99.2%、95.1% 和 91.7%。依拉环素对肺炎链球菌 MIC_{50} 和 MIC_{90} 值分别为 0.016 mg · L^{-1} 和 0.03 mg · L^{-1},较替加环素低 1 ~ 2 个稀释度。大环内酯类和克林霉素体外测试结果仍表现为高耐,耐药率在 84.5% ~ 97.0%,见表 9。

β - 溶血链球菌群对大环内酯类(耐药率 > 90%)和克林霉素(耐药率为 72.7%)耐药率高,其中化脓链球菌耐药率更高, > 97.9%。无乳链球菌则是对左氧氟沙星和莫西沙星耐药率为 53.8%,远高于化脓链球菌的 0%,见表 10。其他测定药物对 β - 溶血链球菌群均表现较好抗菌活性,敏感率多 > 95%。

草绿色溶血链球菌群中占比前 3 位的是:咽峡炎链球菌(36 株)、缓症链球菌(24 株)和星座链球菌

(22株)。对青霉素敏感率为78.0%,对β-内酰胺类药物敏感率多接近或略高于90%,其中对β-内酰胺类药物不敏感主要由缓症链球菌导致。对大环内酯类及克林霉素敏感率在50.9%~64.8%,显著高于肺炎链球菌和β-溶血链球菌群。未发现新型四环素类、利奈唑胺、糖肽类、氯霉素和达托霉素不敏感菌株,见表9。药物对肺炎链球菌MIC分布见,表11。

5 不同来源主要菌种耐药率比较

重症监护病房(intensive care unit, ICU)与非ICU来源金黄色葡萄球菌中MRSA检出率分别为42.9%和28.7%,表皮葡萄球菌中MRSE检出率分别为80.6%和74.5%,ICU来源菌株甲氧西林耐药菌检出率高于非ICU,见表12;粪肠球菌2种来源菌株对测试药物耐药率差异不大,屎肠球菌ICU来源菌株耐药率略高于非ICU,见表13。儿童(≤14岁)、成人(15~64岁)和老年人(≥65岁)中MRSA检出率分别为17.7%、30.5%和34.2%,儿童分离金黄色葡萄球菌对多数测试药物较成人和老年人更敏感,但对大环内酯类药物耐药率高于成人和老年人,见表14;粪肠球菌和屎肠球菌不同年龄来源间差异不大,见表15。儿童分离肺炎链球菌对头孢菌素类、大环内酯类、克林霉素和SXT耐药率均略高于成人和老年人,见表16。不同标本来源比较显示,痰标本中分离的金黄色葡萄球菌和尿标本中分离的肠球菌通常耐药率略高于其他来源,见表17、表18和表19。以上各项比较,在统计学上差异均无统计学意义(均$P>0.05$)。

表1 抗菌药物对金黄色葡萄球菌和表皮葡萄球菌的抗菌作用(mg·L^{-1})及细菌敏感(S)和耐药(R)率(%)

Table 1 Antibacterial activity (mg·L^{-1}) and susceptibility (S) and resistance (R) rates (%) of antimicrobial agents against *Staphylococcus auresus* and *Staphylococcus epidermidis*

Antibiotic	*Staphylococcus auresus* ($n=686$)				*Staphylococcus epidermidis* ($n=173$)			
	MIC_{50}	MIC_{90}	S	R	MIC_{50}	MIC_{90}	S	R
Penicillin	2	32	14.9	85.1	1	16	11.0	89.0
Oxacillin	0.5	64	70.1	29.9	2	128	23.7	76.3
Cefoxitin	4	64	69.8	30.2	8	64	–	–
Cefathiamidine	1	8	–	–	0.5	4	–	–
Gentamicin	0.25	16	85.1	11.8	0.12	64	66.5	31.2
Amikacin	1	4	–	–	1	4	–	–
Erythromycin	256	>256	43.0	55.0	64	>256	27.7	70.5
Azithromycin	256	>256	43.3	56.1	128	>256	28.9	70.5
Clindamycin	0.12	>256	73.9	25.8	0.12	>256	71.7	26.6
Tetracycline	0.25	32	80.0	17.8	1	64	81.5	18.5
Minocycline	0.12	0.25	94.8	3.6	0.25	0.5	99.4	0.6
Tigecycline	0.12	0.25	98.7	1.3 [a]	0.12	0.25	100.0	–
Eravacycline	0.016	0.03	99.6	0.4 [a]	0.03	0.12	100.0	–
Ciprofloxacin	0.5	32	72.3	21.7	4	32	42.8	53.2
Levofloxacin	0.25	8	80.5	18.8	2	16	45.7	46.8
Moxifloxacin	0.06	4	81.0	18.5	0.5	2	54.9	22.5
Nemonoxacin	0.06	1	94.8	5.2	0.12	0.5	93.6	6.4
Gemifloxacin	0.06	4	–	–	0.5	2	–	–
Linezolid	1	1	100.0	0.0	0.5	1	98.8	1.2
Vancomycin	1	1	100.0	0.0	1	2	100.0	0.0
Teicoplanin	1	2	100.0	0.0	2	8	98.3	0.6
Rifampicin	0.008	0.016	97.1	2.0	0.008	0.016	94.8	5.2
SXT	0.016	0.12	98.7	1.3	1	4	89.6	10.4
CHL	4	8	94.6	4.8	4	32	87.9	12.1
FOS	2	16	–	–	4	32	–	–
Daptomycin	0.5	0.5	99.7	0.3 [a]	0.5	0.5	100.0	–

MIC: Minimum inhibitory concentration; SXT: Trimethoprim / sulfamethoxazole; CHL: Chloramphenicol; FOS: Fosfomycin trometamol; Interpretive criteria of USA-FDA was used for tigecycline (S: ≤0.5 mg·L^{-1}); Interpretive criteria of ChinaCAST was used for eravacycline (S: ≤0.25 mg·L^{-1}); Interpretive criteria of nemonoxacin malate and sodium chloride injection introduction was used for nemonoxacin (S: ≤1 mg·L^{-1}; R: ≥2 mg·L^{-1}); a: Non-susceptibility; –: No breakpoint.

表 2 抗菌药物对其他凝固酶阴性葡萄球菌的抗菌作用(mg·L^{-1})及细菌敏感(S)和耐药(R)率(%)

Table 2 Antibacterial activity (mg·L^{-1}) and susceptibility (S) and resistance (R) rates (%) of antimicrobial agents against other coagulase negative *Staphylococcus*

Antibiotic	*Staphylococcus haemolyticus* (n=53)				Other *Staphylococcus spp.* (n=140)			
	MIC_{50}	MIC_{90}	S	R	MIC_{50}	MIC_{90}	S	R
Penicillin	128	256	5.7	94.3	2	32	17.9	82.1
Oxacillin	>256	>256	9.4	90.6	16	256	27.1	72.9
Cefoxitin	256	>256	–	–	16	128	–	–
Cefathiamidine	32	128	–	–	1	8	–	–
Gentamicin	32	128	20.8	77.4	2	32	70.7	17.9
Amikacin	4	8	–	–	0.5	2	–	–
Erythromycin	128	>256	5.7	94.3	64	>256	22.1	72.9
Azithromycin	128	>256	5.7	94.3	128	>256	22.1	73.6
Clindamycin	4	>256	43.4	54.7	0.06	>256	71.4	28.6
Tetracycline	2	128	77.4	22.6	0.25	64	72.1	27.1
Minocycline	0.25	0.5	96.2	1.9	0.06	0.25	99.3	0.7
Tigecycline	0.12	0.12	100.0	–	0.06	0.12	100.0	–
Eravacycline	0.06	0.12	100.0	–	0.03	0.06	100.0	–
Ciprofloxacin	64	64	15.1	84.9	8	64	42.9	55.7
Levofloxacin	16	32	17.0	83.0	4	128	44.3	55.7
Moxifloxacin	4	4	17.0	71.7	1	16	46.4	49.3
Nemonoxacin	1	1	94.3	5.7	0.25	2	80.0	20.0
Gemifloxacin	2	8	–	–	0.5	16	–	–
Linezolid	1	1	100.0	0.0	0.5	1	95.7	4.3
Vancomycin	1	2	100.0	0.0	0.5	1	100.0	0.0
Teicoplanin	8	32	56.6	18.9	1	4	97.9	1.4
Rifampicin	0.016	256	60.4	39.6	0.004	0.016	95.7	4.3
SXT	0.5	32	67.9	32.1	0.25	4	78.6	21.4
CHL	4	4	90.6	9.4	4	64	85.7	13.6
FOS	32	32	–	–	32	>256	–	–
Daptomycin	0.5	1	100.0	–	0.25	1	99.3	0.7 [a]

a: Non-susceptibility; –: No breakpoint.

表 3 甲氧西林敏感及耐药葡萄球菌对抗菌药物的敏感(S)和耐药(R)率(%)

Table 3 Susceptibility (S) and resistance (R) of methicillin susceptible *Stapylococcus aureus* (MSSA), methicillin resistant *Stapylococcus aureus* (MRSA), methicillin susceptible *Stapylococcus epidermidis* (MSSE) and methicillin resistant *Stapylococcus epidermidis* (MRSE) to antimicrobial agents (%)

Antibiotic	MSSA(n=476)		MRSA(n=210)		MSSE(n=41)		MRSE(n=132)	
	S	R	S	R	S	R	S	R
Penicillin	21.4	78.6	0.0	100.0	46.3	53.7	0.0	100.0
Oxacillin	100.0	0.0	2.4	97.6	100.0	0.0	0.0	100.0
Cefoxitin	100.0	0.0	1.4	98.6	–	–	–	–
Gentamicin	90.1	8.2	73.8	20.0	92.7	4.9	58.3	39.4
Erythromycin	52.7	45.4	21.0	76.7	46.3	48.8	22.0	77.3
Azithromycin	52.9	46.4	21.4	78.1	46.3	51.2	23.5	76.5
Clindamycin	87.2	12.8	43.8	55.2	95.1	2.4	64.4	34.1
Tetracycline	89.1	9.2	59.7	37.1	87.8	12.2	79.5	20.5
Minocycline	99.4	0.2	84.3	11.4	97.6	2.4	100.0	0.0
Tigecycline	99.4	0.6 [a]	97.1	2.9 [a]	100.0	–	100.0	–
Eravacycline	100.0	–	98.6	1.4 [a]	100.0	–	100.0	–
Ciprofloxacin	80.0	13.2	54.8	41.0	70.7	24.4	34.1	62.1
Levofloxacin	88.9	10.3	61.4	38.1	73.2	19.5	37.1	55.3
Moxifloxacin	89.5	10.1	61.9	37.6	85.4	4.9	45.5	28.0
Nemonoxacin	99.8	0.2	83.3	16.7	100.0	0.0	91.7	8.3

续表3(Table 3 continued)

Antibiotic	MSSA(n=476)		MRSA(n=210)		MSSE(n=41)		MRSE(n=132)	
	S	R	S	R	S	R	S	R
Linezolid	100.0	0.0	100.0	0.0	100.0	0.0	98.5	1.5
Vancomycin	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Teicoplanin	100.0	0.0	100.0	0.0	100.0	0.0	97.7	0.8
Rifampicin	99.2	0.4	92.4	5.7	100.0	0.0	93.2	6.8
SXT	98.3	1.7	99.5	0.5	95.1	4.9	87.9	12.1
CHL	96.6	3.2	90.0	8.6	90.2	9.8	87.1	12.9
Daptomycin	99.8	0.2[a]	99.5	0.5[a]	100.0	–	100.0	–

a:Non-susceptibility; –:No breakpoint.

表4 抗菌药物对686株金黄色葡萄球菌的最低抑菌浓度(MIC)分布(株)

Table 4 Minimal inhibitory concentrations (MIC) distribution organized by 686 strains of *Staphylococcus aureus* (strains No.)

Antibiotic	MIC(mg·L^{-1})																	
	0.002	0.004	0.008	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	>256
Penicillin	0	0	0	0	8	67	27	27	72	117	103	73	57	63	47	21	2	0	2
Oxacillin	0	0	0	0	0	0	9	176	245	45	6	11	16	27	21	63	23	8	36
Cefoxitin	0	0	0	0	0	0	0	1	1	3	236	238	27	33	55	39	7	10	36
Cefathiamidine	0	0	0	0	0	1	0	15	314	156	38	33	64	25	21	15	2	1	1
Gentamicin	0	0	0	0	0	13	209	324	30	1	1	6	21	26	19	15	16	2	3
Amikacin	0	0	0	0	0	0	0	0	62	334	167	77	13	10	7	9	3	3	1
Erythromycin	0	0	0	0	0	1	18	261	15	2	3	9	6	3	8	8	5	35	312
Azithromycin	0	0	0	0	0	0	2	22	201	71	1	4	8	3	5	11	8	15	335
Clindamycin	0	0	0	0	12	304	168	20	3	1	1	0	1	2	6	6	11	21	130
Tetracycline	0	0	0	0	0	0	39	450	58	0	1	1	15	36	36	28	21	1	0
Minocycline	0	0	0	0	2	220	390	16	5	1	10	6	11	25	0	0	0	0	0
Tigecycline	0	0	0	0	1	155	336	138	47	8	1	0	0	0	0	0	0	0	0
Eravacycline	4	67	198	274	76	40	16	8	3	0	0	0	0	0	0	0	0	0	0
Ciprofloxacin	0	0	0	0	0	0	4	44	348	100	41	15	4	21	57	23	24	4	1
Levofloxacin	0	0	0	0	0	0	53	394	74	31	5	9	61	14	16	9	4	14	2
Moxifloxacin	0	0	0	2	53	370	89	27	15	3	55	31	18	2	3	15	3	0	0
Nemonoxacin	0	0	0	3	272	251	26	5	40	53	12	6	15	3	0	0	0	0	0
Gemifloxacin	0	0	1	25	297	201	27	3	2	6	41	42	10	13	8	10	0	0	0
Linezolid	0	0	0	0	0	0	0	6	53	608	19	0	0	0	0	0	0	0	0
Vancomycin	0	0	0	0	0	0	0	4	204	463	15	0	0	0	0	0	0	0	0
Teicoplanin	0	0	0	0	0	0	0	4	62	319	284	15	2	0	0	0	0	0	0
Rifampicin	42	124	331	154	11	1	0	1	0	2	6	1	4	1	0	1	1	4	2
SXT	0	0	12	342	223	38	37	8	10	2	5	1	1	1	0	4	2	0	0
CHL	0	0	0	0	0	0	0	0	0	0	26	505	118	4	16	17	0	0	0
FOS	0	0	0	0	0	0	0	2	52	162	197	117	86	22	12	12	3	1	20
Daptomycin	0	0	0	0	0	0	1	51	590	42	2	0	0	0	0	0	0	0	0

表5 抗菌药物对173株表皮葡萄球菌的最低抑菌浓度(MIC)分布(株)

Table 5 Minimal inhibitory concentration(MIC) distribution organized by173 Staphylococcus *epidermidis* (strains No.)

Antibiotic	MIC(mg·L^{-1})																	
	0.002	0.004	0.008	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	>256
Penicillin	0	0	0	2	5	4	8	16	30	34	25	17	12	5	12	2	1	0	0
Oxacillin	0	0	0	0	1	12	20	4	4	24	32	16	7	11	13	6	6	13	4
Cefoxitin	0	0	0	0	0	0	0	2	1	20	19	30	46	28	6	8	3	5	5
Cefathiamidine	0	0	0	1	1	20	22	39	46	20	5	2	5	7	3	2	0	0	0
Gentamicin	0	0	0	1	2	14	73	16	0	1	2	6	4	16	16	11	5	5	1
Amikacin	0	0	0	0	0	0	1	4	20	83	36	13	6	1	2	4	3	0	0

续表 5 (Table 5 continued)

Antibiotic	MIC (mg · L^{-1})																		
	0.002	0.004	0.008	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	>256
Erythromycin	0	0	0	0	0	2	42	3	1	1	1	1	1	3	11	27	18	7	55
Azithromycin	0	0	0	0	0	0	8	35	4	3	0	1	0	0	7	17	31	15	52
Clindamycin	0	0	0	1	16	59	44	2	2	0	3	2	0	3	0	0	0	6	35
Tetracycline	0	0	0	0	0	0	10	37	17	62	14	1	0	3	3	15	10	1	0
Minocycline	0	0	0	0	4	46	33	68	17	4	0	0	0	0	1	0	0	0	0
Tigecycline	0	0	0	0	16	54	57	33	13	0	0	0	0	0	0	0	0	0	0
Eravacycline	0	2	38	24	54	33	10	12	0	0	0	0	0	0	0	0	0	0	0
Ciprofloxacin	0	0	0	0	0	0	21	38	5	10	7	30	26	16	14	6	0	0	0
Levofloxacin	0	0	0	0	0	0	26	37	9	7	13	45	18	5	3	1	9	0	0
Moxifloxacin	0	0	0	0	4	49	13	10	19	39	23	4	0	6	4	2	0	0	0
Nemonoxacin	0	0	0	2	47	28	14	49	19	3	4	4	3	0	0	0	0	0	0
Gemifloxacin	0	0	1	20	37	10	9	9	31	30	12	2	2	7	3	0	0	0	0
Linezolid	0	0	0	0	0	0	0	20	112	37	1	1	0	0	1	0	0	0	1
Vancomycin	0	0	0	0	0	0	0	0	42	108	23	0	0	0	0	0	0	0	0
Teicoplanin	0	0	0	0	0	0	0	3	7	26	51	55	28	2	0	1	0	0	0
Rifampicin	12	53	62	34	1	0	0	2	0	0	0	0	0	0	0	1	1	1	6
SXT	0	1	4	7	23	17	12	3	6	34	48	11	3	4	0	0	0	0	0
CHL	0	0	0	0	0	0	0	0	0	1	27	106	18	0	5	12	4	0	0
FOS	0	0	0	0	0	0	0	3	13	29	38	20	32	11	13	3	4	2	5
Daptomycin	0	0	0	0	0	0	8	56	106	3	0	0	0	0	0	0	0	0	0

表 6 抗菌药物对肠球菌的抗菌作用(mg · L^{-1})及细菌敏感(S)和耐药(R)率(%)

Table 6 Antibacterial activity (mg · L^{-1}) and susceptibility (S) and resistance (R) rates (%) of antimicrobial agents against *Enterococcus spp.*

Antibiotic	*Enterococcus faecalis* (n = 323)				*Enterococcus faecium* (n = 330)			
	MIC_{50}	MIC_{90}	S	R	MIC_{50}	MIC_{90}	S	R
Penicillin	2	4	96.9	3.1	>256	>256	10.0	90.0
Ampicillin	1	1	99.4	0.6	>256	>256	10.9	89.1
Cefathiamidine	2	4	–	–	>256	>256	–	–
Erythromycin	>256	>256	3.4	69.3	>256	>256	7.0	78.8
Tetracycline	64	128	21.1	78.9	32	128	37.0	62.4
Minocycline	16	32	22.6	61.6	8	16	43.9	34.2
Tigecycline	0.12	0.25	94.4	5.6[a]	0.06	0.5	88.2	11.8[a]
Eravacycline	0.03	0.06	99.7	0.3[a]	0.016	0.5	86.7	13.3[a]
Ciprofloxacin	1	64	66.3	30.7	64	256	8.5	90.0
Levofloxacin	1	64	69.7	30.3	64	128	11.8	86.4
Moxifloxacin	0.25	8	–	–	16	32	–	–
Linezolid	1	4	88.9	3.7	1	1	98.5	0.6
Vancomycin	1	2	100.0	0.0	1	2	94.5	4.8
Teicoplanin	0.25	0.5	100.0	0.0	0.5	1	96.4	3.6
Rifampicin	4	16	8.7	67.5	8	16	7.9	88.5
CHL	4	32	70.9	25.1	4	8	95.2	3.0
FOS	32	64	99.1[c]	0.9[c]	64	128	64.9[c]	3.1[c]
Nitrofurantoin	8	16	99.1[c]	0.0[c]	64	256	23.7[c]	39.2[c]
HLGM	–	–	90.7	9.3	–	–	83.0	17.0
HLSTR	–	–	96.6	3.4	–	–	99.1	0.9
Daptomycin	1	2	100.0	0.0	1	2	–	0.0

HLGM: High concentration gentamicin; HLSTR: High concentration streptomycin; Interpretive criteria of USA – FDA was used for Tigecycline (S: ≤0.25 mg · L^{-1}); Interpretive criteria of ChinaCAST was used for Eravacyclin (S: ≤0.12 mg · L^{-1}); CLSI criteria of E. faecalis urinary tract isolates was used for FOS (S: ≤64 mg · L^{-1}; R ≥ 256 mg · L^{-1}); a: Non – susceptibility; c: The rates of susceptibility and resistance of urinary tract isolates contain 112 *Enterococcus faecalis* strains and 97 *Enterococcus faecium* strains; –: No breakpoint.

表7 抗菌药物对323株粪肠球菌的MIC分布(株)

Table 7 MIC distribution organized by 323 *Enterococcus faecalis* (strains No.)

Antibiotic	MIC(mg·L^{-1})																		
	0.002	0.004	0.008	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	>256
Penicillin	0	0	0	0	0	0	0	0	1	61	213	28	10	5	3	0	0	0	2
Ampicillin	0	0	0	0	0	0	0	1	102	188	16	9	5	0	0	0	0	0	2
Cefathiamidine	0	0	0	0	0	0	0	0	3	124	160	22	3	7	2	0	0	0	2
Erythromycin	0	0	0	0	0	0	2	3	6	31	45	12	5	2	0	0	1	6	210
Tetracycline	0	0	0	0	0	0	0	13	47	4	2	2	0	0	45	167	34	9	0
Minocycline	0	0	0	0	15	41	5	3	1	2	1	5	51	118	81	0	0	0	0
Tigecycline	0	0	0	3	12	89	135	66	18	0	0	0	0	0	0	0	0	0	0
Eravacycline	1	16	56	82	131	33	3	0	0	1	0	0	0	0	0	0	0	0	0
Ciprofloxacin	0	0	0	0	0	0	1	27	118	68	10	1	2	9	39	41	7	0	0
Levofloxacin	0	0	0	0	0	0	0	3	62	143	17	0	4	27	32	32	3	0	0
Moxifloxacin	0	0	0	0	0	2	101	110	8	4	2	30	40	23	3	0	0	0	0
Linezolid	0	0	0	0	0	0	0	0	9	168	110	24	12	0	0	0	0	0	0
Vancomycin	0	0	0	0	0	0	0	0	86	176	53	8	0	0	0	0	0	0	0
Teicoplanin	0	0	0	0	0	7	30	143	130	12	1	0	0	0	0	0	0	0	0
Rifampicin	0	0	1	0	0	0	0	0	0	27	77	105	76	32	3	0	0	0	2
CHL	0	0	0	0	0	0	0	0	0	0	25	155	49	13	56	24	1	0	0
FOS	0	0	0	0	0	0	0	0	0	0	0	0	0	21	190	108	2	0	2
Nitrofurantoin	0	0	0	0	0	0	0	0	0	0	1	35	199	84	3	1	0	0	0
Daptomycin	0	0	0	0	0	1	1	5	59	121	136	0	0	0	0	0	0	0	0

表8 抗菌药物对330株屎肠球菌的MIC分布(株)

Table 8 MIC distribution organized by 330 *Enterococcus faecium* (strains No.)

Antibiotic	MIC(mg·L^{-1})																		
	0.002	0.004	0.008	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	>256
Penicillin	0	0	0	0	0	0	0	0	0	0	6	22	5	3	3	2	7	26	256
Ampicillin	0	0	0	0	0	0	0	0	5	11	13	6	1	3	1	4	5	25	256
Cefathiamidine	0	0	0	0	0	0	0	0	0	3	3	2	17	9	4	0	0	0	292
Erythromycin	0	0	0	0	0	7	12	0	4	19	18	10	3	2	0	0	2	12	241
Tetracycline	0	0	0	0	0	0	13	88	17	4	0	0	2	8	59	56	81	2	0
Minocycline	0	0	0	0	43	66	8	7	0	1	9	11	72	94	15	4	0	0	0
Tigecycline	0	0	0	2	108	112	50	19	23	11	2	1	0	2	0	0	0	0	0
Eravacycline	1	1	18	171	67	20	8	8	16	15	3	0	1	1	0	0	0	0	0
Ciprofloxacin	0	0	0	0	0	0	1	5	15	7	5	6	5	25	63	76	29	61	32
Levofloxacin	0	0	0	0	0	0	0	3	11	11	14	6	5	16	47	115	88	14	0
Moxifloxacin	0	0	0	0	1	4	8	15	3	4	16	14	44	118	85	13	5	0	0
Linezolid	0	0	0	0	0	0	0	1	36	278	10	3	2	0	0	0	0	0	0
Vancomycin	0	0	0	0	0	0	0	1	124	166	18	3	2	0	0	1	3	0	12
Teicoplanin	0	0	0	0	0	0	3	40	150	114	7	1	3	0	3	1	3	0	5
Rifampicin	0	0	0	7	5	8	0	0	0	6	12	29	115	125	10	4	4	1	4
CHL	0	0	0	0	0	0	0	0	0	0	26	233	55	6	8	2	0	0	0
FOS	0	0	0	0	0	0	0	0	0	0	0	0	0	2	37	186	86	1	18
Nitrofurantoin	0	0	0	0	0	0	0	0	0	0	0	3	4	11	84	122	86	19	1
Daptomycin	0	0	0	0	0	1	1	11	48	179	83	7	0	0	0	0	0	0	0

表 9 抗菌药物对链球菌的抗菌作用(mg·L^{-1})及细菌敏感(S)和耐药(R)率(%)

Table 9 Antibacterial activity (mg·L^{-1}) and susceptibility (S) and resistance (R) rates (%) of antimicrobial agents against *Streptococcus spp.*

Antibiotic	*Streptococcus pneumoniae* (n=264)				*Streptococcus spp.* β-hemolytic group (n=183)				*Streptococcus spp.* virdans group (n=159)			
	MIC_{50}	MIC_{90}	S	R	MIC_{50}	MIC_{90}	S	R	MIC_{50}	MIC_{90}	S	R
Penicillin (iv)	1	2	90.2	0.4	0.03	0.03	100.0	–	0.03	1	78.0	7.5
Penicillin (po)	1	2	26.9	36.0	–	–	–	–	–	–	–	–
Amoxicillin	1	4	72.3	3.4	0.03	0.06	–	–	0.06	2	86.2	7.5
Cefazolin	2	8	–	–	0.12	0.25	–	–	0.25	4	–	–
Cefathiamidine	0.5	1	53.4	46.6	0.016	0.03	98.9	1.1	0.06	1	87.4	12.6
Cefuroxime	4	16	33.3	63.6	0.03	0.06	–	–	0.12	4	83.0	17.0
Cefatriaxone	0.5	2	75.8	9.1	0.03	0.06	100.0	–	0.12	2	89.9	8.2
Cefepime	1	2	64.8	6.8	0.06	0.12	100.0	–	0.25	2	88.7	7.5
Imipenem	0.12	0.5	54.2	0.0	0.008	0.016	–	–	0.016	0.25	95.0	5.0
Meropenem	0.25	0.5	60.2	9.5	0.03	0.06	100.0	–	0.06	0.5	92.5	7.5[a]
Ertapenem	0.5	1	91.7	0.4	0.03	0.12	100.0	–	0.12	1	91.8	8.2[a]
Erythromycin	>256	>256	3.4	94.7	>256	>256	7.1	92.3	0.25	256	51.6	42.8
Azithromycin	>256	>256	3.0	97.0	>256	>256	8.2	91.8	0.5	256	50.9	42.1
Clindamycin	>256	>256	13.3	84.5	256	>256	26.2	72.7	0.06	128	64.8	34.6
Tigecycline	0.06	0.06	95.1	4.9[a]	0.06	0.12	99.5	0.5[a]	0.03	0.06	100.0	–
Eravacycline	0.016	0.03	–	–	0.03	0.06	–	–	0.016	0.03	100.0	0.0
Ciprofloxacin	1	2	–	–	0.5	32	–	–	1	32	–	–
Levofloxacin	1	1	98.5	1.1	0.5	32	64.5	35.5	0.5	16	81.1	18.2
Moxifloxacin	0.12	0.25	98.9	0.4	0.12	4	63.9	36.1	0.12	2	–	–
Nemonoxacin	0.06	0.12	100.0	0.0	0.12	1	–	–	0.06	0.5	–	–
Gemifloxacin	0.03	0.06	98.9	1.1	0.06	2	–	–	0.03	0.5	–	–
Linezolid	1	1	100.0	–	1	1	100.0	–	0.5	2	100.0	–
Vancomycin	0.5	0.5	100.0	–	0.5	1	100.0	–	0.5	1	100.0	–
Teicoplanin	0.12	0.25	100.0	0.0	0.25	0.5	100.0	0.0	0.12	0.25	100.0	0.0
Rifampicin	0.03	0.06	99.2	0.8	0.06	0.12	99.5	0.5	0.06	0.12	–	–
SXT	4	16	19.7	65.2	0.06	0.12	100.0	0.0	0.06	2	–	–
CHL	4	8	67.8	32.2	4	16	89.6	10.4	2	4	100.0	0.0
Daptomycin	0.06	0.12	–	–	0.5	0.5	100.0	–	0.25	0.5	100.0	–

SXT: Trimethoprim / sulfamethoxazole; CHL: Chloramphenicol; EUCAST breakpoint was used for teicoplanin (S: ≤2 mg·L^{-1}; R: ≥4 mg·L^{-1}); a: non-susceptibility; –: No breakpoint; Penicillin (*iv*): Intravenous medication criteria on non-meningitis was used here (S: ≤2 mg·L^{-1}; R: ≥8 mg·L^{-1}); Penicillin (*po*): Oral standard was used here (S: ≤0.06 mg·L^{-1}; R: ≥2 mg·L^{-1}); Interpretive criteria of cefathiamidine susceptibility test plate manual was used for cefathiamidine (S: ≤0.5 mg·L^{-1}; R: ≥1 mg·L^{-1}); Intravenous medication criteria was used for cefuroxime (S: ≤0.5 mg·L^{-1}; R: ≥2 mg·L^{-1}); Criteria on non-meningitis was used for ceftriaxone and cefepime (S: ≤1 mg·L^{-1}; R: ≥4 mg·L^{-1}); Interpretive criteria of USA-FDA was used for tigecycline (S: ≤0.06 mg·L^{-1}); Interpretive criteria of nemonoxacin malate and sodium chloride injection introduction was used for nemonoxacin (S: ≤0.5 mg·L^{-1}; R: ≥1 mg·L^{-1}); β-hemolytic group: Interpretive criteria of cefathiamidine susceptibility test plate manual was used for cefathiamidine (S: ≤0.12 mg·L^{-1}; R: ≥0.25 mg·L^{-1}); Interpretive criteria of USA-FDA was used for tigecycline (S: ≤0.25 mg·L^{-1}); EUCAST breakpoints were used for moxifloxacin (S: ≤0.5 mg·L^{-1}; R: ≥1 mg·L^{-1}), rifampicin (S: ≤0.25 mg·L^{-1}; R: ≥0.5mg·L^{-1}), SXT (S: ≤1 mg·L^{-1}; R: ≥4 mg·L^{-1}); Viridans group: Interpretive criteria of cefathiamidine susceptibility test plate manual was used for cefathiamidine (S: ≤0.5 mg·L^{-1}; R: ≥1 mg·L^{-1}); EUCAST breakpoints were used for amoxicillin (S: ≤0.5 mg·L^{-1}; R: ≥4 mg·L^{-1}), cefuroxime (S: ≤0.5 mg·L^{-1}; R: ≥1 mg·L^{-1}), imipenem (S: ≤2 mg·L^{-1}; R: ≥4 mg·L^{-1}) and eravacycline (S: ≤0.12 mg·L^{-1}; R: ≥0.25 mg·L^{-1}); Interpretive criteria of USA-FDA was used for tigecycline (S: ≤0.25 mg·L^{-1}).

表10 抗菌药物对化脓链球菌和无乳链球菌的抗菌作用(mg·L^{-1})及细菌敏感(S)和耐药(R)率(%)

Table 10 Antibacterial activity (mg·L^{-1}) and susceptibility (S) and resistance (R) rates (%) of antimicrobial agents against *Streptococcus pyogenes and Streptococcus agalactiae*

Antibiotic	*Streptococcus pyogenes*(n=48)				*Streptococcus agalactiae*(n=119)			
	MIC_{50}	MIC_{90}	S	R	MIC_{50}	MIC_{90}	S	R
Penicillin	0.016	0.016	100.0	–	0.03	0.06	100.0	–
Amoxicillin	0.016	0.03	–	–	0.06	0.06	–	–
Cefazolin	0.12	0.12	–	–	0.12	0.25	–	–
Cefathiamidine	0.016	0.016	100.0	0.0	0.016	0.03	98.3	1.7
Cefuroxime	0.016	0.016	–	–	0.03	0.06	–	–
Cefatriaxone	0.016	0.03	100.0	–	0.03	0.12	100.0	–
Cefepime	0.016	0.016	100.0	–	0.06	0.12	100.0	–
Imipenem	0.004	0.008	–	–	0.016	0.016	–	–
Meropenem	0.008	0.008	100.0	–	0.03	0.06	100.0	–
Ertapenem	0.016	0.016	100.0	–	0.06	0.12	100.0	–
Erythromycin	>256	>256	0.0	100.0	>256	>256	10.1	89.1
Azithromycin	>256	>256	0.0	100.0	256	>256	11.8	88.2
Clindamycin	256	>256	2.1	97.9	16	>256	37.8	60.5
Tigecycline	0.06	0.12	100.0	–	0.06	0.06	100.0	–
Eravacycline	0.03	0.06	–	–	0.03	0.06	–	–
Ciprofloxacin	0.25	2	–	–	16	32	–	–
Levofloxacin	0.25	1	100.0	0.0	16	32	46.2	53.8
Moxifloxacin	0.06	0.12	100.0	0.0	2	4	46.2	53.8
Nemonoxacin	0.06	0.12	–	–	0.5	1	–	–
Gemifloxacin	0.03	0.06	–	–	0.5	2	–	–
Linezolid	0.5	1	100.0	–	1	2	100.0	–
Vancomycin	0.5	1	100.0	–	0.5	1	100.0	–
Teicoplanin	0.12	0.25	100.0	0.0	0.25	0.5	100.0	0.0
Rifampicin	0.06	0.12	100.0	0.0	0.12	0.25	99.2	0.8
SXT	0.06	0.12	100.0	0.0	0.06	0.12	100.0	0.0
CHL	4	4	97.9	2.1	4	32	85.7	14.3
Daptomycin	0.25	0.5	100.0	–	0.5	0.5	100.0	–

Same as table 9.

表11 抗菌药物对264株肺炎链球菌的MIC分布(株)

Table 11 MIC distribution organized by 264 *Streptococcus pneumoniae* (strains No.)

Antibiotic	MIC(mg·L^{-1})																		
	0.002	0.004	0.008	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	>256
Penicillin	0	0	13	22	19	17	11	8	21	58	69	25	1	0	0	0	0	0	0
Amoxicillin	0	1	11	37	13	7	16	5	20	43	38	64	9	0	0	0	0	0	0
Cefazolin	0	0	0	1	5	41	11	10	15	10	53	74	40	4	0	0	0	0	0
Cefathiamidine	0	0	2	20	19	14	13	19	54	102	21	0	0	0	0	0	0	0	0
Cefuroxime	0	0	4	24	9	14	17	10	10	8	30	47	41	41	8	1	0	0	0
Cefatriaxone	0	3	20	16	14	11	19	18	53	46	40	24	0	0	0	0	0	0	0
Cefepime	0	1	0	18	23	15	5	20	23	66	75	18	0	0	0	0	0	0	0
Imipenem	3	37	26	14	9	13	41	88	33	0	0	0	0	0	0	0	0	0	0
Meropenem	0	2	45	18	17	14	15	48	80	24	1	0	0	0	0	0	0	0	0
Ertapenem	0	3	28	29	10	11	6	34	64	57	21	1	0	0	0	0	0	0	0
Erythromycin	0	0	0	0	1	5	2	1	5	2	2	7	1	4	8	8	9	30	179
Azithromycin	0	0	0	0	0	0	1	3	4	0	3	3	3	3	3	2	9	36	194
Clindamycin	0	0	0	7	5	7	5	11	6	2	0	0	0	1	3	3	6	51	157
Tigecycline	0	0	0	1	97	153	10	0	3	0	0	0	0	0	0	0	0	0	0
Eravacycline	0	0	4	180	73	4	2	1	0	0	0	0	0	0	0	0	0	0	0
Ciprofloxacin	0	0	0	0	0	0	0	5	37	143	59	16	1	0	3	0	0	0	0
Levofloxacin	0	0	0	0	0	0	0	4	98	142	16	1	0	3	0	0	0	0	0

续表 11 (Table 11 continued)

Antibiotic	MIC (mg · L^{-1})																		
	0.002	0.004	0.008	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	>256
Moxifloxacin	0	0	0	0	3	26	145	86	0	1	2	1	0	0	0	0	0	0	0
Nemonoxacin	0	0	0	1	4	130	107	18	4	0	0	0	0	0	0	0	0	0	0
Gemifloxacin	0	0	0	42	152	59	8	0	2	1	0	0	0	0	0	0	0	0	0
Linezolid	0	0	0	0	0	0	0	1	80	165	18	0	0	0	0	0	0	0	0
Vancomycin	0	0	0	0	0	1	2	95	164	2	0	0	0	0	0	0	0	0	0
Teicoplanin	0	0	0	0	0	46	147	68	3	0	0	0	0	0	0	0	0	0	0
Rifampicin	0	2	10	100	104	44	2	0	0	0	0	1	0	1	0	0	0	0	0
SXT	0	0	0	0	0	1	19	24	8	11	29	53	60	44	15	0	0	0	0
CHL	0	0	0	0	0	0	0	0	0	0	56	123	68	17	0	0	0	0	0
Daptomycin	0	0	0	0	22	175	62	3	0	2	0	0	0	0	0	0	0	0	0

表 12 重症监护病房(ICU)与非 ICU 分离金黄色葡萄球菌和表皮葡萄球菌对抗菌药物敏感(S)和耐药(R)率比较(%)

Table 12 Comparison of susceptibility (S) and resistance (R) rate (%) of *Staphylococci* isolated from intensive care unit (ICU) and non – ICU

Antibiotic	*Staphylococcus aureus*				*Staphylococcus epidermidis*			
	ICU (n = 105)		Non – ICU (n = 575)		ICU (n = 62)		Non – ICU (n = 110)	
	S	R	S	R	S	R	S	R
Penicillin	9.5	90.5	15.8	84.2	12.9	87.1	9.1	90.9
Oxacillin	57.1	42.9	72.2	27.8	19.4	80.6	25.5	74.5
Cefoxitin	57.1	42.9	71.8	28.2	–	–	–	–
Gentamicin	75.2	20.0	86.8	10.4	64.5	33.9	67.3	30.0
Erythromycin	32.4	62.9	44.7	53.7	35.5	61.3	23.6	75.5
Azithromycin	32.4	65.7	45.0	54.6	38.7	61.3	23.6	75.5
Clindamycin	69.5	30.5	74.4	25.2	69.4	29.0	72.7	25.5
Tetracycline	74.3	25.7	81.0	16.5	88.7	11.3	77.3	22.7
Minocycline	85.7	12.4	96.3	2.1	100.0	0.0	99.1	0.9
Tigecycline	96.2	3.8[a]	99.1	0.9[a]	100.0	–	100.0	–
Eravacycline	99.0	1.0[a]	99.7	0.3[a]	100.0	–	100.0	–
Ciprofloxacin	66.7	30.5	73.0	20.3	40.3	53.2	43.6	53.6
Levofloxacin	70.5	29.5	82.1	17.0	45.2	45.2	45.5	48.2
Moxifloxacin	70.5	28.6	82.8	16.9	54.8	27.4	54.5	20.0
Nemonoxacin	85.7	14.3	96.3	3.7	85.5	14.5	98.2	1.8
Linezolid	100.0	0.0	100.0	0.0	96.8	3.2	100.0	0.0
Vancomycin	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Teicoplanin	100.0	0.0	100.0	0.0	98.4	1.6	98.2	0.0
Rifampicin	93.3	5.7	97.7	1.4	91.9	8.1	96.4	3.6
SXT	100.0	0.0	98.4	1.6	88.7	11.3	90.0	10.0
CHL	98.1	1.9	93.9	5.4	87.1	12.9	88.2	11.8
Daptomycin	99.0	1.0[a]	99.8	0.2[a]	100.0	–	100.0	–

Same as table 1.

表 13 ICU 与非 ICU 分离粪肠球菌和屎肠球菌对抗菌药物敏感(S)和耐药(R)率比较(%)

Table 13 Comparison of susceptibility (S) and resistance (R) rate (%) of *Enterococci* isolated from ICU and non – ICU

Antibiotic	*Enterococcus faecalis*				*Enterococcus faecium*			
	ICU (n = 39)		Non – ICU (n = 275)		ICU (n = 112)		Non – ICU (n = 214)	
	S	R	S	R	S	R	S	R
Penicillin	97.4	2.6	97.1	2.9	5.4	94.6	11.7	88.3
Ampicillin	100.0	0.0	99.3	0.7	5.4	94.6	13.1	86.9
Erythromycin	10.3	59.0	2.5	70.2	8.0	81.3	6.5	78.0

续表 13(Table 13 continued)

Antibiotic	*Enterococcus faecalis*				*Enterococcus faecium*			
	ICU(n=39)		Non-ICU(n=275)		ICU(n=112)		Non-ICU(n=214)	
	S	R	S	R	S	R	S	R
Tetracycline	23.1	76.9	21.1	78.9	33.9	64.3	37.9	62.1
Minocycline	23.1	56.4	22.9	61.5	42.0	30.4	44.4	36.9
Tigecycline	97.4	2.6[a]	93.8	6.2[a]	83.9	16.1[a]	90.2	9.8[a]
Eravacycline	97.4	2.6[a]	100.0	–	83.0	17.0[a]	88.3	11.7[a]
Ciprofloxacin	69.2	28.2	65.5	31.3	3.6	95.5	11.2	87.4
Levofloxacin	71.8	28.2	69.1	30.9	4.5	93.8	15.4	82.7
Linezolid	89.7	0.0	88.7	4.0	100.0	0.0	97.7	0.9
Vancomycin	100.0	0.0	100.0	0.0	92.0	7.1	95.8	3.7
Teicoplanin	100.0	0.0	100.0	0.0	94.6	5.4	97.2	2.8
Rifampicin	15.4	51.3	7.6	70.9	5.4	91.1	8.9	87.4
CHL	76.9	23.1	70.2	25.1	97.3	0.9	94.4	4.2
FOS	–	–	99.1[c]	0.9[c]	–	–	67.6[c]	2.9[c]
Nitrofurantoin	–	–	99.1[c]	0.0[c]	–	–	27.9[c]	39.7[c]
HLGM	94.9	5.1	90.2	9.8	83.0	17.0	82.7	17.3
HLSTR	94.9	5.1	97.1	2.9	100.0	0.0	99.1	0.9
Daptomycin	100.0	0.0	100.0	0.0	–	0.0	–	0.0

Same as table 6; c:The rates of susceptibility and resistance of urinary tract isolates contain 108 *Enterococcus faecalis* strains and 68 *Enterococcus faecium* strains isolated from non-ICU.

表 14 不同年龄患者分离金葡菌和表葡菌对抗菌药物敏感(S)和耐药(R)率比较(%)

Table 14 Comparison of susceptibility (S) and resistance (R) rate(%) of *Staphylococci* isolated from different age groups

Antibiotic	*Staphylococcus aureus*						*Staphylococcus epidermidis*					
	≤14 years(n=62)		15-64 years(n=393)		≥65 years(n=231)		≤14 years(n=17)		15-64 years(n=88)		≥65 years(n=68)	
	S	R	S	R	S	R	S	R	S	R	S	R
Penicillin	11.3	88.7	15.5	84.5	14.7	85.3	5.9	94.1	15.9	84.1	5.9	94.1
Oxacillin	82.3	17.7	70.5	29.5	66.2	33.8	17.6	82.4	25.0	75.0	23.5	76.5
Cefoxitin	82.3	17.7	70.2	29.8	65.8	34.2	–	–	–	–	–	–
Gentamicin	96.8	1.6	85.5	11.5	81.4	15.2	52.9	47.1	77.3	19.3	55.9	42.6
Erythromycin	32.3	64.5	44.3	54.2	43.7	53.7	11.8	88.2	27.3	70.5	32.4	66.2
Azithromycin	33.9	66.1	44.3	55.2	44.2	55.0	11.8	88.2	27.3	71.6	35.3	64.7
Clindamycin	80.6	19.4	72.5	27.0	74.5	25.5	70.6	29.4	76.1	22.7	66.2	30.9
Tetracycline	88.7	11.3	78.9	18.6	79.7	18.2	76.5	23.5	80.7	19.3	83.8	16.2
Minocycline	98.4	1.6	94.7	3.6	93.9	4.3	100.0	0.0	98.9	1.1	100.0	0.0
Tigecycline	98.4	1.6[a]	98.2	1.8[a]	99.6	0.4[a]	100.0	–	100.0	–	100.0	–
Eravacycline	100.0	–	100.0	–	98.7	1.3[a]	100.0	–	100.0	–	100.0	–
Ciprofloxacin	85.5	9.7	73.0	20.6	67.5	26.8	35.3	64.7	46.6	47.7	39.7	57.4
Levofloxacin	91.9	8.1	81.4	17.6	75.8	23.8	35.3	58.8	51.1	40.9	41.2	51.5
Moxifloxacin	91.9	8.1	81.9	17.6	76.6	22.9	35.3	23.5	63.6	19.3	48.5	26.5
Nemonoxacin	98.4	1.6	95.4	4.6	92.6	7.4	100.0	–	96.6	3.4	88.2	11.8
Linezolid	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	98.9	1.1	98.5	1.5
Vancomycin	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Teicoplanin	100.0	0.0	100.0	0.0	100.0	0.0	94.1	0.0	98.9	1.1	98.5	0.0
Rifampicin	96.8	1.6	97.5	1.3	96.5	3.5	94.1	5.9	92.0	8.0	98.5	1.5
SXT	98.4	1.6	99.0	1.0	98.3	1.7	88.2	11.8	92.0	8.0	86.8	13.2
CHL	98.4	1.6	94.7	4.6	93.5	6.1	82.4	17.6	93.2	6.8	82.4	17.6
Daptomycin	98.4	1.6[a]	99.7	0.3[a]	100.0	–	100.0	–	100.0	–	100.0	–

Same as table 1.

表 15 不同年龄患者分离粪肠球菌和屎肠球菌对抗菌药物敏感(S)和耐药(R)率比较(%)

Table 15 Comparison of susceptibility (S) and resistance (R) rate (%) of *Enterococci* isolated from different age groups

Antibiotic	*Enterococcus faecalis*						*Enterococcus faecium*					
	≤14 years (n = 26)		15 – 64 years (n = 161)		≥65 years (n = 136)		≤14 years (n = 34)		15 – 64 years (n = 128)		≥65 years (n = 168)	
	S	R	S	R	S	R	S	R	S	R	S	R
Penicillin	92.3	7.7	98.1	1.9	96.3	3.7	8.8	91.2	9.4	90.6	10.7	89.3
Ampicillin	92.3	7.7	100.0	0.0	100.0	0.0	8.8	91.2	10.2	89.8	11.9	88.1
Erythromycin	7.7	50.0	2.5	67.7	3.7	75.0	2.9	85.3	8.6	77.3	6.5	78.6
Tetracycline	42.3	57.7	23.6	76.4	14.0	86.0	29.4	70.6	33.6	65.6	41.1	58.3
Minocycline	42.3	50.0	24.2	64.0	16.9	61.0	41.2	29.4	42.2	38.3	45.8	32.1
Tigecycline	100.0	–	96.3	3.7[a]	91.2	8.8[a]	100.0	–	85.9	14.1[a]	87.5	12.5[a]
Eravacycline	100.0	–	100.0	–	99.3	0.7[a]	100.0	–	83.6	16.4[a]	86.3	13.7[a]
Ciprofloxacin	80.8	19.2	68.3	28.6	61.0	35.3	17.6	82.4	8.6	89.8	6.5	91.7
Levofloxacin	84.6	15.4	71.4	28.6	64.7	35.3	32.4	58.8	9.4	89.1	9.5	89.9
Linezolid	100.0	0.0	88.2	6.2	87.5	1.5	100.0	0.0	96.1	1.6	100.0	0.0
Vancomycin	100.0	0.0	100.0	0.0	100.0	0.0	97.1	0.0	93.8	6.3	94.6	4.8
Teicoplanin	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	95.3	4.7	96.4	3.6
Rifampicin	0.0	73.1	7.5	66.5	11.8	67.6	0.0	97.1	7.8	90.6	9.5	85.1
CHL	76.9	19.2	72.7	24.8	67.6	26.5	91.2	8.8	94.5	3.1	96.4	1.8
FOS	–	–	98.0[c]	2.0[c]	100.0[c]	0.0[c]	–	–	72.7[c]	6.1[c]	75.0[c]	0.0[c]
Nitrofurantoin	–	–	100.0[c]	0.0[c]	100.0[c]	0.0[c]	–	–	21.2[c]	42.4[c]	15.0[c]	47.5[c]
HLGM	96.2	3.8	89.4	10.6	91.2	8.8	94.1	5.9	84.4	15.6	79.8	20.2
HLSTR	100.0	0.0	96.3	3.7	96.3	3.7	100.0	0.0	97.7	2.3	100.0	0.0
Daptomycin	100.0	0.0	100.0	0.0	100.0	0.0	–	0.0	–	0.0	–	0.0

Same as table 6; c: The rates of susceptibility and resistance of urinary tract isolates contain 51 and 43 *Enterococcus faecalis* strains isolated from adult (15 – 64 years) and the elderly (≥65 years), respectively; contain 33 and 40 *Enterococcus faecium* strains isolated from adult and the elderly, respectively.

表 16 不同年龄患者分离肺炎链球菌对抗菌药物敏感(S)和耐药(R)率比较(%)

Table 16 Comparison of susceptibility (S) and resistance (R) rate (%) of *Streptococcus pneumoniae* isolated from different age groups

Antibiotic	≤14 years (n = 106)		15 – 64 years (n = 69)		≥65 years (n = 89)	
	S	R	S	R	S	R
Penicillin (*iv*)	87.7	0.9	95.7	0.0	88.8	0.0
Penicillin (*po*)	19.8	44.3	33.3	29.0	30.3	31.5
Amoxicillin	63.2	2.8	79.7	2.9	77.5	4.5
Cefathiamidine	48.1	51.9	58.0	42.0	56.2	43.8
Cefuroxime	24.5	71.7	42.0	55.1	37.1	60.7
Cefatriaxone	65.1	13.2	85.5	4.3	80.9	7.9
Cefepime	53.8	8.5	72.5	5.8	71.9	5.6
Imipenem	40.6	0.0	66.7	0.0	60.7	0.0
Meropenem	52.8	8.5	63.8	8.7	66.3	11.2
Ertapenem	90.6	0.9	92.8	0.0	92.1	0.0
Erythromycin	0.9	96.2	4.3	95.7	5.6	92.1
Azithromycin	0.0	100.0	4.3	95.7	5.6	94.4
Clindamycin	12.3	87.7	11.6	84.1	15.7	80.9
Tigecycline	99.1	0.9[a]	94.2	5.8[a]	91.0	9.0[a]
Levofloxacin	100.0	0.0	98.6	1.4	96.6	2.2
Moxifloxacin	100.0	0.0	98.6	0.0	97.8	1.1
Nemonoxacin	100.0	0.0	100.0	0.0	100.0	0.0
Gemifloxacin	100.0	0.0	98.6	1.4	97.8	2.2
Linezolid	100.0	–	100.0	–	100.0	–
Vancomycin	100.0	–	100.0	–	100.0	–
Teicoplanin	100.0	0.0	100.0	0.0	100.0	0.0
Rifampicin	99.1	0.9	100.0	0.0	98.9	1.1
SXT	17.0	72.6	20.3	63.8	22.5	57.3
CHL	67.9	32.1	66.7	33.3	68.5	31.5

Same as table 9.

表17 不同标本来源金黄色葡萄球菌对抗菌药物敏感(S)和耐药(R)率比较(%)

Table 17 Comparison of susceptibility (S) and resistance (R) rate(%) of *Staphylococci* aureus isolated from different specimens

Antibiotic	Secretion(n=277)		Blood(n=224)		Sputum(n=83)		Drainage fluid(n=80)	
	S	R	S	R	S	R	S	R
Penicillin	13.4	86.6	16.1	83.9	16.9	83.1	15.0	85.0
Oxacillin	73.6	26.4	69.2	30.8	65.1	34.9	65.0	35.0
Cefoxitin	72.9	27.1	69.2	30.8	63.9	36.1	65.0	35.0
Gentamicin	84.8	11.6	87.1	11.2	77.1	15.7	90.0	10.0
Erythromycin	40.4	58.5	47.3	50.0	33.7	65.1	50.0	45.0
Azithromycin	41.2	58.8	46.9	52.2	34.9	65.1	50.0	47.5
Clindamycin	72.2	27.4	77.2	22.8	72.3	26.5	75.0	25.0
Tetracycline	80.1	17.0	81.7	16.5	78.3	21.7	80.0	18.8
Minocycline	95.7	2.5	95.1	3.1	89.2	8.4	98.8	1.3
Tigecycline	99.3	0.7[a]	98.7	1.3[a]	98.8	1.2[a]	98.8	1.3[a]
Eravacycline	99.6	0.4[a]	99.6	0.4[a]	98.8	1.2[a]	100.0	–
Ciprofloxacin	72.6	20.6	72.8	20.5	65.1	30.1	80.0	16.3
Levofloxacin	81.2	18.1	83.0	16.1	71.1	27.7	83.8	16.3
Moxifloxacin	81.6	18.4	84.4	15.2	72.3	26.5	82.5	16.3
Nemonoxacin	96.0	4.0	96.4	3.6	85.5	14.5	97.5	2.5
Linezolid	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Vancomycin	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Teicoplanin	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Rifampicin	96.8	1.4	97.8	2.2	97.6	2.4	96.3	2.5
SXT	98.9	1.1	98.2	1.8	100.0	0.0	98.8	1.3
CHL	93.1	5.8	95.1	4.9	97.6	2.4	93.8	5.0
Daptomycin	100.0	–	100.0	–	98.8	1.2[a]	100.0	–

Same as table 1.

表18 不同标本来源粪肠球菌对抗菌药物敏感(S)和耐药(R)率比较(%)

Table 18 Comparison of susceptibility (S) and resistance (R) rate(%) of *Enterococcus faecalis* isolated from different specimens

Antibiotic	Urine(n=112)		Blood(n=102)		Drainage fluid(n=55)		Secretion(n=52)	
	S	R	S	R	S	R	S	R
Penicillin	97.3	2.7	93.1	6.9	100.0	0.0	100.0	0.0
Ampicillin	98.2	1.8	100.0	0.0	100.0	0.0	100.0	0.0
Erythromycin	2.7	75.9	3.9	68.6	5.5	45.5	0.0	82.7
Tetracycline	13.4	86.6	20.6	79.4	40.0	60.0	17.3	82.7
Minocycline	14.3	68.8	23.5	56.9	40.0	56.4	19.2	63.5
Tigecycline	91.1	8.9[a]	95.1	4.9[a]	98.2	1.8[a]	96.2	3.8[a]
Eravacycline	100.0	–	99.0	1.0[a]	100.0	–	100.0	–
Ciprofloxacin	62.5	36.6	58.8	35.3	81.8	14.5	73.1	25.0
Levofloxacin	63.4	36.6	64.7	35.3	85.5	14.5	76.9	23.1
Linezolid	89.3	4.5	91.2	2.0	83.6	3.6	88.5	5.8
Vancomycin	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Teicoplanin	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Rifampicin	6.3	70.5	9.8	65.7	14.5	65.5	5.8	67.3
CHL	68.8	28.6	72.5	22.5	80.0	16.4	63.5	30.8
FOS	99.1	0.9	–	–	–	–	–	–
Nitrofurantoin	99.1	0.0	–	–	–	–	–	–
HLGM	90.2	9.8	90.2	9.8	94.5	5.5	88.5	11.5
HLSTR	99.1	0.9	91.2	8.8	100.0	0.0	98.1	1.9
Daptomycin	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0

Same as table 6.

表 19 不同标本来源屎肠球菌对抗菌药物敏感(S)和耐药(R)率比较(%)

Table 19 Comparison of susceptibility (S) and resistance (R) rate(%) of *Enterococcus faecium* isolated from different specimens

Antibiotic	Blood(n=129)		Urine(n=97)		Drainage fluid(n=80)		Secretion(n=23)	
	S	R	S	R	S	R	S	R
Penicillin	7.8	92.2	6.2	93.8	17.5	82.5	13.0	87.0
Ampicillin	9.3	90.7	5.2	94.8	20.0	80.0	13.0	87.0
Erythromycin	7.0	77.5	5.2	86.6	7.5	73.8	13.0	69.6
Tetracycline	37.2	61.2	28.9	71.1	47.5	52.5	34.8	65.2
Minocycline	45.0	34.9	38.1	37.1	48.8	32.5	47.8	26.1
Tigecycline	82.9	17.1[a]	89.7	10.3[a]	93.8	6.3[a]	91.3	8.7[a]
Eravacycline	78.3	21.7[a]	91.8	8.2[a]	92.5	7.5[a]	91.3	8.7[a]
Ciprofloxacin	5.4	92.2	4.1	94.8	16.3	82.5	17.4	82.6
Levofloxacin	9.3	89.1	8.2	89.7	20.0	78.8	13.0	82.6
Linezolid	100.0	0.0	99.0	1.0	95.0	1.3	100.0	0.0
Vancomycin	93.0	6.2	92.8	6.2	100.0	0.0	91.3	8.7
Teicoplanin	95.3	4.7	95.9	4.1	100.0	0.0	91.3	8.7
Rifampicin	9.3	87.6	7.2	89.7	7.5	86.3	4.2	95.7
CHL	95.3	3.1	96.9	3.1	93.8	3.8	91.3	0.0
FOS	–	–	64.9	3.1	–	–	–	–
Nitrofurantoin	–	–	23.7	39.2	–	–	–	–
HLGM	84.5	15.5	87.6	12.4	78.8	21.3	69.6	30.4
HLSTR	99.2	0.8	100.0	0.0	97.5	2.5	100.0	0.0
Daptomycin	–	0.0	–	0.0	–	0.0	–	0.0

Same as table 6.

讨　论

本次监测中 MRSA 和 MRSE 的检出率分别为 30.6% 和 76.3%，较 2021 至 2022 年[5]分别下降 5.8 和 3.6 个百分点，监测药物耐药率均较稳定。MRSA 检出率与 2023 年 CARSS[6]全国平均值及 CHINET[7]监测结果基本一致。欧盟的欧洲抗菌药物耐药监测网（European Antimicrobial Resistance Surveillance Network，EARS-Net）[8]显示，2023 年欧洲各国MRSA 检出率为 1.5% ~51.1%，平均为 15.8%，2019 年至 2023 年间呈下降趋势。SENTRY 抗菌药物监测项目（SENTRY Antimicrobial Surveillance Program，SENTRY）[9]和辉瑞公司支持的抗菌药物测试引导和监测项目（Antimicrobial Testing Leadership and Surveillance，ATLAS）[10]显示，2023 年MRSA全球平均检出率在 26.2% ~29.4%，北欧、西欧均低于 20%，北美接近 40%，亚洲处于平均水平。屎肠球菌中 VRE 检出率为 5.5%，20 年来首次超过 5%，略高于 CARSS[6]的 2.9% 和 CHINET[7]的 3.2%。虽然我国 VRE 检出率仍处于较低水平，显著低于美洲各国、澳大利亚、印度及多数欧洲国家[8-10]，但近年在广东、广西和湖南等地上升趋势明显，已引起关注。口服青霉素对肺炎链球菌敏感折点等于其流行病学界值（epidemiological cutoff，Ecoff），故敏感率即野生型占比（MIC ≤0.06 mg·L^{-1}），本次监测为 26.9%，低于全球多数国家，同样低比例的还有韩国和泰国[10]。肺炎链球菌对大环内酯类药物及克林霉素敏感率仍<15%，此低敏感现象集中在中、日、韩 3 国[10]。2011 至 2012 年监测[11]中，已出现无乳链球菌对喹诺酮类药物耐药现象，因耐药菌数量较少，未单独列出，至 2013 至 2014 年[12]，耐药率已达 46.2% ~47.3%，与 CHINET[13]2013 年报告中 B 组 β-溶血链球菌对左氧氟沙星耐药率 41.4% 相近。耐药机制主要为喹诺酮结合位点 *gyrA*、*parC*、*parE* 联合基因突变[14]。

依拉环素为本次监测新增药物，对革兰氏阳性菌具有很好抗菌活性，对绝大多数革兰氏阳性菌 MIC 值在 0.002 ~1 mg·L^{-1}，MIC_{50}、MIC_{90}值多为替加环素的 1/2 ~1/4，细菌敏感率 >99%，MRSA 对其敏感率为 98.6%，屎肠球菌对其敏感率为 86.7%，与替加环素相似。较 HAWSER 等[15]报道的 2017 至 2020 年全球监测 MIC 结果基本一致或低一个稀释度，采用相同判定标准时，细菌敏感率基本一致。与 HUANG[16]等对依拉环素体外抗菌活性综述情况相符。

吉米沙星为韩国 LG 生命科学公司研制的第四代氟喹诺酮类抗菌药物，抗菌谱显示，其对肺炎链球菌、化脓性链球菌、甲氧西林敏感金黄色葡萄球菌、单核细胞增多性李斯特菌、流感嗜血杆菌、卡他莫拉菌、非

典型病原体及革兰阳性厌氧菌具有良好抗菌作用[17]。2006年在我国上市[18],2009至2010年曾对其监测[19]。本次监测结果显示,吉米沙星对链球菌属细菌有很好抗菌作用,MIC值多为莫西沙星的1/2~1/4,环丙沙星、左氧氟沙星的1/8~1/64,肺炎链球菌敏感率为98.9%。较2009至2010年监测结果,对金黄色葡萄球菌、肺炎链球菌、化脓链球菌抗菌作用保持一致。

总之,MRSA检出率持续下降,VRE检出率呈上升趋势,需持续关注。

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