SHORT COMMUNICATION

Disc-diffusion and PCR Detection of Methicillin Resistance in Environmental Airborne Strains of *Staphylococcus* spp.

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Abstract

The aim of this study was to assess the species composition of airborne *Staphylococcus* spp. in public premises, to determine the methicillin resistance of the isolates and the prevalence of *mecA* gene, determining resistance to β -lactams. In total 65 *Staphylococcus* strains were isolated from 54 sites. Four strains exhibited phenotypic methicillin resistance, while the presence of *mecA* gene was found in 11 strains. The results of both assays were compared, showing that the phenotypic tests revealed methicillin resistance only in 36% of the examined samples. This study revealed high species diversity among airborne *Staphylococcus* spp. population, which consists of multidrug resistant strains.

Key words: airborne Staphylococcus spp., disc-diffusion method, mecA gene, methicillin resistance, PCR

Staphylococci are among the most frequently isolated human pathogenic bacteria, causing nosocomial infections, acute infections and in extreme cases, death of patients. Over many years, the attention of microbiologists and clinicians over the world was focused on Staphylococcus aureus, as a major factor of nosocomial infections. Currently, increasing attention is paid to coagulase-negative staphylococci (CoNS) that were considered harmless until 1970 (Kloos and Banerman, 1994; von Eiff et al., 2001). Data from the United States National Nosocomial Infections Surveillance System from January 1990 to May 1999 showed that CoNS were the most commonly reported pathogens (37.3% for CoNS versus 12.6% for S. aureus) isolated from bloodstream infections in intensive care unit patients (American Journal of Infection Control, 1999). CoNS are also among the most frequently isolated bacteria in clinical microbiology laboratories (Patrick, 1990). More importantly, CoNS often serve as reservoirs of antimicrobial resistance determinants, since they usually have a high prevalence of multidrug resistance (Bastos et al., 1999). Therefore, it is important to characterize CoNS strains isolated from the environment. Methicillin resistance of Staphylococcus spp. is determined by the presence of the mecA gene, encoding the protein PBP2a (penicillin binding protein) (Chambers, 1997). PBP2a protein, unlike the PBP protein is not inactivated by the β -lactam antibiotics. The PBP2a protein, despite the presence of antibiotics, can continuously participate in the synthesis of the bacterial cell wall, thus contributing to resistance to e.g.: penicillins, cephalosporins, monobactams, carbapenems and other drugs associated with β -lactamase inhibitors (Georgopapadakou, 1993; Idzik et al., 2000). Drug resistance, including resistance to methicillin is routinely evaluated in diagnostic laboratories using a disc-diffusion method (EUCAST, 2012). However, as shown by Idzik et al. (2000), strains phenotypically identified as sensitive, can possess the *mecA* gene, responsible for resistance to β -lactam antibiotics. Similarly, in staphylococci exhibiting resistance in a disc-diffusion test, the presence of mecA gene may not be detected, which in turn may indicate the existence of other, more complex mechanisms of resistance to β -lactam antibiotics (Banerjee *et al.*, 2010). From an epidemiological point of view, this phenomenon is very dangerous and requires monitoring.

Therefore, the aim of this study was to isolate and identify the bioaerosol-forming species of *Staphylococcus* spp. in public premises. Another aim was to assess the drug resistance of the isolated strains, with particular emphasis on methicillin resistance and to compare the results of phenotypic tests with molecular detection of *mecA* gene, responsible for the resistance to β -lactam antibiotics. The air sampling was conducted in 45 public utility buildings in the city of Kraków, divided into 4 groups: teaching facilities of the University of

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Table I Location and characteristics of the study sites

Location						
TEACHING FACILITIES CHURCHES		SHOPPING MALLS	HEALTH CARE FACILITIES	CZERNICHÓW	CONTROL	
1U Laboratory classroom	1K Capuchin monastery	1G Krakowska	1S Jagiellońskie Est. Clinic	6CZ Farm premise – horses	1 Jordan's Park	
2U Elevator	2K Śt. Anna church	2G Kazimierz	2S Złotego Wieku Est. Clinic	7CZ Farm premise – cows	2 Planty meadow	
3U Toilet	3K Franciscan monastery	3G Plaza	3S Rydygiera Hospital	9CZ Health care clinic	3 Polish Aviators Park	
4U Vivarium	4K Dominican monastery	4G M1	4S Urocze Est.	10CZ Farm premise Clinic	4 Botanical Garden – calf house	
5U Reading room	5K Śt. Barbara church	5G Carrefour	5S Szkolne Est. Clinic		4CZ Czernichów Park	
6U Bar	6K Lord's Ark church	6G Leroy Merlin	6S Żeromskiego Hospital			
7U Gym	7K Our Lady of Częstochowa churchi	7G Tesco	7S Borek Fałęck Est. Clinic			
8U Lecture hall 1	8K Łagiewniki Sanctuary	8G Biedronka	8S Neurology CMUJ			
9U Lecture hall 2	9K Immaculate Concep- tion of Virgin Mary church	9G Solvay	9S Gynecology CMUJ			
10 U Corridor	10K Sacred Heart of Jesus church	10G Zakopianka	10S Occupational Medicine			
11U Locker room	11K St. Mary's Basilica	11G Bonarka				
12U Deanery						
13U PCR lab						

Agriculture and the Jagiellonian University, churches, shopping malls and health care facilities and in 4 sites located outside the city in Czernichów. Five sites located outdoors were used as control – 4 in Kraków and 1 in Czernichów (Table I).

Air sampling was performed twice - in December 2012 and June 2013 using a MAS-100 impactor (Merck) in order to verify the seasonal effect on the species composition of Staphylococcus spp. Two types of media were used for isolation of Staphylococcus bacteria: general medium - Tryptic Soy Agar - TSA (bioMerieux) supplemented with 5% sheep blood and differential Baird-Parker medium (bioMerieux) for microorganisms belonging to the genus Staphylococcus and Micrococcus. Species identification of Staphylococcus spp. was performed according to Kloos and Schleifer (1975), Kloos and Bannerman (1994), Gaillot et al. (2000) and Murray (2007). Gram stained microscopic preparations were made from macroscopically characteristic colonies that grew on TSA and Baird-Parker media. Another stage was the furazolidone sensitivity test to discriminate between the genus Staphylococcus and Micrococcus. Bacteria susceptible to furazolidone were identified as Staphylococcus, while the remaining ones - as Micrococcus. Subsequently, the catalase test was performed in order to exclude the presence of catalase-negative streptococci in the examined material. By using free coagulase, the Staphylococcus strains were differentiated into coagulase-positive and coagulase-negative. The final step was the biochemical test performed using the API Staph system (bioMerieux). This was followed by the assessment of antibiotic sensitivity of all examined strains using a disc-diffusion method on Mueller-Hinton Agar II (bioMerieux) according to the recommendations of EUCAST (2012). The following antibiotics were used in the study: cefoxitin, erythromycin, clindamycin, cotrimoxazole, doxycycline, ciprofloxacin, gentamicin. Reference strains S. aureus ATCC 25923 (methicillin-sensitive) and S. aureus MR 3 (methicillin-resistant, strain derived from the culture collection of the Jan Bober Centre for Microbiological research and Autovaccines) were used as control. Prior to DNA extraction, the bacterial strains were cultured on TSA supplemented with 5% sheep blood at 37°C for 24 hours. After the incubation, 4-5 colonies were collected with a sterile loop and suspended in 100 µl Tris buffer. Bacterial DNA was extracted using Genomic Mini DNA extraction kit (A&A Biotechnology, Poland), following the manufacturer's instructions. PCR reactions were performed using primers mecA-F (5'GTAGAAATGACTGAACGTCCGATAA3') and mecA-R (5'CCAATTCCACATTGTTTCGGTCTAA3')

and the expected product length was 310 bp (Geha et al., 1994). Polymerase chain reaction contained 50 ng of DNA template, 12.5 pM of each primer, 2.5 mM of dNTP, 1×PCR buffer and 1U DreamTaq DNA polymerase in a total volume of 25 µl. The following temperature profile was used for DNA amplification: initial denaturation at 94°C for 2 min followed by 30 cycles of amplification (denaturation at 94°C for 1 min, annealing at 55°C for 1 min and extension at 72°C for 2 min) and final extension at 72°C for 5 min. PCR amplifications were performed using T100[™] Thermal Cycler (Bio-Rad, USA). The PCR products were visualized by 1×TBE electrophoresis in ethidium-bromide-stained, 1% agarose gel. The PCR reaction was performed on all examined environmental strains together with the reference strains.

In total, 65 *Staphylococcus* strains were isolated from 54 sampling sites. 15 species of coagulase-negative staphylococci were identified, while *S. aureus* was not detected in the examined material. Two species, *i.e. Staphylococcus haemolyticus* and *Staphylococcus* hominis dominated among the collected strains (Table II).

 Table II

 Prevalence of the collected Staphylococcus species

No.	Species	Number of isolates	No.	Species	Number of isolates
1.	S. haemolyticus	12	9.	S. lentus	2
2.	S. hominis	10	10.	S. saprophyticus	2
3.	S. epidermidis	8	11.	S. simulans	2
4.	S. warneri	6	12.	S. kloosii	2
5.	S. xylosus	5	13.	S. equorum	2
6.	S. cohnii cohnii	5	14.	S. auricularis	1
7.	S. capitis	4	15.	S. caprae	1
8.	S. cohnii ureal	3			

Among 65 isolates, 42 (65%) exhibited resistance to at least one of the analyzed antibiotics in the discdiffusion test. Four strains (6%) were resistant to cefoxitin, which indicates the methicillin resistance of those isolates (Żabicka and Hryniewicz, 2010). Two of those strains were isolated in the summer and two in the winter; they belonged to different species and showed varied resistance to other tested antibiotics. The only common feature in the methicillin-resistant strains was their origin, *i.e.* 3 of 4 strains were isolated from the air of Kraków shopping malls and one from the hospital (Table III). During the winter isolation, despite unfavorable meteorological conditions (low air temperature, low humidity), 39 strains were collected, while 26 strains were isolated in the summer.

The PCR test revealed that 11 (17%) out of 65 strains possessed *mecA* gene which determines resistance to

 β -lactam antibiotics. The results of phenotypic analysis were compared with those obtained in PCR reaction (Table III). Based on the conducted study, it can be concluded that possessing the gene that determines the methicillin resistance is not synonymous with its detection by the disc-diffusion method. The results of both methods were congruent only in the case of 4 (36%) out of 11 Staphylococcus spp. strains. It should be noted that the methicillin-resistant strains originated from densely populated premises (shopping mall and churches). On the other hand, methicillin-resistant staphylococci were not detected in control sites (parks and gardens). Microbiological quality of indoor air is the subject of many studies worldwide (Wanner et al., 1993; Lee and Jo, 2006). This is due to the fact that with the development of civilization, people spend more time indoors (87% of time). Therefore, it has become important to understand the potential threat posed by the bioaerosol inside public facilities (Gaska-Jedruch and Dudzinska, 2009). Staphylococci are commonly isolated from the air in residential and commercial buildings (Gąska-Jedruch and Dudzinska, 2009) but also from the outdoor air (Zmysłowska and Jackowska, 2005). The most common indoor species are: Staphylococcus epidermidis, S. haemolyticus, Staphylococcus saprophyticus, Staphylococcus auricularius, Staphylococcus. capitis, Staphylococcus warneri, S. hominis (Bonetta et al., 2010). On the other hand, outdoor air is a reservoir of among others: Staphylococcus xylosus, Staphylococcus lentus, S. aureus and S. epidermidis (Zmysłowska and Jackowska, 2005). People staying indoors are exposed to continuous contact with bacteria of the genus Staphylococcus, which is a disturbing phenomenon, as infections caused by both coagulase-positive and coagulase-negative methicillinresistant staphylococci become increasingly frequent (Idzik et al., 2000). Sensitivity and speed of previously used methods for the determination of drug resistance is insufficient, therefore fast, highly specific and sensitive techniques, such as the PCR, are being sought (York et al., 1996). The PCR technique, which was used in this study to determine the presence of mecA gene, increased the detection rate of the methicillin-resistant isolates. Only in 36% of cases the methicillin resistance was detected using both methods employed in this study. Our results are congruent with those obtained by other authors, who also observed very low correlation between the results of phenotypic tests and molecular analyses (York et al., 1996; Idzik et al., 2000). This is very alarming, because this situation creates the possibility of missing strains, that can be a source of fateful infections. As shown in this research, strains forming a microbial aerosol at public premises, belonging to the species until recently considered as little virulent, are carriers of methicillin resistance genes. Additionally, based on the conducted study it can be assumed

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 Table III

 Drug resistance of the collected Staphylococcus spp. strains

1.W1Ukrythomycin-S. kaenarii2.W2UKrythomycin-S. haenarii3.W4U-+S. kentus4.W4US. solutus5.S4US. solutus6.W7U-+S. hominis7.W7UFrythomycin Clindamycin-S. solutus8.W9UErythomycin Clindamycin-S. solutus9.W10UErythomycin Coxycycline-S. solutus10.W10UFrythomycin Clindamycin-S. solutus11.W12US. solutus12.W13US. solutus13.W1KErythomycin Clindamycin-S. solutus14.S2KErythomycin Clindamycin-S. solutus15.S3KS. solutus16.W4KS. solutus17.W4KS. solutus18.W5KErythomycin-S. solutus19.W4KS. solutus10.S5KS. solutus11.W4KS. solutus12.W4KS. solutus13.W4KS. solutus <t< th=""><th>No.</th><th>Collection date (winter/summer)</th><th>Sampling site</th><th>Antibiotic resistance</th><th>mecA gene (+/-)</th><th>Species</th></t<>	No.	Collection date (winter/summer)	Sampling site	Antibiotic resistance	mecA gene (+/-)	Species
2.W2UErythromycin-S. hotemolyticus3.W4US. koltus4.WW4US. koltus5.S4US. koltus6.WW7UErythromycin Clindamycin-S. kontus7.WW7UErythromycin Doxycycline-S. coltu colni9.WW9UErythromycin Doxycycline-S. coltu colni9.WW10UFrythromycin Doxycycline-S. colni colni10.WW13US. kontus11.WW13US. kontus13.WW13KErythromycin Clindamycin-S. konsit14.S2KErythromycin Clindamycin-S. konsit15.S3KS. colni colni16.WW4KS. konsit17.W4KS. konsit18.WW5KErythromycin-S. konsit19.WW5KS. konsit20.S5KS. konsit21.S8KCortinoxazole+S. konsiti22.WW8KErythromycin-S. kontus23.W8KErythromycin-S. kontus24.WW10KFrythromycin-S. kontus25.WW10K	1.	W	1U	Erythromycin	-	S. warnerii
3.W4U-+S. kentis4.W4US. sylosis5.S4US. kentis6.W7US. kentis7.W7UErythromycin Clindamycin-S. soloni colni9.W10UErythromycin Doxycycline-S. soloni colni10.W10UErythromycin Clindamycin-S. sylosis11.W12US. sylosis12.W13US. sylosis13.W13US. sylosis14.S2KErythromycin Clindamycin-S. sylosis15.S3KS. sylosis16.W4KS. sylosis18.W5KErythromycin-S. sylosis18.W5KErythromycin-S. sylosis18.W5KErythromycin-S. sylosis19.W4KS. sylosis18.W5KErythromycin-S. sylosis19.W4KS. sylosis19.W4KS. sylosis10.S5KSS. sylosis11.KKFrythromycin-S. sylosis12.S5KCatinoszaole	2.	W	2U	Erythromycin	-	S. haemolyticus
4.W4USecond5.S4US. lentus6.W7U-+S. horninis7.W7UErythromycin Clindamycin-S. sciolar8.W9UErythromycin Doxycycline-S. sciolar10.W10UFrythromycin Doxycycline-S. sciolar11.W12US. warneril12.W13US. warneril13.W14KErythromycin Clindamycin-S. Sylosus14.S23KS. kolosii15.S33KS. scipitis16.W44KS. scipitis17.W44KS. scipitis18.W55KFrythromycin-S. scipitis19.W55KS. scipitis20.S55KS. scipitis21.S85KCotrimoxazole+S. scipitarnidis22.W85KErythromycin-S. kominis23.W85KErythromycin-S. kominis24.W10KS. kominis25.W10KFrythromycin-S. kominis26.S4CZS. kominis27.S6CZFrythromycin-S. cohni war	3.	W	4U	-	+	S. lentus
5.S4USentis6.W7U-+S. Ionitis7.W7UErythromycin Clindamycin-S. saparolyticus8.W9UErythromycin Doxycycline-S. schoni cohni9.W10UErythromycin Doxycycline-S. szylosus11.W10US. szylosus11.W12US. szylosus12.W13US. szylosus13.W1KErythromycin Clindamycin-S. kdoosii14.S2KErythromycin Clindamycin-S. kdoosii15.S3KS. szylosus16.W4KS. szylosus17.W4KS. szylosus18.W5KErythromycin-S. szylosus19.W5KS. szylosus20.S5KS. szylosus21.S8KErythromycin-S. horinitis22.W8KErythromycin-S. septaremitis23.W8KErythromycin-S. septaremitis24.W10KS. septaremitis25.W10KErythromycin-S. cohrini wal26.S4CZS. szylosus31.S7CZEr	4.	W	4U	-	-	S. xylosus
6.W7U-+S. Saprophyticus7.W7UFrythromycin Clindamycin-S. saprophyticus8.W9UErythromycin Doxycycline-S. cphidrmidis10.W10US. spidermidis11.W12US. spidermidis12.W13U-+S. spidermidis13.W13U-+S. spidermidis14.S2KErythromycin Clindamycin-S. spidermidis15.S3KS. hominis16.W4KS. hominis17.W4KS. spidermidis18.W5KErythromycin-S. spidermidis19.W5KS. spidermidis20.S5KS. spidermidis21.S8KCotrimoxazole+S. spidermidis22.W8KErythromycin-S. haemolyticus23.W8KErythromycin-S. spidermidis24.W10KS. cohni insi25.W10KErythromycin-S. cohni irreal26.S7CZErythromycin-S. cohni irreal27.S6CZErythromycin Cotrimoxazole-S. spidermidis28.S7CZErythromycin Cotrimoxazole-S	5.	S	4U	-	-	S. lentus
7.W7UErythromycin Clindamycin-S. saprophyticas8.W9UErythromycin Doxycycline-S. spidermids10.W10UErythromycin Doxycycline-S. spidermids11.W12US. spidermids12.W13US. syinsus13.W1KErythromycin Clindamycin-S. syinsus14.S2KErythromycin Clindamycin-S. syinsus15.S3KS. sopinits16.W4KS. sopinits17.W4KS. spiosus18.W5KErythromycin-S. spidermidis19.W5KS. saprae21.S8KCotrinoxazole+S. spidermidis22.W8KErythromycin-S. koninits23.W8KErythromycin-S. sopinits24.W10KS. sopinits25.W10KErythromycin Doxycycline Ciprofloxacin-S. colini urad29.S7CZFrythromycin Cotrinoxazole-S. sopinitis24.W18Erythromycin Cotrinoxazole-S. sopinitis26.S4CZS. colini urad29.S7CZFrythromycin Cotrinoxazole-S. sopinitis29.<	6.	W	7U	-	+	S. hominis
8. W 9U Erythromycin Doxycycline - S. epidernidis 10. W 10U Erythromycin Doxycycline - S. szylosa 11. W 12U - - S. szylosa 11. W 12U - - S. szylosa 13. W 11K Erythromycin Clindamycin - S. szylosas 13. W 11K Erythromycin Clindamycin - S. szylosas 14. S 2X Erythromycin Clindamycin - S. szylosas 15. S 3K - - S. koosii 16. W 4K - - S. komis 17. W 4K - - S. szylosas 18. W 5K Erythromycin Clindamycin - S. sepidermidis 20. S 5K - - S. szylosas 21. S 8K Cotrimoxazole + S. epidermidis	7.	W	7U	Erythromycin Clindamycin	-	S. saprophyticus
9. W 10U Erythromycin Doxycycline - S. epidermidis 10. W 10U - - S. sylosus 11. W 12U - S. warnerii 12. W 13U - + S. colnit cohni 13. W 11K Erythromycin Clindamycin - S. Aldosii 14. S 21K Erythromycin Clindamycin - S. Aldosii 15. S 33K - - S. Aldosii 16. W 44K - - S. Aldosii 17. W 44K - - S. Aldosii 18. W 5K Erythromycin - S. kominis 20. S 5K - - S. epidermidis 21. S 8K Cotrinoxazole + S. epidermidis 22. W 8K Erythromycin - S. hominis 23. W	8.	W	9U	Erythromycin	-	S. cohni cohni
10. W 10U - S. xylosus 11. W 12U - - S. warrerii 12. W 13U - - S. warrerii 13. W 11K Erythromycin Clindamycin - S. xylosus 14. S 2K Erythromycin - S. koosii 15. S 3K - - S. capitis 16. W 4K - - S. capitis 17. W 4K - - S. sylosus 18. W 5K Erythromycin - S. gridernidis 20. S 5K - - S. caprae 21. S 8K Cotrimoxarole + S. epidernidis 22. W 8K Erythromycin - S. hominis 24. W 10K Frythromycin - S. hominis 25. W 10K Erythromycin Doxycycline Ciprofloxacin - S. cohni ureal 28. S <td< td=""><td>9.</td><td>W</td><td>10U</td><td>Erythromycin Doxycycline</td><td>-</td><td>S. epidermidis</td></td<>	9.	W	10U	Erythromycin Doxycycline	-	S. epidermidis
11.W12US. warnerii12.W13U-+S. colvii colni13.W11KErythromycin Clindamycin-S. koosii14.S2KErythromycin-S. koosii15.S3KS. capitis16.W4KS. koosii17.W4KS. splosus18.W5KErythromycin-S. splosus19.W5KS. capitis20.S5KS. capitar21.SSKCortinoxazole+S. epidermidis22.W8KErythromycin-S. hoeminis23.W8KErythromycin-S. hoeminis24.W10KS. epidermidis25.W10KErythromycin-S. colni ireal26.S4CZS. colni ireal29.S7CZErythromycin Doxycycline Ciprofloxacin-S. colni ireal20.S10CZS. splosus31.S9CZCortinoxazole Gentamicin-S. splosus32.S11SErythromycin Cortimoxazole-S. splosus33.S11SErythromycin Cortimoxazole-S. solminis26.S10CZS. hoeminis31. <td>10.</td> <td>W</td> <td>10U</td> <td>-</td> <td>-</td> <td>S. xylosus</td>	10.	W	10U	-	-	S. xylosus
12. W 13U - + S. cohni cohni 13. W 1K Erythromycin Clindamycin - S. xylosus 14. S 2K Erythromycin - S. kloosii 15. S 3K - - S. apitis 16. W 4K - - S. sopisis 17. W 4K - - S. sopisis 18. W 5K Erythromycin - S. sopisis 19. W 5K - - S. caprae 21. S 8K Cotrinoxazole + S. epidermidis 22. W 8K Erythromycin - S. haemolyticus 23. W 8K Erythromycin - S. hominis 24. W 10K Frythromycin - S. cohni ureal 25. W 10K Erythromycin Cotrinoxacin - S. cohni ureal 26. S 4CZ - - S. cohni ureal 28.	11.	W	12U	-	-	S. warnerii
13. W 1K Erythromycin	12.	W	13U	-	+	S. cohni cohni
14. S 2K Erythromycin - S. kloosii 15. S 3K - - S. capitis 16. W 4K - - S. capitis 16. W 4K - - S. capitis 17. W 4K - - S. kominis 18. W 5K Erythromycin - S. epidermidis 19. W 5K - - S. warnerii 20. S 5K - - S. kaemolyticus 21. S 8K Cotrimoxazole + S. epidermidis 22. W 8K Erythromycin - S. haemolyticus 23. W 8K Erythromycin - S. hominis 24. W 10K - - S. epidermidis 25. W 10K Frythromycin - S. epidermidis 26. S 4CZ - - S. cohni ureal 28. S 7CZ <	13.	W	1K	Erythromycin Clindamycin	-	S. xylosus
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16. W 4K - S. hominis 17. W 4K - S. xylosus 18. W 5K Erythromycin - S. epidermidis 19. W 5K - S. epidermidis 20. S 5K - - S. caprae 21. S 8K Cotrimoxazole + S. epidermidis 22. W 8K Erythromycin - S. hominis 23. W 8K Erythromycin - S. hominis 24. W 10K - - S. epidermidis 25. W 10K Erythromycin - S. cohni ireal 26. S 4CZ - - S. cohni ireal 27. S 6CZ Erythromycin Doxycycline Ciprofloxacin - S. cohni ireal 28. S 7CZ Erythromycin - S. cohni ireal 30. S 9CZ Cotrimoxazole Gentamicin - S. spidermidis 31. S	15.	S	3K	-	-	S. capitis
17.W4KS. xylosus18.W5KErythromycin-S. epidermidis19.W5KS. caprae20.S5KS. caprae21.S8KCotrimoxazole+S. epidermidis22.W8KErythromycin-S. haemolyticus23.W8KErythromycin-S. hominis24.W10KS. epidermidis25.W10KErythromycin-S. hominis26.S4CZS. equorum27.S6CZErythromycin Doxycycline Ciprofloxacin-S. cohni ureal28.S7CZErythromycin-S. cohni ureal29.S7CZErythromycin-S. cohni ureal30.S9CZS. cohni ureal31.S9CZCotrimoxazole Gentamicin-S. saprophyticus33.S1SErythromycin Cotrimoxazole-S. saprophyticus34.W15Erythromycin-S. hominis35.W2SErythromycin-S. hominis36.S2S-+S. hominis37.W2SErythromycin-S. haemolyticus38.M2SErythromycin Clindamycin Doxycycline-S. haemolyticus39.S4S- </td <td>16.</td> <td>W</td> <td>4K</td> <td>-</td> <td>_</td> <td>S. hominis</td>	16.	W	4K	-	_	S. hominis
18.W5KErythromycin-S. epidermidis19.W5KS. warnerii20.S5KS. warnerii21.S8KCotrimoxazole+S. cpidermidis22.W8KErythromycin-S. haemolyticus23.W8KErythromycin-S. haemolyticus24.W10KS. epidermidis25.W10KErythromycin-S. colminis26.S4CZS. equorum27.S6CZErythromycin Doxycycline Ciprofloxacin-S. colmi ureal28.S7CZErythromycin-S. colmi ureal29.S7CZErythromycin-S. colmi ureal30.S9CZS. epidermidis31.S9CZS. saprophyticus33.S11SErythromycin Cotrimoxazole-S. saprophyticus34.W18Erythromycin Cotrimoxazole-S. saprophyticus35.W25Erythromycin-S. colmi aloni37.W25Erythromycin Clindamycin Doxycycline-S. shoemolyticus38.W25Erythromycin Clindamycin Doxycycline-S. hoemolyticus39.S45Erythromycin-S. kloosii41.W45S. kloosii<	17.	W	4K	-	_	S. xylosus
19.W5KS. warnertii20.S5KS. caprae21.S8KCotrinoxazole+S. epidernidis22.W8KErythromycin-S. haemolyticus23.W8KErythromycin-S. hominis24.W10KS. epidernidis25.W10KErythromycin-S. hominis26.S4CZS. epidernidis27.S6CZErythromycin Doxycycline Ciprofloxacin-S. cohni ureal28.S7CZErythromycin-S. cohni ureal29.S7CZErythromycin-S. cohni ureal30.S9CZS. hominis31.S9CZCotrimoxazole Gentamicin-S. saprophyticus33.S10CZS. saprophyticus34.W1SErythromycin Cotrimoxazole-S. saprophyticus35.W2SErythromycin-S. hominis37.W2SErythromycin-S. hoemolyticus38.W2SErythromycin-S. haemolyticus39.S4SErythromycin-S. haemolyticus39.S4SErythromycin-S. haemolyticus41.W4SS. haemolyticus43.W6SEryth	18.	W	5K	Erythromycin	_	S. epidermidis
20.S $5K$ $ -$ S. caprae21.S8KCotrimoxazole+S. epidermidis22.W8KErythromycin-S. haemolyticus23.W8KErythromycin-S. hominis24.W10K-S. epidermidis25.W10KErythromycin-S. hominis26.S4CZS. equorum27.S6CZErythromycin Doxycycline Ciprofloxacin-S. cohni ureal28.S7CZErythromycin-S. cohni ureal29.S7CZErythromycin-S. cohni ureal30.S9CZS. cohni ureal31.S9CZS. sepidermidis32.S10CZS. sepidermidis33.S15Erythromycin Cotrimoxazole-S. saprophyticus34.W18Erythromycin-S. cohni cohni35.W25Erythromycin-S. hominis37.W25Erythromycin Cindamycin Doxycycline-S. hominis38.W25Erythromycin-S. haemolyticus38.W25Erythromycin-S. haemolyticus39.S45Erythromycin-S. haemolyticus41.W48S. haemolyticus43.W68Ery	19.	W	5K	-	_	S. warnerii
21.S8KCotrimoxazole+S. epidermidis22.W8KErythromycin-S. haemolyticus23.W8KErythromycin-S. hominis24.W10KS. epidermidis25.W10KErythromycin-S. hominis26.S4CZS. equorum27.S6CZErythromycin Doxycycline Ciprofloxacin-S. cohni ureal28.S7CZErythromycin-S. cohni ureal29.S7CZErythromycin-S. cohni ureal30.S9CZS. hominis31.S9CZCotrimoxazole Gentamicin-S. epidermidis32.S10CZS. saprophyticus33.S15Erythromycin Cotrimoxazole-S. saprophyticus34.W15Erythromycin-S. cohni cohni35.W25Erythromycin-S. haemolyticus38.W25Erythromycin Clindamycin Doxycycline-S. haemolyticus39.S45Erythromycin-S. haemolyticus40.W45S. haemolyticus41.W68Erythromycin-S. equitis43.W68Erythromycin-S. equitis44.S75Erythromycin Clindamycin-S. haemolyticus<	20.	S	5K	_	_	S. caprae
22. W 8K Erythromycin - S. haemolyticus 23. W 8K Erythromycin - S. hominis 24. W 10K - S. bominis 25. W 10K Erythromycin - S. bominis 26. S 4CZ - - S. cohni ureal 27. S 6CZ Erythromycin Doxycycline Ciprofloxacin - S. cohni ureal 28. S 7CZ Erythromycin - S. cohni ureal 29. S 7CZ Erythromycin - S. cohni ureal 30. S 9CZ - - S. hominis 31. S 9CZ - - S. suppotyticus 33. S 18 Erythromycin Cotrimoxazole - S. suppotyticus 34. W 15 Erythromycin - S. cohni i cohni 35. W 25 Erythromycin - S. suppotyticus 36. S 25 - + S. hoemolyticus <	21.	S	8K	Cotrimoxazole	+	S. epidermidis
23.W8KErythromycin-S. hominis24.W10KS. epidermidis25.W10KErythromycin-S. hominis26.S4CZS. equorum27.S6CZErythromycin Doxycycline Ciprofloxacin-S. cohni ureal28.S7CZErythromycin-S. cohni ureal29.S7CZErythromycin-S. cohni ureal30.S9CZS. epidermidis31.S9CZCotrimoxazole Gentamicin-S. epidermidis32.S10CZS. saprophyticus33.S15Erythromycin-S. cohni cohni35.W25Erythromycin-S. cohni cohni36.S25-+S. hominis37.W25Erythromycin-S. haemolyticus38.W28Erythromycin Clindamycin Doxycycline-S. haemolyticus39.S45Erythromycin-S. haemolyticus41.W45S. haemolyticus43.W65Erythromycin-S. cohni is44.S75Erythromycin Clindamycin-S. haemolyticus45.W88Erythromycin Clindamycin-S. cohni is46.W95Cefoxitin Erythromycin Cotrimoxazole Doxycycline+ <td>22.</td> <td>W</td> <td>8K</td> <td>Erythromycin</td> <td>-</td> <td>S. haemolyticus</td>	22.	W	8K	Erythromycin	-	S. haemolyticus
24. W 10K - Sepidermidis 25. W 10K Erythromycin - S. hominis 26. S 4CZ - - S. equorum 27. S 6CZ Erythromycin Doxycycline Ciprofloxacin - S. cohni ureal 28. S 7CZ Erythromycin - S. cohni ureal 29. S 7CZ Erythromycin - S. cohni ureal 30. S 9CZ - - S. hominis 31. S 9CZ - - S. hominis 32. S 10CZ - - S. saprophyticus 33. S 1S Erythromycin Cotrimoxazole - S. cohni cohni 34. W 1S Erythromycin - S. cohni cohni 35. W 2S Erythromycin - S. haemolyticus 36. S 2S Frythromycin Clindamycin Doxycycline - S. haemol	23.	W	8K	Erythromycin	-	S. hominis
25.W10KErythromycin-S. hominis26.S4CZS. equorum27.S6CZErythromycin Doxycycline Ciprofloxacin-S. cohni ureal28.S7CZErythromycin-S. cohni ureal29.S7CZErythromycin-S. cohni ureal30.S9CZS. hominis31.S9CZCotrinoxazole Gentamicin-S. epidermidis32.S10CZS. saprophyticus33.S1SErythromycin Cotrimoxazole-S. saprophyticus34.W1SErythromycin-S. cohni is35.W2SErythromycin-S. warnerii36.S2S-+S. hominis37.W2SErythromycin-S. haemolyticus38.W2SErythromycin Clindamycin Doxycycline-S. haemolyticus39.S4SErythromycin-S. haemolyticus41.W4SS. haemolyticus42.W5SErythromycin-S. capitis43.W6SErythromycin-S. capitis44.S7SErythromycin Clindamycin-S. kaemolyticus45.W8SErythromycin Clindamycin-S. equorum46.W9SCefoxitin Erythromycin Cotrimoxazole Doxycyclin	24.	W	10K	-	-	S. epidermidis
26.S $4CZ$ -S. equorum27.S $6CZ$ Erythromycin Doxycycline Ciprofloxacin-S. cohni ureal28.S $7CZ$ Erythromycin-S. cohni ureal29.S $7CZ$ Erythromycin-S. cohni ureal30.S $9CZ$ S. hominis31.S $9CZ$ Cotrimoxazole Gentamicin-S. epidermidis32.S $10CZ$ S. saprophyticus33.S18Erythromycin Cotrimoxazole-S. saprophyticus34.W18Erythromycin-S. cohni cohni35.W2SErythromycin-S. hominis36.S2S-+S. hominis37.W2SErythromycin Clindamycin Doxycycline-S. simulans39.S4SErythromycin-S. haemolyticus40.W4SS. haemolyticus41.W4SS. haemolyticus42.W5SErythromycin-S. capitis43.W68Erythromycin-S. warnerii44.S78Erythromycin Clindamycin-S. hominis45.W88Erythromycin Clindamycin-S. hominis46.W98Cefoxitin Erythromycin Clindamycin-S. echoridermidis	25.	W	10K	Erythromycin	-	S. hominis
27.S6CZErythromycin Doxycycline Ciprofloxacin-S. cohni ureal28.S7CZErythromycin-S. cohni ureal29.S7CZErythromycin-S. cohni ureal30.S9CZS. hominis31.S9CZCotrimoxazole Gentamicin-S. epidermidis32.S10CZS. saprophyticus33.S1SErythromycin Cotrimoxazole-S. saprophyticus34.W1SErythromycin-S. cohni cohni35.W2SErythromycin-S. hominis36.S2S-+S. hominis37.W2SErythromycin Doxycycline-S. simulans38.W2SErythromycin Clindamycin Doxycycline-S. kaemolyticus40.W4SS. kloosii41.W4SS. kloosii42.W5SErythromycin-S. capitis43.W6SErythromycin-S. warnerii44.S7SErythromycin Clindamycin Cotrimoxazole Doxycycline-S. equorum46.W9SCefoxitin Erythromycin Cotrimoxazole Doxycycline+S. cohni identi	26.	S	4CZ	-	_	S. equorum
28.S7CZErythromycin-S. cohni ureal29.S7CZErythromycin-S. cohni ureal30.S9CZS. hominis31.S9CZCotrimoxazole Gentamicin-S. epidermidis32.S10CZS. saprophyticus33.S15Erythromycin Cotrimoxazole-S. saprophyticus34.W15Erythromycin-S. cohni cohni35.W2SErythromycin-S. warnerii36.S2S-+S. hominis37.W2SErythromycin Clindamycin Doxycycline-S. simulans38.W2SErythromycin Clindamycin Doxycycline-S. haemolyticus40.W4SS. kloosii41.W4SS. kloosii42.W5SErythromycin-S. warnerii43.W6SErythromycin-S. hominis44.S7SErythromycin Clindamycin-S. hominis45.W8SErythromycin-S. cohni cohni46.W9SCefoxitin Erythromycin Cotrimoxazole Doxycycline+S. cohni cohni	27.	S	6CZ	Erythromycin Doxycycline Ciprofloxacin	-	S. cohni ureal
29.S7CZFrythromycin-S. cohni ureal30.S9CZS. hominis31.S9CZCotrimoxazole Gentamicin-S. epidermidis32.S10CZS. xylosus33.S1SErythromycin Cotrimoxazole-S. saprophyticus34.W1SErythromycin-S. cohni cohni35.W2SErythromycin-S. warnerii36.S2S-+S. hominis37.W2SErythromycin Clindamycin Doxycycline-S. haemolyticus38.W2SErythromycin Clindamycin Doxycycline-S. haemolyticus39.S4SErythromycin-S. kloosii41.W4SS. kloosii42.W5SErythromycin-S. warnerii43.W68Erythromycin-S. warnerii44.S75Erythromycin Clindamycin Cotrimoxazole Doxycycline-S. hominis45.W88Erythromycin Cotrimoxazole Doxycycline+S. cohni cohni46.W98Cefoxitin Erythromycin Cotrimoxazole Doxycycline+S. cohni cohni	28.	S	7CZ	Erythromycin	_	S. cohni ureal
30.S9CZ-S. hominis31.S9CZCotrimoxazole Gentamicin-S. epidermidis32.S10CZ-S. sylosus33.S1SErythromycin Cotrimoxazole-S. saprophyticus34.W1SErythromycin-S. cohni cohni35.W2SErythromycin-S. hominis36.S2S-+S. hominis37.W2SErythromycin-S. haemolyticus38.W2SErythromycin Clindamycin Doxycycline-S. simulans39.S4SErythromycin-S. haemolyticus40.W4SS. kloosii41.W4SS. kloosii43.W68Erythromycin-S. capitis43.W68Erythromycin-S. capitis44.S75Erythromycin Clindamycin-S. hominis45.W85Erythromycin Clindamycin-S. cohni cohni46.W95Cefoxitin Erythromycin Cotrimoxazole Doxycycline+S. cohni cohni47.W105Erythromycin-S. cohni cohni	29.	S	7CZ	Erythromycin	_	S. cohni ureal
31.S9CZCotrimoxazole Gentamicin-S. epidermidis32.S10CZS. xylosus33.S1SErythromycin Cotrimoxazole-S. saprophyticus34.W1SErythromycin-S. cohni cohni35.W2SErythromycin-S. warnerii36.S2S-+S. hominis37.W2SErythromycin-S. haemolyticus38.W2SErythromycin Clindamycin Doxycycline-S. simulans39.S4SErythromycin-S. haemolyticus40.W4SS. kloosii41.W4SS. kloosii43.W6SErythromycin-S. capitis43.W6SErythromycin-S. karnerii44.S7SErythromycin Clindamycin-S. hominis45.W8SErythromycin Clindamycin-S. cohni cohni46.W9SCefoxitin Erythromycin Cotrimoxazole Doxycycline+S. cohni cohni	30.	S	9CZ	-	_	S. hominis
32.S10CZ-S. xylosus33.S1SErythromycin Cotrimoxazole-S. saprophyticus34.W1SErythromycin-S. cohni cohni35.W2SErythromycin-S. warnerii36.S2S-+S. hominis37.W2SErythromycin-S. haemolyticus38.W2SErythromycin Clindamycin Doxycycline-S. simulans39.S4SErythromycin-S. haemolyticus40.W4SS. haemolyticus41.W4SS. kloosii42.W5SErythromycin-S. capitis43.W6SErythromycin-S. warnerii44.S7SErythromycin Clindamycin-S. hominis45.W8SErythromycin Clindamycin-S. hominis46.W9SCefoxitin Erythromycin Cotrimoxazole Doxycycline+S. cohni cohni47.W10SErythromycin-S. epidermidis	31.	S	9CZ	Cotrimoxazole Gentamicin	_	S. epidermidis
33.S1SErythromycin Cotrimoxazole-S. saprophyticus34.W1SErythromycin-S. cohni cohni35.W2SErythromycin-S. cohni cohni36.S2S-+S. hominis37.W2SErythromycin-S. haemolyticus38.W2SErythromycin Clindamycin Doxycycline-S. simulans39.S4SErythromycin-S. haemolyticus40.W4SS. kloosii41.W4SS. haemolyticus42.W5SErythromycin-S. capitis43.W6SErythromycin-S. warnerii44.S7SErythromycin Clindamycin-S. hominis45.W8SErythromycin-S. hominis46.W9SCefoxitin Erythromycin Cotrimoxazole Doxycycline+S. cohni cohni47.W10SErythromycin-S. epidermidis	32.	S	10CZ	_	_	S. xvlosus
34.W1SErythromycin-S. colni colni35.W2SErythromycin-S. warnerii36.S2S-+S. hominis37.W2SErythromycin-S. haemolyticus38.W2SErythromycin Clindamycin Doxycycline-S. simulans39.S4SErythromycin-S. haemolyticus40.W4SS. kloosii41.W4SS. kloosii42.W5SErythromycin-S. capitis43.W6SErythromycin-S. warnerii44.S7SErythromycin Clindamycin-S. hominis45.W8SErythromycin Clindamycin-S. equorum46.W9SCefoxitin Erythromycin Cotrimoxazole Doxycycline+S. cohni cohni47.W10SErythromycin-S. epidermidis	33.	S	15	Ervthromycin Cotrimoxazole	_	S. saprophyticus
35.W28Erythromycin-S. warnerii36.S2S-+S. hominis37.W28Erythromycin-S. haemolyticus38.W28Erythromycin Clindamycin Doxycycline-S. simulans39.S48Erythromycin-S. haemolyticus40.W48S. kloosii41.W48S. haemolyticus42.W58Erythromycin-S. haemolyticus43.W68Erythromycin-S. capitis44.S75Erythromycin-S. hominis45.W88Erythromycin Clindamycin-S. equorum46.W98Cefoxitin Erythromycin Cotrimoxazole Doxycycline+S. cohni cohni47.W108Erythromycin-S. enidermidis	34.	W	15	Erythromycin	_	S. cohni cohni
36.S2S-+S. hominis37.W2SErythromycin-S. haemolyticus38.W2SErythromycin Clindamycin Doxycycline-S. simulans39.S4SErythromycin-S. haemolyticus40.W4SS. kloosii41.W4SS. haemolyticus42.W5SErythromycin-S. haemolyticus43.W6SErythromycin-S. capitis44.S7SErythromycin Clindamycin-S. hominis45.W8SErythromycin Clindamycin-S. equorum46.W9SCefoxitin Erythromycin Cotrimoxazole Doxycycline+S. cohni cohni47.W10SErythromycin-S. epidermidis	35.	W	28	Erythromycin	_	S. warnerii
37.W2SErythromycin-S. haemolyticus38.W2SErythromycin Clindamycin Doxycycline-S. simulans39.S4SErythromycin-S. haemolyticus40.W4SS. kloosii41.W4SS. haemolyticus42.W5SErythromycin-S. haemolyticus43.W6SErythromycin-S. warnerii44.S7SErythromycin-S. hominis45.W8SErythromycin Clindamycin-S. equorum46.W9SCefoxitin Erythromycin Cotrimoxazole Doxycycline+S. cohni cohni47.W10SErythromycin-S. epidermidis	36.	S	2.5	_	+	S. hominis
38. W 2S Erythromycin Clindamycin Doxycycline - S. simulans 39. S 4S Erythromycin - S. haemolyticus 40. W 4S - - S. kloosii 41. W 4S - - S. haemolyticus 42. W 5S Erythromycin - S. haemolyticus 43. W 6S Erythromycin - S. warnerii 44. S 7S Erythromycin Clindamycin - S. hominis 45. W 8S Erythromycin Clindamycin - S. equorum 46. W 9S Cefoxitin Erythromycin Cotrimoxazole Doxycycline + S. cohni cohni 47. W 10S Erythromycin - S. epidermidis	37.	W	28	Erythromycin	_	S. haemolyticus
39. S 4S Erythromycin - S. haemolyticus 40. W 4S - - S. kloosii 41. W 4S - - S. haemolyticus 42. W 5S Erythromycin - S. haemolyticus 43. W 6S Erythromycin - S. warnerii 44. S 7S Erythromycin - S. hominis 45. W 8S Erythromycin Clindamycin - S. equorum 46. W 9S Cefoxitin Erythromycin Cotrimoxazole Doxycycline + S. cohni cohni 47. W 10S Erythromycin - S. epidermidis	38.	W	2.5	Erythromycin Clindamycin Doxycycline	_	S. simulans
40.W4SS. kloosii41.W4SS. kloosii42.W5SErythromycin-S. capitis43.W6SErythromycin-S. warnerii44.S7SErythromycin-S. hominis45.W8SErythromycin Clindamycin-S. equorum46.W9SCefoxitin Erythromycin Cotrimoxazole Doxycycline+S. cohni cohni47.W10SErythromycin-S. epidermidis	39.	S	45	Erythromycin	_	S. haemolyticus
41. W 4S - S. haemolyticus 42. W 5S Erythromycin - S. capitis 43. W 6S Erythromycin - S. warnerii 44. S 7S Erythromycin - S. hominis 45. W 8S Erythromycin Clindamycin - S. equorum 46. W 9S Cefoxitin Erythromycin Cotrimoxazole Doxycycline + S. cohni cohni 47. W 10S Erythromycin - S. epidermidis	40	W	45	_	_	S kloosii
42. W 5S Erythromycin - S. capitis 43. W 6S Erythromycin - S. warnerii 44. S 7S Erythromycin - S. hominis 45. W 8S Erythromycin Clindamycin - S. equorum 46. W 9S Cefoxitin Erythromycin Cotrimoxazole Doxycycline + S. cohni cohni 47. W 10S Erythromycin - S. epidermidis	41	W	48		_	S. haemolvticus
43. W 6S Erythromycin - S. warnerii 44. S 7S Erythromycin - S. hominis 45. W 8S Erythromycin Clindamycin - S. equorum 46. W 9S Cefoxitin Erythromycin Cotrimoxazole Doxycycline + S. cohni cohni 47. W 10S Erythromycin - S. epidermidis	42	W	55	Erythromycin	_	S capitis
44. S 7S Erythromycin - S. hominis 45. W 8S Erythromycin Clindamycin - S. equorum 46. W 9S Cefoxitin Erythromycin Cotrimoxazole Doxycycline + S. cohni cohni 47. W 10S Erythromycin - S. epidermidis	43	W	65	Erythromycin	_	S. warnerii
45. W 8S Erythromycin Clindamycin - S. equorum 46. W 9S Cefoxitin Erythromycin Cotrimoxazole Doxycycline + S. cohni cohni 47. W 10S Erythromycin - S. epidermidis	44	S	75	Erythromycin	_	S. hominis
46. W 98 Cefoxitin Erythromycin Cotrimoxazole Doxycycline + S. cohni cohni 47. W 108 Erythromycin - S. epidermidis	45	W	85	Erythromycin Clindamycin	_	S equorum
47. W 10S Erythromycin – S epidermidis	46	W	95	Cefoxitin Erythromycin Cotrimoxazole Doxycycline	+	S. cohni cohni
	47.	W	105	Erythromycin		S. epidermidis

Short communication

No.	Collection date (winter/summer)	Sampling site	Antibiotic resistance	mecA gene (+/-)	Species
48.	S	105	-	+	S. haemolyticus
49.	W	1G	Clindamycin	-	S. haemolyticus
50.	W	2G	Cefoxitin Erythromycin	+	S. hominis
51.	W	2G	Erythromycin	-	S. hominis
52.	S	2G	Cefoxitin	+	S. haemolyticus
53.	S	3G	Erythromycin	-	S. epidermidis
54.	W	4G	Erythromycin	-	S. haemolyticus
55.	W	4G	Erythromycin	-	S. haemolyticus
56.	S	5G	-	-	S. capitis
57.	W	6G	Erythromycin	-	S. warnerii
58.	W	6G	-	-	S. auricularis
59.	S	7G	Erythromycin	-	S. haemolyticus
60.	S	8G	Erythromycin	-	S. cohni cohni
61.	S	9G	Cefoxitin Erythromycin Cotrimoxazole	+	S. simulans
62.	S	10G	Erythromycin	-	S. epidermidis
63.	W	10G	Erythromycin	-	S. hominis
64.	S	11G	Erythromycin Doxycycline	+	S. haemolyticus
65.	W	11G	-	-	S. capitis
66.	Positive control		Cefoxitin	+	S. aureus MR 3
67.	Negative control		-	-	S. aureus ATCC 25923

Table III continued

that the absence of methicillin-resistant staphylococci in outdoor air, in contrast to the indoor air, may be related to the high population density of the examined premises. It is therefore well known that people are the primary source of microbiological contamination indoors (Gołofit-Szymczak and Skowron, 2005).

In conclusion, the air in public premises is a reservoir of numerous, various *Staphylococcus* species, that are resistant to multiple antibiotics, including cefoxitin, which indicates their methicillin resistance. PCR detection revealed that the strains that did not exhibit methicillin resistance in phenotypic analysis, may possess the *mecA* gene, responsible for the formation of resistance mechanisms. Therefore, it is necessary to monitor the abundance of potentially pathogenic bacteria in the environment, as they may become an important but frequently ignored etiological infection agent in humans.

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