

Group A Streptococcus among Aurora University Students

Elizabeth Stark
Aurora University

Abstract

The purpose of this study is to determine the prevalence of the bacterium *Streptococcus pyogenes* among residents and commuters in the Aurora University community. Strep throat is a serious problem that is experienced by people throughout the world. It is most common among school age children but everyone is susceptible to the illness. Student's throats' were swabbed and then the samples were plated on blood agar plates. If beta-hemolytic bacteria were present, the sample was then run through a rapid strep test to determine if *S. pyogenes* caused the hemolysis. We found 55% of those tested were carriers of the *Streptococcus* bacterium. Probabilities, relative risks, and odds ratios were also calculated for the various groups within the study.

S. pyogenes, the bacterium that causes strep throat, is a member of the Group A Streptococcus family. It is a facultatively anaerobic, gram positive coccus that occurs in chains or pairs¹. *S. pyogenes* exhibits β -hemolysis on blood agar. β -hemolysis occurs when the blood cells around the bacterial colony are completely lysed. It causes infections such as pharyngitis, scarlet fever, cellulitis, necrotizing fasciitis, and streptococcal toxic shock syndrome. Infections from *S. pyogenes* are traditionally treated with penicillin or other antibiotics from the penicillin family. Streptococcus infection can also lead to sequelae such as rheumatic fever and glomerulonephritis². According to the Centers for Disease Control and Prevention, 10%-15% of patients with invasive group A streptococcal disease die from their infection³. It is spread by direct contact through respiratory secretions and fomites. This means it can be transmitted by sharing cups, pillows, toothbrushes, etc.

It is estimated that between 5-15% of normal individuals harbor the bacterium, usually in the respiratory tract⁴. Being a part of the normal flora within the body, *S.*

pyogenes is an opportunistic pathogen. Strep throat is the most common bacterial infection in the throat⁵. Those with strep may experience symptoms such as a sore/red throat, difficulty swallowing, white patches on the tonsils, swollen lymph nodes, fever and headache⁶. Strep is most common among children because they are in close contact with each other on a daily basis at school. It is common for strep infections to occur less frequently in an individual after they complete high school, but the incidence of strep throat remains high for students in college.

Methods

Thirty eight undergraduate students enrolled in biology classes at Aurora University were screened. All participants were age 18 or over. Participants filled out a questionnaire that provided us with basic background information such as whether they were a resident or commuter, gender, age, and number of hours worked per week. After the questionnaire was completed participants were called into a private room to take the samples. Each participant's throat was swabbed on the tonsils and back of the throat. Samples were immediately plated on a 5% sheep blood agar plate to screen for β -hemolytic bacterium (Figure 1). The plates were pre-labeled with a random number which was also written on the participant's questionnaire to match the data with the sample. Each participant received their number so they could collect their results at the end. The plates were placed in an incubator at 37^oC for 24 hours to allow for bacterial growth. A plate was considered positive for presence of β -hemolytic bacterium if the blood cells were lysed (Figures 2 & 3). If the plate was positive, a rapid strep test was run for the sample to confirm the presence of *S. pyogenes*. The SLIDEX Strepto Plus A kit,

a polystyrene microparticle agglutination test, was used. The rapid test was positive if agglutination occurred between the latex beads and the strep antigens (Figure 4). Once the tests were completed and analyzed the results were placed in envelopes labeled with the subject's number and were given to the participants. This coding system used maintained participant anonymity and privacy; the teachers and researchers did not know the results of each participant. If the results were positive then they were directed to see either the school nurse or a personal physician for follow up.

Universal health and safety precautions were followed when collecting the samples. Precautions included the use of gloves and sterile swabs while collecting and use of proper disposal and autoclaving of contaminated materials. Gloves were changed if they became contaminated.

Results were analyzed and calculated the probabilities, odds ratio and confidence intervals were calculated for the different groupings. (Table 1).



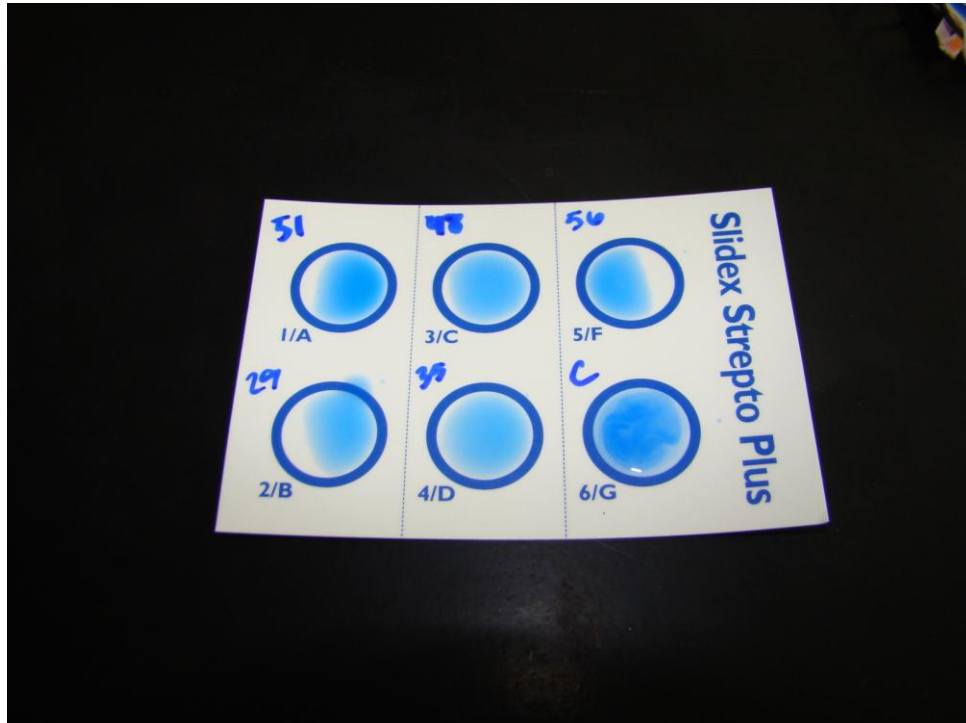
[Figure 1] Plating a sample on blood agar plate
(M. Zelman)



[Figure 2] β -hemolytic streptococcus vs. uninoculated blood agar plate
(E. Stark)



[Figure 3] β -hemolytic streptococcus vs. non- β -hemolytic bacteria
(E. Stark)



[Figure 4] Slidex rapid strep test positive results
(E. Stark)

Results

A total of 38 students were sampled in this study, including 16 residents, 30 females, and 15 students age 19 and under. Ages ranged from 18 to 44. None of the participants had the white patches typical of strep throat. All of the positive blood agar plates tested positive with the rapid strep test. Overall 55% had *S. pyogenes*.

Calculating the relative risks showed that commuters were 10% more likely to carry strep. Males were 10% less likely to have the streptococcus bacteria while females were 4% more likely to carry the bacterium. Those age 19 and under were 22% more likely to have strep as well. Table 1 reports the relative risk for populations as well as the confidence intervals.

Table 1
Probabilities, Relative Risks, Odds Ratios

	N	Positive Strep Test	Probability of Strep	Relative Risk	Odds Ratio	Confidence Interval
Whole Population	38	21	.55	1.0	-	-
Residents	16	8	.50	0.91	0.69	0.19 – 2.45
Commuters	22	13	.59	1.1	-	-
Females	30	17	.57	1.04	1.32	0.29 – 5.86
Males	8	4	.50	0.91	-	-
Age 19 and under	15	10	.67	1.22	0.66	0.59 – 8.11
Above the age of 19	23	11	.48	0.87	-	-

Discussion

This study found that 55% of the participants had *S. pyogenes*. This was a much higher rate than expected. There were numerical differences in risk for females and those aged 19 and under but they weren't statistically significant. Commuters were 10% more

likely to carry strep than the population as a whole. Participants 19 and under were 22% more likely to have strep and females 4% more likely to carry the bacterium. While elevated relative risks were seen for these groups, the risks were nonsignificant because all of the confidence intervals calculated overlapped 1.

A higher rate of *S. pyogenes* in the commuter group was found, which was surprising, since it was expected that the residents would have a higher incidence because they share close living quarters. It is unclear why commuters tested positive more than the residents, but it may be because they live with small children that bring the bacterium home. Those age 19 and under also had a higher rate than those above the age of 19. It is also not clear why this trend occurred, but there were more residents in this group than commuters.

The population numbers were skewed due to low participation which may have had an impact on the statistical analysis.

A very high rate of *S. pyogenes* overall was observed. This could be due to technical error from false positives through the rapid strep test. The SLIDEX kit has a 99.2% concordance compared to identification and classification of streptococci according to the Lancefield system. It also has a 94.2% correlation compared with a commercial kit.

Conclusion

This study produced an unexpectedly high rate of carriers for *S. pyogenes*. The results showed that commuters, females and those aged 19 and under had a greater risk

for carrying *S. pyogenes* than others. Cases of strep throat caused by *S. pyogenes* are not reported at the county, state and national levels, so the number of cases found each year is unknown. This would be good information to compare with these results to see if a particularly high rate of incidence occurred at Aurora University. A larger sample size would also have been helpful. Perhaps a larger population would reveal different trends. Finally, are college students at a greater risk for contracting illnesses from *S. pyogenes*? These results would suggest that they have a good chance of getting not only strep throat, but other infections caused by Group A streptococcus such as necrotizing fasciitis, otitis media or sinusitis.

References

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