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RESEARCH NOTE

Colonisation rates of *Streptococcus pyogenes* and *Staphylococcus aureus* in the oropharynx of a young adult population

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ABSTRACT

There are very few reports on the rates of oropharyngeal colonisation by *Streptococcus pyogenes* and *Staphylococcus aureus* in young adults. The present study found colonisation rates of 9.6% and 26.2%, respectively. These rates are two-fold higher than historical rates, indicating that these organisms may be more prevalent than thought previously. This finding may have important clinical consequences in certain populations, and requires further investigation.

Keywords Colonisation, oropharynx, pharyngitis, *Streptococcus pyogenes*, *Staphylococcus aureus*, young adults

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Numerous studies have investigated the presence of pathogenic bacteria in the oropharynx of individuals with symptoms of pharyngitis, but little is known about the prevalence of such organisms in the asymptomatic young adult population. Both *Streptococcus pyogenes* and *Staphylococcus aureus* may be present as part of the

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oropharyngeal flora in apparently healthy individuals, but are more likely to be pathogenic than other organisms recoverable from the oropharynx. A previous study found that the prevalence of *Strep. pyogenes* in the oropharynx of university students with acne who were using tetracycline antibiotics was higher than in individuals with acne who were not using antibiotics. Unexpectedly, the group who were not using antibiotics and did not have symptoms of an acute upper respiratory illness had *Strep. pyogenes* and *Staph. aureus* prevalence rates of 8.3% (4/48) and 29.8% (14/47), respectively [1]. These rates were higher than previously reported rates of oropharyngeal colonisation in asymptomatic individuals. For example, while *Strep. pyogenes* has been reported to occur in 1.3–50% of symptomatic individuals [2–4], this frequency is age-related and would have been expected to be <5% in the asymptomatic individuals studied [2,3]. Similarly, *Staph. aureus* has been found in the oropharynx of only 5–14% of healthy house physicians [5]. The findings from the previous study suggested that acne patients might have increased carriage rates of these organisms. Since the rates described above were reported nearly 20 years ago, the present study aimed to determine whether colonisation rates had changed and whether there were seasonal variations in the rates observed [6].

This was a cross-sectional study, approved by the institutional review board, in which students aged 18–27 years from a local university (University of Pennsylvania) had a single swab sample taken of their oropharynx. The age group was similar to that of individuals in the previous study [1]. In total, 87 subjects were recruited during the late winter/early spring of 2002, and 100 subjects were recruited during the autumn of 2002. Individuals were recruited through direct contact on campus, but were excluded if they had seen a physician for acne in the previous 12 months, or if they had been prescribed an oral, topical or ophthalmological antibiotic in the previous 6 months, or if they had more than ten cumulative acne lesions on facial examination. All subjects completed a questionnaire inquiring about the presence of upper respiratory illness or symptoms during the past 30 days. Individuals who were swabbed during the first period were not eligible to be swabbed during the second period.

The oropharynx of subjects was swabbed with a Culturette swab (BD Diagnostic Systems, Coc-

keysville, MD, USA) using the standard clinical technique. Each specimen was cultured within 24 h for *Strep. pyogenes* and *Staph. aureus* according to American Society of Microbiology and NCCLS guidelines [1]. Logistic regression and chi-square analyses were used to compare dichotomous variables and determine p values.

The overall prevalence of *Strep. pyogenes* and *Staph. aureus* was 9.6% (18/187) and 26.2% (49/187), respectively. In total, 52 individuals reported at least one symptom that could be consistent with pharyngitis. Therefore, the overall prevalence of *Strep. pyogenes* and *Staph. aureus* in asymptomatic individuals was 8.1% (11/135) and 26.6% (36/135), respectively. The prevalence of *Strep. pyogenes* was 11.5% (10/87) during the late winter/early spring, and 8% (8/100) during the autumn (p 0.42) (Table 1). The prevalence of *Staph. aureus* was 27.6% (24/87) during the late winter/early spring, and 25% (25/100) during the autumn (p 0.69) (Table 1).

Strep. pyogenes and *Staph. aureus* are two organisms that are not normally common inhabitants of the human oropharynx. *Strep. pyogenes* can cause pharyngitis, impetigo, necrotising fasciitis and rheumatic heart disease, while *Staph. aureus* is a causative agent of cutaneous, soft tissue and pulmonary disease. Most studies report asymptomatic carrier rates of <5% for *Strep. pyogenes* [2,3,7,8] and <15% for *Staph. aureus* [5] in young adults. Specifically, students at the University of Pennsylvania [7] and the University of Oslo [8] had *Strep. pyogenes* prevalence rates of 4% and 5.6%, respectively (although the latter study included both symptomatic and asymptomatic subjects). Qualitatively, the present results suggest that the students studied were nearly two-fold more likely to be colonised by *Strep. pyogenes* or *Staph. aureus*

Table 1. Prevalence of *Streptococcus pyogenes* and *Staphylococcus aureus* in the oropharynx of university students at two different time points

	<i>Strep. pyogenes</i> Prevalence in late winter/early spring (%)	Prevalence in autumn (%)	<i>Staph. aureus</i> Prevalence in late winter/early spring (%)	Prevalence in autumn (%)
All subjects	10/87 (11.5)	8/100 (8)	24/87 (27.6)	25/100 (25)
Subjects who reported no current illness but had recent symptoms	4/27 (14.8)	3/25 (12)	7/27 (25.9)	6/25 (24)
No reported illness	6/60 (10)	5/75 (6.7)	17/60 (28.3)	19/75 (25.3)

than would have been expected, and the prevalence rates in the institution appeared to have risen significantly since the previous study [7].

Seasonality has been suggested as a factor that determines *Strep. pyogenes* colonisation of the oropharynx [6,8,9]. However, when the historically reported high prevalence season (late winter/early spring) was compared with the low prevalence season (autumn), no significant association was found. However, it is important to note that these historical rates are those of symptomatic subjects, whereas the present study included both symptomatic and asymptomatic subjects. In addition, the present study was not powered to find a small difference in prevalence between the two seasons studied, and a difference of 3.5% (11.5–8.0%) is unlikely to be clinically significant.

Overall, the present study demonstrated that individuals of university age had increased carriage rates of *Strep. pyogenes* and *Staph. aureus* compared with previous reports [2,3,5,7]. The precise reasons for these increased carriage rates are unknown. These findings, and those from a previous study [1], indicate that *Strep. pyogenes* may now be more prevalent in the oropharynx in university age populations (both with and without acne) and in acne patients taking long-term antibiotics. This may impact the health status of both carriers and their close contacts. Given the increased concern about antibiotic overuse, as well as numerous reports of severe streptococcal diseases, these findings may have important public health implications with respect to the treatment and diagnosis of bacterial pharyngitis. Further investigation is required to elucidate the possible clinical significance.

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RESEARCH NOTE

Bacteriology of abdominal wounds in elective open colon surgery: a prospective study of 100 surgical wounds

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ABSTRACT

This article describes a prospective bacteriological study designed to assess the value of bacterial sampling during elective open colon surgery. Swabs of the subcutaneous tissue were taken after closure of the abdominal fascia, but before closure of the skin, in 100 patients during elective

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