

# Effect of a moustache on nasal *Staphylococcus aureus* colonisation and nasal cytology results in men

E SOYLU<sup>1</sup>, I ORHAN<sup>1</sup>, A ÇAKIR<sup>2</sup>, A İSTANBULLU<sup>3</sup>, G ALTIN<sup>1</sup>, R YILMAZER<sup>1</sup>,  
O F CALIM<sup>1</sup>

Departments of <sup>1</sup>Otolaryngology, Head and Neck Surgery, <sup>2</sup>Pathology, and <sup>3</sup>Microbiology, Medipol University Hospital, Istanbul, Turkey

## Abstract

**Objective:** This study compared the results of nasal *Staphylococcus aureus* carriage and nasal cytology in men with and without a moustache.

**Methods:** The study group comprised 118 adult men with a moustache, and the control group consisted of 123 adult men without a moustache. Samples were taken from the participants' right nasal cavity for cytology and from the left nasal cavity for microbiology.

**Results:** The results for *S aureus* were positive in 19.5 per cent ( $n = 23$ ) of participants with a moustache and in 20.3 per cent ( $n = 25$ ) of men without a moustache. This difference was not significant ( $p > 0.05$ ). However, nasal cytology revealed rich eosinophil clusters in participants with a moustache.

**Conclusion:** The presence or absence of a moustache had no effect on nasal *S aureus* colonisation. However, further research is needed to understand whether the presence of a moustache increases the risk of allergic or non-allergic rhinitis.

**Key words:** Staphylococcus Aureus; Nasal Cavity; Nasal Mucosa; Rhinitis

## Introduction

The anterior nares are the primary reservoirs of *Staphylococcus aureus*, which is a risk factor for the development of both community-acquired and nosocomial infections.<sup>1,2</sup> The rate of nasal carriage of *S aureus* strains ranges from 16.8 to 90 per cent;<sup>3–6</sup> thus, its presence may be considered a serious public health problem. Despite antibiotic therapy, staphylococcal infections occur frequently in hospitalised patients, often with severe consequences.<sup>3</sup> Therefore, medical staff, food industry employees, and those working in close contact with people should be periodically assessed regarding *S aureus* carriage.

In order to fully address this public health problem, it is important to elucidate whether the presence of a moustache affects nasal colonisation of *S aureus*. Therefore, this study assessed the effect of a moustache on nasal *S aureus* colonisation through nasal cytology and microbiology testing.

## Materials and methods

The study was approved by the local ethics committee of the University of Medipol. Verbal and written

informed consent was obtained from all participants. Between March and July 2013, 118 men with a moustache, aged 20–50 years old (study group), and 123 age-matched men without a moustache (control group) took part in the study. The participants in the study group had been wearing a moustache for at least one year, whereas the participants in the control group had shaved the hair in this region daily over the previous year. None of the participants had been hospitalised or treated with antibiotics in the previous three months. Furthermore, none were smokers, and none had any acute upper respiratory tract infection, chronic metabolic disease, immune insufficiency, significant nasal septal deviation or intravenous drug addiction.

Nasal swabs were taken from the right nasal cavity for cytology and from the left nasal cavity for microbiology. The swabbing was performed by anterior rhinoscopy, using a nasal speculum. The swab was soaked in saline before being inserted 1 cm deep into the left nostril and rotated five times. It was then immediately sent to the laboratory for microbiological assessment.<sup>7</sup> The cells in the right nostril were collected by swabbing

the mid part of the inferior turbinate.<sup>8</sup> The obtained cells were then dispersed on a slide, allowed to dry and sent for cytological analysis.

#### Microbiological assessment

The samples were inoculated in 5 per cent sheep blood agar and incubated for 24 hours at 37°C. Gram stain, catalase and coagulase tests were conducted. Positive cocci from the colonies proliferating in the media after 24 hours were identified as *S aureus*. Development of  $\beta$ -haemolysis was then determined. The Staphylase Test Kit (Oxoid™) was used to establish coagulase efficiency using saline as a negative control. The tube coagulase test was performed on the strains that had a negative coagulase test result and false negativity was excluded. Methicillin resistance was investigated via the Kirby–Bauer disc diffusion method on Muller Hinton agar using a 30  $\mu$ g cefoxitin disc; isolates with a zone diameter of 21 mm or less were considered to be methicillin-resistant *S aureus* (MRSA).<sup>9</sup>

#### Cytological assessment

The smears were stained using the May–Grünwald–Giemsa stain (Fast Color Kit; DDK Italia, Milan, Italy) and closed with the lamella. The presence of eosinophils, neutrophils and mast cells was assessed under light microscopy, and classified as either existent or non-existent. In addition, a semi-quantitative assessment was performed by scoring no cells as 0, single and multiple cells as 1, and cell-rich clusters as 2.

#### Statistical evaluation

The Number Cruncher Statistical System (2007) and Power Analysis and Sample Size (2008) statistical software programs (NCSS, Kaysville, Utah, USA) were used for the statistical analyses. The Student's *t*-test was employed to compare the parameters showing normal distribution, and to provide descriptive statistical data (means, standard deviations, frequencies and ratios). Pearson's chi-square test and Yates' continuity correction test were utilised to compare the qualitative data. Significance was assessed at the level of  $p < 0.05$ .

The power analysis indicated that the number of samples required for 80 per cent power, with an  $\alpha$  value of 0.05, was 186, when a  $\Delta$  value of 15 per cent was used for the nasal cytology eosinophil scores. The minimum expected culture growth rate was 45 per cent.

## Results

The study comprised 241 participants, 49 per cent ( $n = 118$ ) of whom had a moustache and 51 per cent ( $n = 123$ ) did not. The mean ages of the participants in the study group and control group were  $33.8 \pm 9$  years and  $34.1 \pm 8.4$  years, respectively ( $p > 0.05$ ) (Figure 1).

Overall, *S aureus* bacteria were detected in 19.9 per cent ( $n = 48$ ) of the participants. The *S aureus* carrier

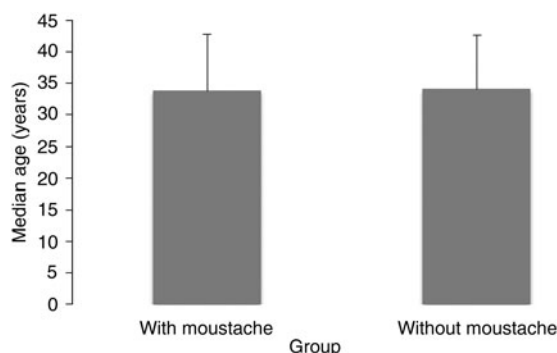


FIG. 1

Age distribution of participants with or without a moustache.

<i>S aureus</i> carriage results	Group		$p^\ddagger$
	With moustache ( $n$ (%))*	Without moustache ( $n$ (%)) <sup>†</sup>	
Negative	95 (80.5)	98 (79.7)	0.874
Positive	23 (19.5)	25 (20.3)	

\*Total  $n = 118$ ; <sup>†</sup>total  $n = 123$ . <sup>‡</sup>Pearson's chi-square test.  
*S aureus* = *Staphylococcus aureus*

rates in the study group and control group participants were 19.5 per cent ( $n = 23$ ) and 20.3 per cent ( $n = 25$ ), respectively ( $p > 0.05$ ) (Table I). Among the *S aureus* carriers, three participants without a moustache and two participants with a moustache had MRSA ( $p > 0.05$ ).

According to the cytology results, both the study group and control group were similar in terms of the results for neutrophils and mast cells ( $p > 0.05$ ). However, eosinophil clusters were significantly more prominent in participants with a moustache as compared to those without (Table II). There was no association between the microbiology and cytology results (Table III).

## Discussion

Various studies have assessed *S aureus* carriage in: medical staff, people involved with food products for human consumption, patients in intensive care units, and individuals with chronic metabolic diseases and intravenous drug dependence. Given the public health implications with regard to nasal *S aureus* carriage by medical staff, food industry employees and those in close contact with people, some businesses require that employees regularly shave their moustaches and beards, which, for some men, is a social and cosmetic issue. However, whether the presence or absence of a beard or moustache is important in terms of public health remains to be determined.

As a moustache is situated at the entrance to the nostrils, some bacterial contamination might be

TABLE II  
NASAL CYTOLOGY RESULTS BY GROUP

Nasal cytology	Group		$p^{\ddagger}$
	With moustache (n (%))*	Without moustache (n (%)) <sup>†</sup>	
Eosinophils			
– Non-existent	60 (50.8)	76 (61.8)	0.087
– Existent	58 (49.2)	47 (38.2)	
– Single & diffuse	34 (28.8)	38 (30.9)	0.012**
– In clusters & rich	24 (20.3)	9 (7.3)	
Neutrophils			
– Non-existent	38 (32.2)	49 (39.8)	0.217
– Existent	80 (67.8)	74 (60.2)	
– Single & diffuse	47 (39.8)	36 (29.3)	0.221
– In clusters & rich	33 (28.0)	38 (30.9)	
Mast cells			
– Non-existent	98 (83.1)	112 (91.1)	0.063
– Existent	20 (16.9)	11 (8.9)	

\*Total  $n = 118$ ; <sup>†</sup>total  $n = 123$ . <sup>‡</sup>Pearson's chi-square test.  
\*\* $p < 0.05$

possible, especially in nasal *S aureus* carriers. Nevertheless, this study indicated that nasal *S aureus* carriage is similar in men with and without a moustache. The carrier rate of *S aureus* observed herein is comparable to those rates reported in the literature.<sup>10–12</sup> Therefore, having a moustache does not increase the risk of *S aureus* colonisation in the nose.

When exposed to the causative allergen, either in the environment or during a nasal provocation test, patients suffering from allergic rhinitis develop an immediate nasal response, the so-called early phase response, followed by a late phase response. From a microscopic

point of view, these responses are characterised by a mucosal infiltration of inflammatory cells (eosinophils, mast cells and neutrophils).<sup>13,14</sup> Nasal cytology provides an important contribution to the definition and understanding of the pathophysiological mechanisms of allergic and non-allergic rhinitis.<sup>15–17</sup> Mast cells and eosinophils are not cells specific to allergic rhinitis. In this study, we comparatively assessed cells that have a role in the pathogenesis of allergic rhinitis in nasal mucosa. The presence of eosinophil clusters was significantly higher in the study group. Furthermore, in general, the numbers of mast and eosinophil cells were higher in this group, although this difference was not statistically significant. However, the groups were not compared in terms of frequency of allergic rhinitis. Thus, this study highlights a new outlook for future related studies investigating the risks of allergic and non-allergic rhinitis in men with a moustache.

- Medical staff, food industry employees and those working in close contact with people should be periodically assessed regarding *Staphylococcus aureus* carriage
- The presence or absence of a moustache had no effect on nasal *S aureus* colonisation
- The number of eosinophil clusters was significantly higher in participants with a moustache

In conclusion, the presence or absence of a moustache appears to have no effect on nasal *S aureus* colonisation. However, further research is required to elucidate whether the presence of a moustache increases the risk of allergic or non-allergic rhinitis.

TABLE III  
NASAL CYTOLOGY RESULTS ACCORDING TO *S AUREUS* CARRIAGE

Nasal cytology	<i>S aureus</i> carriage results		$p^{\ddagger}$
	Negative (n (%))*	Positive (n (%)) <sup>†</sup>	
Eosinophils			
– Non-existent	104 (53.9)	32 (66.7)	0.279
– Single & diffuse	61 (31.6)	11 (22.9)	
– In clusters & rich	28 (14.5)	5 (10.4)	
Neutrophils			
– Non-existent	72 (37.3)	15 (31.3)	0.172
– Single & diffuse	61 (31.6)	22 (45.8)	
– In clusters & rich	60 (31.1)	11 (22.9)	
Mast cells			
– Non-existent	166 (86.0)	44 (91.7)	0.420**
– Existent	27 (14.0)	4 (8.3)	

\*Total  $n = 193$ ; <sup>†</sup>total  $n = 48$ . <sup>‡</sup>Pearson's chi-square test. \*\*Yates' continuity correction performed. *S aureus* = *Staphylococcus aureus*

## References

- Boelaert JR, Van Landuyt HW, de Baere YA, Deruyter MM, Daneels RF, Schurgers ML *et al.* Staphylococcus aureus infections in haemodialysis patients: pathophysiology and use of nasal mupirocin for prevention. *J Chemother* 1995;**3**(7 suppl): 49–53
- Kluytmans JA, Manders MJ, van Bommel E, Verbrugh H. Elimination of nasal carriage of *Staphylococcus aureus* in hemodialysis patients. *Infect Control Hosp Epidemiol* 1996;**17**:793–7
- Kluytmans J, van Belkum A, Verbrugh H. Nasal carriage of *Staphylococcus aureus*: epidemiology, underlying mechanism and associated risks. *Clin Microbiol Rev* 1997;**10**:505–20
- Bolyard EA, Tablan OC, Williams WW, Pearson ML, Shapiro CN, Deitchmann SD. Guideline for infection control in health care personnel, 1998. Hospital Infection Control Practices Advisory Committee. *Infect Control Hosp Epidemiol* 1998;**19**: 407–63
- Goyal R, Das S, Mathur M. Colonisation of methicillin-resistant *Staphylococcus aureus* among health care workers in a tertiary care hospital of Delhi. *Indian J Med Sci* 2002;**56**:321–4
- Alghaithy AA, Bilal NE, Gedebo M, Weily AH. Nasal carriage and antibiotic resistance of *Staphylococcus aureus* isolates from hospital and non-hospital personnel in Abha, Saudi Arabia. *Trans R Soc Trop Med Hyg* 2000;**94**:504–7
- Scarnato F, Mallaret MR, Croize J, Kouabenan DR, Dubois M, Maitre A *et al.* Incidence and prevalence of methicillin-resistant *Staphylococcus aureus* nasal carriage among healthcare workers in geriatric departments: relevance to preventive measures. *Infect Control Hosp Epidemiol* 2003;**24**:456–8

- 8 Meltzer EO, Jalowayski AA. Nasal cytology in clinical practice. *Am J Rhinol* 1988;**2**:47–54
- 9 Clinical and Laboratory Standards Institute. *Performance Standards for Antimicrobial Susceptibility Testing: 22nd Informational Supplement*, Document M100-S22. Wayne, Pennsylvania: CLSI, 2012
- 10 al Bustan MA, Udo EE, Chugh TD. Nasal carriage of enterotoxin-producing *Staphylococcus aureus* among restaurant workers in Kuwait City. *Epidemiol Infect* 1996;**116**:319–22
- 11 Simsek Z, Koruk I, Copur A, Gürses G. The prevalence of *Staphylococcus aureus* and intestinal parasites among food handlers in Sanliurfa, Southeastern Anatolia. *J Public Health Manag Pract* 2009;**15**:518–23
- 12 den Heijer CD, van Bijnen EM, Paget WJ, Pringle M, Goossens H, Bruggeman CA *et al.* Prevalence and resistance of commensal *Staphylococcus aureus*, including methicillin-resistant *S aureus*, in nine European countries: a cross-sectional study. *Lancet Infect Dis* 2013;**13**:409–15
- 13 Pelikan Z, Pelikan-Filipek M. Cytologic changes in the nasal secretions during the immediate nasal response. *J Allergy Clin Immunol* 1988;**82**:1103–12
- 14 Pelikan Z, Pelikan-Filipek M. Cytologic changes in the nasal secretions during the late nasal response. *J Allergy Clin Immunol* 1989;**83**:1068–79
- 15 Gelardi M, Incorvaia C, Passalacqua G, Quaranta N, Frati F. The classification of allergic rhinitis and its cytological correlate. *Allergy* 2011;**66**:1624–5
- 16 Bickmore JT, Marshall ML. Cytology of nasal secretions: further diagnostic help. *Laryngoscope* 1976;**86**:516–23
- 17 Gelardi M, Maselli del Giudice A, Fiorella ML, Fiorella R, Russo C, Soleti P. Non-allergic rhinitis with eosinophils and mast cells constitutes a new severe nasal disorder. *Int J Immunopathol Pharmacol* 2008;**23**:325–31

Address for correspondence:

Dr Erkan Soylu,  
TEM Avrupa Otoyolu Goztepe çıkışı No: 1,  
Bağcılar,  
34214 Istanbul, Turkey

Fax: 90 212 460 7070

E-mail: [erkansoylu23@gmail.com](mailto:erkansoylu23@gmail.com)

---

Dr E Soylu takes responsibility for the integrity of the content of the paper  
Competing interests: None declared

---