

## IN BRIEF

- A large retrospective analysis of the isolation of *S. aureus* in oral specimens submitted to a regional diagnostic oral microbiology laboratory.
- The role of *S. aureus* in some types of oral disease may be more important than previously recognised.
- Methicillin resistant *S. aureus* was isolated in a small number of specimens from the oral cavity.

# *Staphylococcus aureus* in the oral cavity: a three-year retrospective analysis of clinical laboratory data

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**Objective** A retrospective analysis of laboratory data to investigate the isolation of *Staphylococcus aureus* from the oral cavity and facial area in specimens submitted to a regional diagnostic oral microbiology laboratory.

**Methods** A hand search of laboratory records for a three-year period (1998–2000) was performed for specimens submitted to the regional diagnostic oral microbiology laboratory based at Glasgow Dental Hospital and School. Data were collected from forms where *S. aureus* was isolated. These data included demographics, referral source, specimen type, methicillin susceptibility and clinical details.

**Results** For the period 1998–2000, there were 5,005 specimens submitted to the laboratory. *S. aureus* was isolated from 1,017 specimens, of which 967 (95%) were sensitive to methicillin (MSSA) and 50 (5%) were resistant to methicillin (MRSA). The 1,017 specimens were provided from 615 patients. MRSA was isolated from 37 (6%) of patients. There was an increasing incidence of *S. aureus* with age, particularly in the >70 years age group. The most common specimen from which MSSA was isolated was an oral rinse (38%) whilst for MRSA isolates this was a tongue swab (28%). The clinical condition most commonly reported for MSSA isolates was angular cheilitis (22%). Erythema, swelling, pain or burning of the oral mucosa was the clinical condition most commonly reported for MRSA isolates (16%). Patients from whom the MSSA isolates were recovered were most commonly (55%) seen in the oral medicine clinic at the dental hospital, whilst patients with MRSA were more commonly seen in primary care settings such as nursing homes, hospices and general dental practice (51%).

**Conclusion** In line with more recent surveys, this retrospective study suggests that *S. aureus* may be a more frequent isolate from the oral cavity than hitherto suspected. A small proportion of the *S. aureus* isolates were MRSA. There were insufficient data available to

determine whether the *S. aureus* isolates were colonising or infecting the oral cavity. However, the role of *S. aureus* in several diseases of the oral mucosa merits further investigation.

## INTRODUCTION

A recent review has highlighted the paucity of both clinical and laboratory data on the role of *S. aureus* in the oral cavity in both health or disease.<sup>1</sup> Some oral infections are caused at least in part by *S. aureus*, for example, angular cheilitis,<sup>2</sup> parotitis<sup>3</sup> and staphylococcal mucositis.<sup>4</sup> Furthermore there is now a growing body of evidence to suggest that staphylococci can be frequently isolated from the oral cavity of particular patient groups such as children,<sup>5</sup> the elderly<sup>4</sup> and some groups with systemic disease, such as the terminally ill,<sup>6</sup> rheumatoid arthritis<sup>7</sup> and patients with haematological malignancies.<sup>8</sup>

The aim of this study was to identify the rate of *S. aureus* isolation from specimens submitted to a regional diagnostic oral microbiology laboratory over the period 1998–2000.

## MATERIALS AND METHODS

A hand search was conducted of laboratory work sheets compiled during 1998–2000.

Reports were searched for the isolation of *S. aureus* from specimens submitted to a regional oral microbiology diagnostic laboratory. The specimens most commonly submitted to the unit normally comprise dento-alveolar aspirates and swabs, oral mucosal swabs and oral rinses. Data were collected from the request form submitted by the clinician and the accompanying laboratory work sheet. The patient age, referring clinical unit, clinical presentation, specimen type and sensitivity to methicillin were recorded for each patient.

## RESULTS

The isolation rate of *S. aureus* over the 3-year period is shown in Table 1. For the period 1998–2000, there were 5,005 specimens submitted to the laboratory. *S. aureus* was isolated from 1,017 specimens, of which 967 (95%) were sensitive to methicillin (MSSA) and 50 (5%) were resistant to methicillin (MRSA). The 1,017 specimens were provided from 615 patients. MRSA was isolated from 37 (6%) of these patients.

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**Table 1** Number of MSSA and MRSA isolates per year

Specimen	1998			1999			2000			Total		
	n	MSSA (%)	MRSA (%)	n	MSSA (%)	MRSA (%)	n	MSSA (%)	MRSA (%)	n	MSSA (%)	MRSA (%)
Oral rinse	601	100 (17)	4 (0.6)	627	128 (20)	3 (0.4)	473	99 (21)	1 (0.2)	1,701	327	8
Swab	1,249	252 (20)	12 (0.9)	803	228 (28)	23 (3)	686	142 (21)	7 (1)	2,738	622	42
Aspirate	180	6 (3)	0	203	8 (4)	0	183	4(2)	0	566	18	0
Total	2,030	358 (18)	16 (0.7)	1,633	364 (22)	26 (1.6)	1,342	245 (18)	8 (0.6)	5,005	967 (19)	50 (0.9)

**Table 2** Age distribution of patients with MRSA and MSSA

Age of patient (years)	MRSA	MSSA
0-9	0	8
10-19	2	30
20-29	1	66
30-39	1	39
40-49	3	73
50-59	6	115
60-69	7	116
70+	17	131
Total	37	578

There was an increasing incidence of *S. aureus* with age (Table 2) particularly in the >70 years age group. The most common specimen type (Tables 3a and 3b) from which MSSA was isolated was an oral rinse (38%) whilst for MRSA isolates this was a tongue swab (28%). Of interest was the recovery of *S. aureus* from six dento-alveolar abscess infections and one case of localised alveolar osteitis (dry socket). All of these isolates were sensitive to methicillin. *S. aureus* accounted for a small number of salivary gland infections from the parotid (n=3) and submandibular gland (n=1). The clinical condition most commonly reported for MSSA isolates (Table 4) was angular cheilitis (22%). A large proportion of both MSSA (25%) and MRSA (16%) were associated with erythema, swelling, painful or burning of the oral mucosa. Patients from which the MSSA isolates were recovered were most commonly (55%) seen in the oral medicine clinic at the dental hospital. Patients with MRSA were more commonly seen in primary care settings such as nursing homes, hospices and general dental practice (51%).

**Table 3a** Details of specimen types containing MSSA

Specimen	1998	1999	2000	Total
Oral rinse	100	128	99	327
Angle of mouth swab	79	55	59	193
Hard palate swab	44	45	21	110
Tongue swab	47	33	22	102
Nares swab	31	39	19	89
Upper denture swab	30	23	8	61
Lip swab	6	9	8	23
Face swab	3	17	2	22
Dento-alveolar abscess swab/aspirate	4	7	3	14
Oral mucosal swab	6	2	2	10
Facial implant swab	5	3	1	9
Salivary gland swab/aspirate	2	1	1	4
Intra-oral bone graft swab	1	1	0	2
Intra-oral implant swab	0	1	0	1
Patients	209	215	154	578
Specimens	358	364	245	967

## DISCUSSION

This study highlights the potential role of *S. aureus* in a number of oral diseases. However, it is difficult from this retrospective study to ascribe a pathogenic role to the *S. aureus* isolates, which may have been colonising rather than infecting the oral cavity. *S. aureus* infection is commonly associated with angular cheilitis and the findings of this study have confirmed those of earlier workers, suggesting a *S. aureus* isolation rate of 63% from angular cheilitis.<sup>2</sup>

Of interest was the isolation of *S. aureus* from a small number of acute dento-alveolar infections, such as a dental abscess. The acute dento-alveolar abscess is more usually associated with strict anaerobes and *S. anginosus* group streptococci.

There was a trend to increased recovery of *S. aureus* isolates from more elderly patients in contrast to previous work<sup>9</sup> which found no age related trend for the recovery of *S. aureus* from a healthy population. It is unclear whether this reflects changes in the oral flora associated with increasing age, medication, increased incidence of prosthetic oral devices or referral patterns. The presence of prosthetic devices within the oral cavity, such as acrylic dentures, may encourage the carriage of staphylococci.<sup>10</sup> In studies of denture wearing patients, carriage rates of *S. aureus* have varied from 23-48%.<sup>11,12</sup>

In a study of 110 patients attending a dental hospital with a range of oral diseases there was an observed prevalence of *S. aureus* in saliva of 21% and from gingival swabs of 11%.<sup>13</sup> Salivary carriage of *S. aureus* in a cohort of patients with reduced salivary flow rates attending an oral medicine clinic was found in 41% of patients with a range of concentrations from  $3.7 \times 10^1$  –  $5.2 \times 10^3$  cfu ml<sup>-1</sup>.<sup>14</sup>

The case for *S. aureus* in the aetiology of oral dysaesthesia and mucositis is complicated by the diversity of the normal oral flora and by healthy carriage of *S. aureus* in some patient groups. However, the high rates of recovery of *S. aureus* from patients presenting with symptoms from the oral mucosa ranging from pain, burning, erythema and swelling, suggests that clinicians should address the possibility of this agent playing a role in oral mucosal disease. Isolates of *S. aureus* are capable of producing a wide range of exotoxins which has been noted in oral isolates. A study of staphylococcal carriage in children attending a paedodontic department

**Table 3b** Details of specimen types containing MRSA

Specimen	1998	1999	2000	total
Tongue swab	4	8	2	14
Oral rinse	4	3	1	8
Hard palate swab	2	5	1	8
Face swab	2	2	3	7
Intra-oral bone graft swab	1	1	0	2
Oral mucosa swab	1	1	0	2
Nares swab	2	0	0	2
Salivary gland swab	0	1	0	1
Denture swab	0	5	1	6
Patients	15	17	5	37
Specimens	16	26	8	50

**Table 4 Clinical details from which MRSA and MSSA were recovered**

Clinical details	MRSA	MSSA
Angular cheilitis	2	130
Erythema/swelling	6	78
Painful/burning mouth	6	64
Sjögrens syndrome	3	60
Pre-operative oral rinse cardiac transplants	0	48
Candidal infection	4	40
Denture stomatitis	3	22
Mouth ulcer	0	12
Facial abscess	0	80
Others – includes cysts, intra-oral implant and facial implants	10	82
Unknown	3	34
Total	37	578

found that 19% of the *S. aureus* isolates produced exfoliative toxin and 40% produced enterotoxin.<sup>5</sup>

Of concern was the small but significant number of MRSA isolates recovered from oral specimens. This may reflect the increasing reservoir of community MRSA, for example, 17% of nursing homes in one locality.<sup>15</sup> The prevention of horizontal transmission of MRSA has become increasingly more important as the prevalence of this pathogen increases. Oral carriage of MRSA may serve as a reservoir for recolonisation of other body sites or for cross-infection to other patients or healthcare workers. At least two cases have been reported of cross infection from a general dental practitioner to patients.<sup>16</sup> The practitioner had probably been colonised whilst a patient in hospital. Nursing homes are another important source of colonisation and infection and two cases of acute parotitis caused by MRSA in elderly patients have been described.<sup>17</sup> Within the oral cavity MRSA may preferentially colonise denture surfaces. One group of workers<sup>12</sup> found 10% of unselected denture wearing patients carrying MRSA on their dentures which proved difficult to eradicate using conventional denture cleaning agents. In a subsequent study, eradication of the long term carriage of MRSA from denture wearing patients was successful only after heat sterilising or remaking the dentures that had become persistently colonised by MRSA.<sup>18</sup> More recently, 19% of an elderly institutionalised veteran population were shown to be colonised by MRSA in the oral cavity, compared with a prevalence of 20% in the

nares. Interestingly 4% of subjects were culture positive for oral MRSA without evidence of nasal carriage.<sup>18</sup>

In conclusion this study suggests that oral carriage of *S. aureus* may be more common than previously recognised and the data collected suggests a reappraisal of the role of *S. aureus* in the health and disease of the oral cavity.

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