Staphylococcus aureus Colonization of Children with Atopic Eczema and Their Parents

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Sir,

The prevalence of atopic eczema in children is between 5% and 15%, and appears to be increasing (1). Prevalence rates vary between countries (2), as well as within countries (3). Regional variations in prevalence suggest strong environmental influences in the pathogenesis of the disease, such as *Staphylococcus aureus* (*S. aureus*) colonization.

S. aureus skin colonization is present in less than 10% of normal controls. However, in children with atopic eczema, *S. aureus* can be cultured from swabs of affected skin in 93% of cases and from uninvolved skin in 70% of cases (4). *In vitro* studies have demonstrated that *S. aureus* shows increased adherence to atopic skin (5). The presence of *S. aureus* in atopic eczema is often associated with an exacerbation of the eczema (6, 7), and treatment with antibiotics alone can lead to clinical improvement of the eczema (8). The *S. aureus* exotoxin superantigen theory is a possible explanation for the association of *S. aureus* colonization with exacerbations of eczema (9). Some *S. aureus* strains secrete an exotoxin (10), which preferentially stimulates skin homing T cells (11). This leads to the T-cell secretion of cytokines that can exacerbate the immunological imbalance in eczema (12). When such *S. aureus* strains are applied directly to normal skin of atopic or non-atopic individuals they can produce an eczematous eruption (13).

The aim of this study was to assess the prevalence of *S. aureus* carriage in consecutive newly referred children with atopic eczema, in their topical preparations and in their parents/carers.

MATERIALS AND METHOD

All consecutive referrals from the community of children with atopic eczema (based on the Hanifin & Rajka criteria (14)) were entered in the study. Children who had previously received treatment for their eczema in hospital were excluded. Informed, witnessed, written consent was obtained from the parent. The study received ethical approval from the Gwent Ethics Committee.

For each case, age, sex, duration of eczema, current treatments and antibiotic usage (topical and oral) within the preceding 3 months were documented. Severity of eczema was recorded using the SCORAD index (15). Assessments for intensity of eczema and extent of skin involvement were undertaken by a single observer (GKP) who had previous experience of using the index in an international study of eczema.

Sterile saline-soaked swabs for bacteriology were taken from the affected skin, nose, one axilla and periungual skin of the patient and from the nose and one axilla of the parent or carers routinely responsible for applying the topical treatment. Patients were asked to bring their topical treatments for the consultation. Swabs for bacteriology were also taken from the treatment creams and ointments. Each *S. aureus* isolate was then tested for antibiotic sensitivity by a conventional method using a BSAC 91 comparative method.

The mean and standard deviations (SDs) were calculated for SCORAD values of eczema severity in patients with and without cutaneous *S. aureus* colonization and for patients with and without nasal *S. aureus* colonization. Comparisons between these groups were made using the pooled variance *t*-test. Other comparisons of a categorical nature were made using Fisher's exact test. Analysis was carried out using Unistat® for Windows, version 4.5.

Forty-four patients, 26 males and 18 females, were recruited (mean age 3.8 years, range 5 months to 14 years). Mean duration of the eczema was 22 months (range 1 month to 14 years). None of the patients had previously been seen by a dermatologist. Forty-two of the 44 patients had been using a topical corticosteroid. All had been prescribed an emollient and 9 were using an antiseptic bath emollient. In the preceding 3 months, 52% of the patients had received antibiotics.

RESULTS

S. aureus was cultured from 57% of skin swabs, 39% of nasal swabs, 14% of periungual swabs and 11% of axilla swabs from the patients. *S. aureus* in all cases was sensitive to flucloxacillin, erythromycin, ciprofloxacin and trimethoprim. In two patients, *S. aureus* was cultured from nasal swabs even though the affected skin swabs were negative for *S. aureus*. The presence of *S. aureus* colonization of the skin was not associated with eczema severity. The mean SCORAD scores were similar ($p = 0.27$) for those patients with and without *S. aureus*; scores were 40.5 and 35.7, respectively. When patients were subdivided according to presence or absence of nasal *S. aureus*, the SCORAD values were again very close. In those patients with nasal colonization the mean SCORAD value was 40.2 (SD = 16.3), whereas in those without nasal *S. aureus* the mean value was 38.6 (SD = 14.6), ($p = 0.73$).

There was no relationship between previous use of anti-staphylococcal antibiotics and the presence or absence of *S. aureus* colonization (one-tailed; $p = 0.37$; Fisher's exact test). Similarly, there was no relationship between the presence or absence of a history of previous topical antiseptic usage and the presence or absence of *S. aureus* colonization (Table I), (one-tailed; $p = 0.11$; Fisher's exact test).

There was a weak association between the presence of parental nasal *S. aureus* and cutaneous *S. aureus* colonization in the child (one-tailed; $p = 0.0217$; Fisher's exact test). Only one of the 150 ointments and creams swabbed grew *S. aureus*.

DISCUSSION

S. aureus colonization is a significant environmental trigger in atopic eczema; it was shown to be present in 57% of patients in this study and between 90% and 100% of patients in previous studies (2, 8, 16). The lower rate of *S. aureus* colonization in the current study may reflect the selection criteria; patients were new referrals not previously treated in hospital. The use of antibiotics to treat eczema in primary care may not be constant in different parts of the country and may also account for some of the variation between studies.

The presence of *S. aureus* in atopic eczema is often associated with exacerbation of the skin disease (4, 8). *S. aureus* is often a dominant environmental factor in atopic eczema and is an important consideration in the management of chronic severe

Table I. *Comparison of the number of patients with and without* S. aureus *colonization by current use or non-use of an antiseptic bath emollient*

	Patients receiving antiseptics	Patients not receiving antiseptics
S. aureus skin colonization positive	3	22
S. aureus skin colonization negative	6	13

eczema. Eczema can be improved if *S. aureus* is eradicated by antibiotics (17), although continuous antibiotic treatment does not influence the disease (18). It is of concern that re-colonization occurred within 3 months of receiving antibiotic therapy, although no cases of methicillin-resistant *S. aureus* were identified. The persistence of *S. aureus* in patients with atopic eczema can be due to resistance; clearly, this was not the case in our study. This may, however, become an important consideration in those receiving multiple courses of antibiotics, particularly in hospital.

Nasal carriage of *S. aureus* is common among the general population (up to 35% carriage rate (19)) and is higher among patients with atopic eczema (39–82% colonized (8)). Of the 17 patients with nasal *S. aureus* carriage in this study, only two did not have *S. aureus* on skin swab culture; one of these had previously been treated with antibiotics. A further possible explanation for the persistence of *S. aureus* despite prior antibiotic treatment is colonization of the parent leading to re-colonization of the child. Only 6 of the 46 parents had nasal carriage of *S. aureus*; however, in all these cases the children were also colonized with *S. aureus*. It seems likely that parental *S. aureus* carriage influences *S. aureus* colonization in the child.

It is a widely held belief that the persistence of *S. aureus* colonization may be due to contamination of topical treatments. Nurses trained in dermatology often advise patients not to use their fingers to remove creams from pots. Despite our patients not having received this advice prior to attendance at the paediatric dermatology clinic, reassuringly only one of the 150 treatments swabbed grew *S. aureus*.

The presence of *S. aureus* in a patient with atopic eczema is often associated with exacerbation, though in the community other factors may also be important. *S. aureus* is not the only environmental factor to influence atopic eczema; environmental factors such as house dust mite may be more important in some patients (20). Eradication of *S. aureus* can be achieved with the use of antibiotics; however, re-colonization occurs frequently. Re-colonization with *S. aureus* after an initial course of antibiotics may be reduced by treating parental nasal *S. aureus* carriage.

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