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TETRACYCLINE-RESISTANT STAPHYLOCOCCI IN ACNE VULGARIS

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Abstract. The widespread use of broad-spectrum antibiotics in the treatment of acne vulgaris may have resulted in qualitative changes in the bacterial flora of acne lesions. As previously noted, two bacteria, *Corynebacterium acnes* and *Staphylococcus albus* are predominant in the comedones, pustules and cysts of patients with acne. Of the staphylococci isolated, Baird-Parker group II was by far the most common. Approximately one-third of these staphylococcal isolates were found to be resistant to tetracycline on routine sensitivity testing.

There are many reports in the literature to suggest that two species of bacteria, *Corynebacterium acnes* and *Staphylococcus albus*, are the predominant micro-organisms in lesions of acne (8, 11, 13). Since both of these organisms possess lipolytic activity (5, 6, 10, 14) it is thought that they may play a role in the pathogenesis of acne by hydrolysing the triglycerides of sebum into free fatty acids, some of which are irritants (7).

C. acnes has previously been shown to be exquisitely sensitive to tetracycline (9). This observation, combined with the demonstration of decreased formation of fatty acids during tetracycline therapy (3), has provided a rationale for the use of this antibiotic in the treatment of acne. The staphylococci, however, are notorious for their ability to develop resistance to antibiotics. If coagulase-negative staphylococci play a significant role in the pathogenesis of acne, it would be important to have an idea of the incidence of resistant strains in a large population of acne patients.

This study was undertaken to identify the specific staphylococci in the various lesions of acne vulgaris and to determine the incidence of tetracycline-resistant strains in patients with this dermatosis.

MATERIALS AND METHODS

Specimens for microbiologic evaluation were collected from open and closed comedones, from pustules and from cysts of 134 patients with acne vulgaris, ranging in age from 13 to 23 and attending a special acne clinic. No antibiotic therapy had been prescribed for at least 3 months prior to the initial collection of samples, but almost all had received tetracycline therapy at some time in the past.

After thorough cleansing of the skin surface with 70% alcohol, the contents of the various lesions were obtained on sterile lancets and transferred to 5 ml of trypticase soy broth. After vigorous shaking, the diluted specimens were plated onto the surface of trypticase-soy agar containing 6% sheep blood, mannitol-salt agar, brain-heart infusion agar containing 1% glucose (13), Maconkey's agar and also seeded into thioglycollate broth. The brain-heart infusion agar plates were incubated in an anaerobic jar for 5 days in an atmosphere of hydrogen and CO_2 (BBL Gas-Pak) at 34°C. All other media were incubated aerobically for 48 hours at 34°C. Each morphologically distinct colony was subcultured for more specific identification.

Staphylococci and micrococci were differentiated from each other and further identified according to the criteria of Baird-Parker (1). Isolates were identified as *C. acnes* on the following criteria: gram-positive, anaerobic rods, catalase positive and agglutinating with either of two commercially available antisera (Difco). Other bacteria were identified by standard methods.

Sensitivity testing was performed using BBL antibiotic sensitivity discs, 30 μg and 50 μg for tetracycline. Incubation was at 34°C and readings were made after 18 hours. A strain was called resistant if there was no inhibition with the 50 μg disc. Sensitivity was determined as a zone of 19 mm or more with the 30 μg disc.

RESULTS

Staphylococci were isolated from more than half of all the acne lesions tested. Baird-Parker group II was by far the most common type of staphylococcus isolated, representing 82% of the staphylo-

Table I. *Frequency of isolation of organisms from lesions of 134 patients with acne vulgaris*
Percentages within parentheses

Organism	Lesion			
	Open comedones (32 samples)	Closed comedones (34 samples)	Pustules (62 samples)	Cysts (28 samples)
C. acnes	19 (59)	21 (62)	42 (68)	9 (32)
Staphylococci				
Baird-Parker type				
I	0	2 (6)	3 (5)	2 (7)
II	17 (53)	21 (61)	34 (55)	12 (43)
IV	1 (3)	0	2 (3)	1 (3)
V	2 (6)	4 (12)	7 (11)	3 (11)
VI	0	0	3 (5)	1 (4)
Gram-negative rods	5 (16)	5 (15)	10 (16)	3 (11)
Other organisms	1 (3)	1 (3)	2 (3)	3 (11)

coccal isolates from comedones and 70% of the staphylococcal isolates from pustules and cysts (Table I). The number of organisms isolated totals more than the number of lesions because frequently more than one species of bacterium was isolated from a single lesion. Of the staphylococcal groups isolated, 37% of group II, 34% of group V and 36% of group VI were resistant to tetracycline. None of the *C. acnes* tested were found to be resistant to tetracycline.

Two of our patients yielded tetracycline-sensitive staphylococci before our treatment with tetracycline and subsequently developed tetracycline-resistant strains during a 6 month course of therapy, but the great majority showed no change in the antibiograms of their cocci. We have no controlled data to indicate whether or not the clinical course of acne is affected by this tetracycline resistance.

Other organisms occasionally isolated included micrococci, alpha-hemolytic streptococci, *Neisseria pharyngitidis*, aerobic diphtheroids, *Proteus mirabilis*, *Pseudomonas aeroginosa* and various species of *Enterobacter*.

DISCUSSION

The incidence of tetracycline-resistant staphylococci found in the present study is similar to that reported by Marples & Izumi in their study of the bacteriology of pustular acne (8). Our data are also in general agreement with the findings of Corse & Williams (2) who studied the resistance to antibiotics of coagulase-negative staphylococci from various sources.

The significance of these data is much more difficult to evaluate. We had originally planned to study if tetracycline resistance developed during long-term administration of the drug. Unfortunately, only a very small percentage of our patients had never received antibiotics previously in the treatment of their acne.

The incidence of gram-negative organisms (Table I) is also of interest. These organisms occurred in similar low percentages in comedones, pustules and cysts. The condition of "gram-negative folliculitis" (4) was not seen in these patients and only 17% of these organisms were resistant to tetracycline.

Of particular interest is the fact that tetracycline-resistant staphylococci have provided us with a useful tool for the study of lipase inhibition by this antibiotic. Since such organisms are resistant to tetracycline we have been able to study the effect of this antibiotic on lipase activity without significantly affecting the growth of the cocci. Preliminary data indicates that tetracycline is able to inhibit staphylococcal lipase (12).

Our recovery of *C. acnes* is somewhat lower than that described elsewhere in the literature. This remains unexplained at present. The *C. acnes* is included primarily as a source of comparison for tetracycline sensitivity.

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