

# *Staphylococci in Community-acquired Infections:*

## *Increased Resistance to Penicillin*

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One hundred patients with community-acquired staphylococcal infections of the skin and soft tissues were treated in the Emergency Ward of Cleveland Metropolitan General Hospital from June to October of 1974. Each staphylococcal infection was considered community-acquired if, within two weeks prior to being treated for the first time, the patient had not received antibiotics, had not been hospitalized, and had not been in contact with other recently hospitalized persons. Of 100 community-acquired staphylococcal infections, 85 were resistant to penicillin. Almost no resistance to other tested antibiotics was observed. Unless indicated otherwise by bacteriologic testing, penicillin is a poor drug of choice in those skin and soft tissue infections suspected of harboring staphylococci.

IN 1943 when penicillin was first introduced, *Staphylococcus aureus* was resistant to the drug in only 5–7% of cases.<sup>1</sup> Since that time its resistance has increased dramatically. The acquisition of resistance has been related to the hospital environment where antibiotics are frequently used and where exposure to already resistant organisms takes place.

These facts become important in the treatment of patients with skin and soft tissue infections, most commonly caused by *Staphylococcus aureus*. Some of these infections require antibiotic therapy in addition to surgical debridement or drainage, and therapy must be started before bacteriologic cultures and sensitivities are reported. Is penicillin as effective now as it has been in the past?

### **Materials and Methods**

A review was made of the charts of 203 patients with skin and soft tissue infections who were treated in the Emergency Ward of Cleveland Metropolitan General Hospital from June to October of 1974.

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When first seen, all pustular eruptions, abscesses, furuncles, paronychia and secondarily infected abrasions, lacerations, ulcers and burns were cultured. Each culture was sent immediately to the Department of Bacteriology for plating and for in vitro susceptibility testing using Kirby-Bauer disc sensitivity methods. All other types of cultures and those cultures not frankly purulent were excluded from the study.

Among the staphylococcal infections, each was considered community-acquired if, within two weeks prior to being treated for the first time, the patient had not received antibiotics, had not been hospitalized, and had not been in contact with other recently hospitalized persons. These criteria were applied only to those patients with staphylococcal infections. Those patients not fulfilling all of the criteria were excluded from the study.

The age and sex of each patient with community-acquired staphylococcal infection and the location of each lesion were noted. Finally, the results of the bacteriologic cultures and sensitivities were recorded.

### **Results**

Of the original 203 patients, 30 had staphylococcal infections which were not community-acquired and were not included in the study. Table 1 illustrates the number of organisms cultured from the remaining 173 skin and soft tissue infections. One hundred cultures grew *Staphylococcus aureus* from community-acquired infections, and 33 grew group "A" beta-hemolytic streptococcus, either in pure or in mixed growth. Fifteen other types of organisms, mainly gram-positives and commensals,

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TABLE 1. 173 Skin and Soft Tissue Infections: Type and Number of Organisms

| Organism                               | Number |
|--|--------|
| Community <i>Staph. aureus</i>         | 100    |
| Group "A" Beta-hemolytic Streptococcus | 33     |
| All other                              | 86     |

were identified in far fewer numbers. Four sterile cultures were obtained, probably due to previous antibiotic therapy.

Fifty-two males and forty-eight females, ranging from one year to 79 years of age (average 21), were found to have community-acquired staphylococcal infections of the skin and soft tissues. As shown in Table 2, 72 staphylococcal cultures were pure and 28 were mixed, predominantly with beta-hemolytic streptococcus.

The types of skin and soft tissue staphylococcal infections are listed in Table 3. These include a variety of pustular eruptions, abscesses, furuncles, paronychia and secondarily infected abrasions, lacerations, ulcers and burns.

Table 4 demonstrates that the majority of these lesions were located on the face and on the extremities.

The results of in vitro susceptibility are shown in Table 5. Of 100 cultures of community staphylococci, 85 were resistant to penicillin, 5 to tetracycline, 3 each to erythromycin and streptomycin, and one to kanamycin, often with multiple drug resistance. No resistance to the semisynthetic penicillins (methicillin), lincomycin or chloramphenicol was identified.

### Discussion

Exposure of *Staphylococcus aureus* to the hospital environment has allowed it to be divided into hospital-acquired and community-acquired groups. Literature in recent years suggests that the resistance of community-acquired staphylococcus to the natural penicillins is much less than that of hospital-acquired staphylococcus.

By 1948, 59% of hospital staphylococci was reported

TABLE 3. 100 Community-Acquired Staphylococcal Infections: Types of Lesions

|                                   |
|-----------------------------------|
| 30 Infected abrasions/lacerations |
| 28 Pustular eruptions             |
| 20 Abscesses                      |
| 9 Paronychia                      |
| 6 Furuncles                       |
| 4 Infected ulcers                 |
| 3 Infected burns                  |

to be resistant to penicillin<sup>2</sup> and in 1960 Thompson and associates reported that 82% of hospital staphylococci was penicillin-resistant.<sup>6</sup> This resistance not only is greater now, but extends to the semi-synthetic penicillins and to other antibiotics as well.

In contrast, community-acquired staphylococci reportedly have been less resistant to penicillin. In a survey conducted in Britain from 1965 to 1967, Harris reported that 37.7% of staphylococci seen in general practice were resistant to penicillin.<sup>3</sup> In 1967, Martin wrote, "In more than half the patients without hospital contact, penicillins G and V remain effective and the drugs of choice in staphylococcal infections."<sup>4</sup>

Little information has been published on the matter since 1970. In one report from this hospital in 1971, however, Wood and Wolinsky indicated that 83% of community staphylococci was resistant to penicillin<sup>7</sup>—an alarming increase. In 1972 Ross and associates examined 95 "street" strains of *Staphylococcus aureus* obtained from pediatric patients in Washington, D.C. Of these, 84% was resistant to penicillin G based on Kirby-Bauer disc sensitivity testing.<sup>5</sup> Neither report, however, specifies whether previous antibiotic therapy or hospital contact had occurred. Nevertheless, our results support these findings and indicate that there has been no change since then.

In this present study with its particular patient population, *Staphylococcus aureus* was cultured from more than half of all skin and soft tissue infections. Eighty-five per cent of community-acquired staphylococci was resistant to penicillin, whether due to wider use of antibiotics or to more frequent exposure to already resistant organisms, has limited the effectiveness of this drug to 15% of community-acquired staphylococcal infections.

TABLE 2. 100 Community-Acquired Staphylococcal Infections: 72 Pure, and 28 Mixed

|   |
|---|
| 16 Group "A" beta-hemolytic streptococcus |
| 5 Enterobacter                            |
| 4 Klebsiella                              |
| 3 <i>E. coli</i>                          |
| 3 Mima-Herellea                           |
| 3 Non "A" beta-hemolytic streptococcus    |
| 2 Alpha streptococcus                     |
| 1 <i>Staph. albus</i>                     |
| 1 Diptheroid                              |

TABLE 4. 100 Community-Acquired Staphylococcal Infections: Location of Lesions

|               |                 |
|---------------|-----------------|
| 23 Hand/wrist | 6 Scalp         |
| 16 Leg        | 4 Chest         |
| 15 Foot/ankle | 4 Abdomen/groin |
| 12 Face       | 2 Neck          |
| 10 Arm        | 1 Back          |
| 7 Axilla      |                 |

TABLE 5. 100 Community-Acquired Staphylococcal Infections: Antibiotic Sensitivity

| Drug            | Number Sensitive | Number Resistant |
|-----------------|------------------|------------------|
| Penicillin      | 15               | 85               |
| Tetracycline    | 95               | 5                |
| Erythromycin    | 97               | 3                |
| Streptomycin    | 97               | 3                |
| Kanamycin       | 99               | 1                |
| Methicillin     | 100              | 0                |
| Lincomycin      | 100              | 0                |
| Chloramphenicol | 100              | 0                |

Unless indicated otherwise by bacteriologic testing, penicillin is a poor drug of choice in those skin and soft tissue infections which require antibiotic therapy in addition to surgical debridement or drainage.

## References

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