

# Streptococcal Throat Infections in Family Practice

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Beta hemolytic streptococcal throat infections occur often enough and cause sufficient morbidity that careful diagnosis and appropriate treatment are matters of concern to the family physician and others involved in primary patient care. Throat cultures aid the precision of diagnosis; a simple, inexpensive, and accurate method of performing cultures in the office is described. The risk of rheumatic fever secondary to untreated streptococcal infections appears to be less than it once was, and further work defining this risk in various population groups is needed. Penicillin remains the drug of choice for treatment, with blood levels maintained for at least ten days either by oral administration or by a single intramuscular dose of benzathine penicillin G. The results of a recent survey of US family practice programs and an equivalent number of practicing family physicians show that most physicians use a selective approach to diagnosis and treatment of throat infections based on symptoms, signs, and age of the patient.

Group A beta hemolytic streptococcal infections occur frequently in family practice and accurate diagnosis and appropriate treatment are of great clinical value. Marsland et al,<sup>1</sup> in their study of the incidence of illness in family practice, reported 20,176 cases of pharyngitis among 526,196 problems encountered. On the basis of other studies<sup>2,3</sup> indicating that about one third of sore throats are streptococcal,\* it may be assumed that approximately 7,000 cases of this illness appeared in the Virginia study. Dingle et al<sup>4</sup> demonstrated 437 episodes of culture-proven streptococcal infection among 23,155 illnesses in 2,692 person-years (556 family-years) of observation in a selected group of Cleveland, Ohio, families.

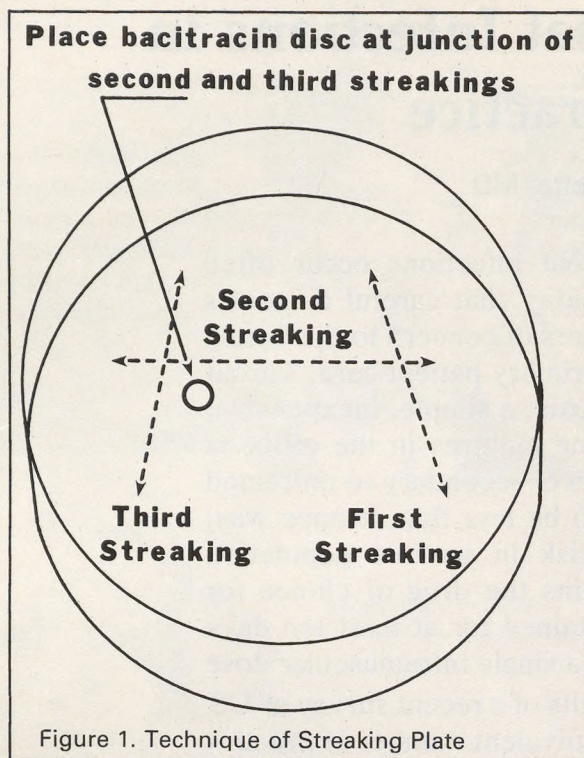
Since streptococcal throat infections tend to be self-limited within five or six days, there are those who feel that relief of symptoms is not an adequate indication for etiologic diagnosis and specific treatment. This may well be the case if the infection is first seen when it has passed its peak, but appropriate antibiotics give dramatic relief of symptoms and may well be justified on that basis alone if the patient is seen in the first or second day of the illness. Since antibiotics render the patient noninfectious within 48 hours, they may also be justified as a way of reducing spread of infection.

A major reason for recognizing and treating such infections is the prevention of rheumatic fever, a known sequel of untreated streptococcal pharyngitis.<sup>5</sup> Although the incidence of this disease appears to be dropping,<sup>6</sup> it is still a significant health problem. The incidence of rheumatic fever appears to vary among demographic groups, being highest in inner-city populations<sup>7</sup> and lower among patients of private physicians. The varying incidence in different patient populations may explain

\*For economy of space the term "streptococcal" herein indicates group A beta hemolytic streptococcal throat infection.

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some of the widespread disagreement regarding the urgency of etiologic diagnosis and specific treatment of throat infections.

Other complications of streptococcal throat infections include peritonsillar abscess and acute glomerulonephritis. The latter condition may follow either pharyngitis or pyoderma caused by a limited number of streptococcal types.

### Clinical Manifestations

The streptococcal sore throat is classically described as of abrupt onset with fever, headache, difficulty in swallowing, and sometimes intestinal upset.<sup>8</sup> The throat and tonsils are markedly inflamed with edema and exudate, anterior cervical lymph nodes are enlarged and tender, and the white blood cell count is frequently elevated with an increase in neutrophils. A clinical diagnosis is relatively easy if all of these manifestations are present, but it must be remembered that the disease exists in all degrees of severity from the full-blown picture described above to a totally asymptomatic carrier state. Many cases will be overlooked if one waits for the classic picture before treating. The incidence is highest in school-

age children, dropping rapidly with increasing age among adults.<sup>9</sup>

Occasionally, especially in children, abdominal pain may be the initial complaint. Scarletiform rashes and palatal petechiae are highly suggestive of streptococcal etiology. In patients under three years of age, there is often a purulent nasal discharge, excoriated nares, and a more indolent course.

These infections respond dramatically to appropriate antibiotic therapy, and if the patient is not significantly improved within 24 to 48 hours, streptococcal pathogenesis is most unlikely. Asymptomatic streptococcal carriers may of course develop nonbacterial sore throats, necessitating clinical judgment in the interpretation of positive cultures.

### Differential Diagnosis

The most common problem of differentiation is with nonspecific viral pharyngitis. Such infections tend to be less exudative, less abrupt in onset, and more likely to be accompanied by nasal discharge. Cervical lymph nodes tend to be less prominent and less tender. Lymphoid follicles are more frequently seen in the posterior pharyngeal wall. Findings in viral and streptococcal infections overlap, however, and clinical differentiation is unreliable.<sup>10,11</sup>

Infectious mononucleosis may be suspected when severe pharyngitis with adenopathy is seen but the throat culture is negative and antibiotic therapy brings no response. The presence of atypical mononuclear cells in a peripheral blood smear may suggest the diagnosis, and the appropriate agglutination test will become positive within two or three weeks.

Gonococcal throat infections may be seen among homosexuals. Their clinical appearance is not distinctive and the diagnosis can be made only by appropriate culture techniques. A more rare cause of throat infections, again requiring specific culture method for diagnosis, is diphtheria. A thick white membrane in the throat, associated with severe constitutional symptoms, is said to be characteristic of this infection. Staphylococci and numerous other bacteria frequently reside in the throat but do not cause symptoms.

### Throat Cultures

Numerous studies<sup>12,13</sup> have demonstrated that



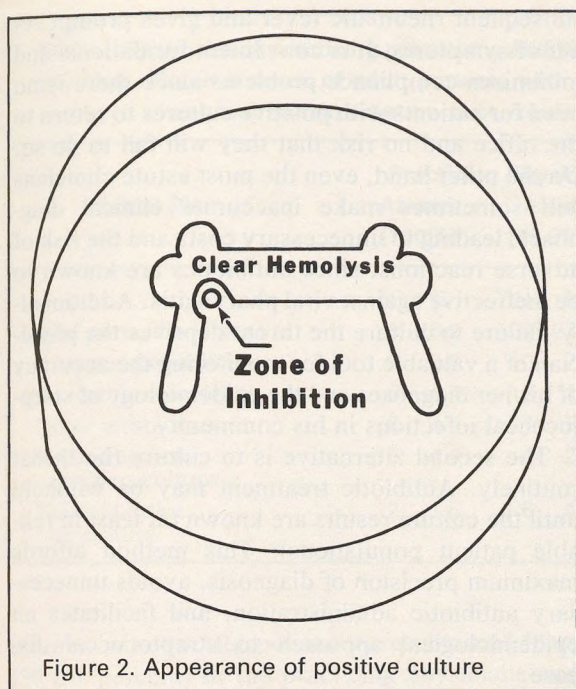


Figure 2. Appearance of positive culture

throat cultures greatly increase precision in identifying streptococcal infections. The procedure needs to produce only a simple positive or negative answer with regard to group A beta hemolytic streptococci. Antibiotic sensitivities are irrelevant since the organism is universally susceptible to penicillin. Results should, with few exceptions, be available within 24 hours. Physicians practicing with ready access to a clinical laboratory should expect such service at a fee no greater than the cost of a ten-day prescription for oral penicillin.

Practices without immediate access to a laboratory service should do their own throat cultures. In addition to meeting the above criteria the technique should be clinically accurate and reliable in the hands of a competent aide with no previous bacteriological training. Numerous reports<sup>14,15</sup> have questioned the accuracy of office throat cultures, but in such reports the techniques either are not described in detail or are lacking in some respect. The author's method, a synthesis of the work of others,<sup>16-18</sup> has proven highly satisfactory (Figures 1 and 2). Sterile technique is used at each stage. A small alcohol lamp or Bunsen burner is satisfactory for sterilizing instrument tips. The procedure is as follows:

1. Commercially available disposable sheep blood agar plates are used, with attention to proper refrigerated storage and to use before the expiration date. Discolored, dehydrated, or contaminated plates are discarded.

2. A sterile swab is used to gather material directly from the posterior pharyngeal wall and from the tonsils or tonsillar fossa. A recently suggested refinement, useful if much exudate is present, is to use one swab to rub away much of the debris in the area to be cultured, after which a second swab is used to gather the specimen.

3. The material to be cultured is swabbed directly onto the plate in a swath roughly 1.5 cm wide.

4. Another sterile swab is then used to spread a portion of the initial inoculum in a swath more or less perpendicular to the first one.

5. Still another sterile swab is used to make a third swath, diluting the inoculum even further.

6. A dissecting pick or a bacteriologist's loop is next used to make a number of stabs through the inoculum in each swath, starting with the most dilute. This procedure carries a few bacteria below the surface, making it possible to demonstrate the characteristic anaerobic beta hemolysis.

7. A commercially available bacitracin disc is then placed at the junction of the second and third swaths. Be sure to use the kind prepared for identification of streptococci, not discs prepared for antibiotic sensitivity testing.

8. The plates are marked for identification (a felt tip pen is satisfactory) and incubated in the inverted position at 37 C. After 18 to 24 hours the plates may be inspected and the results reported. Characteristically, a positive culture will show clear (beta) hemolysis in many areas, especially in the first and second swaths. The hemolysis will be more intense in previously stabbed areas, and in some cases will appear only there. A "zone of inhibition" surrounding the bacitracin disc will be free of hemolysis. Streptococcal colonies will be small and may be surrounded by larger, more predominant colonies of other organisms. There is no need to identify colonies grossly or to prepare smears for microscopic examination.

The fluorescent antibody technique is unsuited to the small-volume office laboratory because of its technical complexity, but is the preferred technique where available because of its rapidity and accuracy.



The routine culturing of family contacts is frequently recommended because a significant number of them will be carrying the streptococcus. Further work is needed to clarify the significance of positive cultures in contacts with regard to their contagiousness and risk of developing either symptomatic pharyngitis or late complications.

## Treatment

Penicillin, with modest blood levels maintained for at least ten days, has long been recognized as the treatment of choice. Oral penicillin V or G is effective, but controversy exists as to whether patients can be relied upon to take it for a full ten days, during most of which time they are asymptomatic.<sup>19</sup> The alternative is benzathine penicillin (Bicillin, Permapen) given as a single intramuscular injection. This drug is unsurpassed for reliability in eradicating streptococci, but the injections are painful. A preparation of Bicillin C-R, which contains equal amounts of benzathine and procaine penicillins, has often been used in an effort to reduce the discomfort. A newer preparation (Bicillin C-R 900/300) appears to be a more rational choice,<sup>20</sup> each unit containing 900,000 units of benzathine penicillin and 300,000 units of procaine penicillin. The fact that allergic reactions occur more commonly after intramuscular penicillin injections than after oral administration should be considered in planning treatment. However, this risk is not high enough to deter the use of intramuscular administration when it is indicated.

Erythromycin is effective against streptococci<sup>21</sup> and is the agent of choice in patients allergic to penicillin. Broad-spectrum antibiotics such as ampicillin have no advantage over penicillin or erythromycin in the treatment of throat infections although, of course, they are more costly. Tetracyclines and sulfa preparations are unreliable and should not be used. Lincomycin is effective but hazardous.

## Comment

There are for practical purposes three alternatives in the treatment of streptococcal throat infection. The first is to immediately prescribe antibiotics for all patients suspected of having this disease, a procedure which minimizes the risk of

subsequent rheumatic fever and gives prompt relief of symptoms. It is convenient for patients and minimizes compliance problems since there is no need for patients with positive cultures to return to the office and no risk that they will fail to do so. On the other hand, even the most astute clinicians will sometimes make inaccurate clinical diagnoses, leading to unnecessary costs and the risk of adverse reactions, since antibiotics are known to be ineffective against viral pharyngitis. Additionally, failure to culture the throat deprives the physician of a valuable tool for monitoring the accuracy of his/her diagnoses and the epidemiology of streptococcal infections in his community.

The second alternative is to culture the throat routinely. Antibiotic treatment may be withheld until the culture results are known (at least in reliable patient populations). This method affords maximum precision of diagnosis, avoids unnecessary antibiotic administration, and facilitates an epidemiological approach to streptococcal disease.

The third choice is to treat symptoms only. This procedure has the advantage of maximum economy for patient and physician. Whether the increased risk of rheumatic fever outweighs the value of prevented penicillin reactions is unproven. This alternative has gained little favor among practicing physicians but deserves consideration in selected cases.

Forsyth<sup>22</sup> advocates a selective approach, using the alternatives mentioned above variously, depending on the clinical manifestations and the age of the patient. His paper goes one step further in attempting a cost analysis of the various alternatives. One may question whether the majority of physicians can match Forsyth's clinical skill in diagnosing streptococcal throat infections and wish for more precise data to evaluate the extrapolations in his paper, but it represents a commendable effort to quantitate the many facets of this problem in a rational manner.

## Questionnaire

Recently a questionnaire was mailed to the directors of all the approved family practice programs in the United States and to the same number (284) of practicing physicians chosen at random from the Directory of the Ohio State Medical Board. The two groups are not comparable geographically but a comparison of their responses is



**Table 1. Response of practicing physicians and family practice residency program representatives to the question, 'Given a series of adult patients with inflamed throats, temperature of 101° F, and palpable cervical nodes, what percent would you treat in each of the following ways?'**

| Initial Plan                      | Practicing Physicians (n=138) |                     |                     | Residency Programs (n=203) |                     |                     |    |      |    |      |     |      |
|-----------------------------------|-------------------------------|---------------------|---------------------|----------------------------|---------------------|---------------------|----|------|----|------|-----|------|
|                                   | Always<br>(100%)              | Usually<br>(75-99%) | Total<br>Mentioning | Always<br>(100%)           | Usually<br>(75-99%) | Total<br>Mentioning |    |      |    |      |     |      |
|                                   | N                             | %                   | N                   | %                          | N                   | %                   | N  | %    | N  | %    |     |      |
| Oral penicillin V or G            | 25                            | 18.1                | 32                  | 23.2                       | 97                  | 70.3                | 22 | 10.8 | 34 | 16.8 | 150 | 73.9 |
| Procaine penicillin               | 8                             | 5.8                 | 10                  | 7.2                        | 47                  | 34.1                | 1  | 0.5  | 2  | 1.0  | 31  | 15.3 |
| Benzathine penicillin             | 6                             | 4.4                 | 2                   | 1.5                        | 42                  | 30.4                | 0  | 0.0  | 1  | 0.5  | 40  | 19.7 |
| Other antibiotics                 | 6                             | 4.4                 | 7                   | 5.1                        | 68                  | 49.3                | 2  | 1.0  | 2  | 1.0  | 61  | 30.0 |
| No antibiotics<br>pending culture | 6                             | 4.4                 | 4                   | 2.9                        | 49                  | 39.5                | 32 | 15.8 | 47 | 23.2 | 152 | 74.9 |
| No antibiotics<br>no culture      | 2                             | 1.5                 | 6                   | 4.4                        | 27                  | 19.6                | 1  | 0.5  | 0  | 0.0  | 33  | 16.3 |

of some interest. Responses were obtained from 138 (51 percent) of the practicing physicians and 203 (72 percent) of the family practice programs. The two groups were similar in their evaluation of various parameters used in diagnosing streptococcal throat infections, except that residency directors gave less weight to the appearance of the throat and more weight to throat culture findings than did the practicing physicians. Throat cultures were used routinely by 135 (66 percent) of the responding residency programs but by only 50 (36 percent) of the practicing physicians. One hundred twenty-four (61 percent) of the family practice programs did their own throat cultures while only 33 (24 percent) of the practicing physicians did so. Throat cultures were least favored by physicians who perceived them as expensive and time-consuming, objections which do not apply to properly performed office cultures.

When asked their initial methods of management most responders indicated a selective approach. Responses were grouped according to whether a particular approach was used 100 percent of the time ("always") or 75 to 99 percent of the time ("usual"), and the total number of responders mentioning each choice was also tabulated (Table 1). Withholding treatment pending culture was the most widely practiced procedure in family practice centers, while treating with oral penicillin G or V was the next most-often mentioned. Benzathine penicillin was seldom men-

tioned as an initial method of treatment, perhaps reflecting the fact that most physicians who employ this drug do so only for culture-proven cases. The use of inappropriate antibiotics was commendably low for both groups.

## Recommendations

Like Forsyth, the author prefers an eclectic approach with somewhat different criteria for children and adults. This may be summarized as follows:

1. For children with probable viral infections (lymphoid follicles, not much adenopathy, no highly suggestive signs) antibiotics are withheld and a throat culture is obtained. If the culture is positive the patient will be called back for treatment even though the problem may in fact be only a carrier state with a low risk of rheumatic fever.

2. Children with findings suggesting streptococcal infections are treated with oral penicillin or erythromycin (this may be dispensed inexpensively from the office) until the culture is reported. A unit dose of Bicillin C-R 900/300 is administered to children with positive cultures unless the parents seem unusually reliable and request otherwise, in which case ten days of oral penicillin V is substituted, with admonition to give it until the medicine is gone.

3. Adults with findings suggesting viral infec-



tion are treated symptomatically. Throat cultures are occasionally ordered to reassure the patient but need not be done routinely unless the patient has a history of rheumatic or other heart disease.

4. Adults with clinical findings suggesting a streptococcal throat infection are cultured. A decision as to whether to prescribe antibiotics before the culture is reported and the choice of treatment thereafter is individually chosen, based on severity and duration of symptoms, reliability of the patient, and the presence of susceptible children in the home.

### Unanswered Questions

There are a number of unanswered questions with regard to streptococcal throat infections which lend themselves to investigation by family physicians, including the following:

More refined data are needed about age incidence. Are streptococcal throat infections really uncommon before age three, or are they missed because of atypical symptoms? Does it make a difference whether a four-year-old child is in nursery school or at home? Is his risk higher if he has older siblings in school?

The risk of rheumatic fever needs to be more sharply defined. Is it lower, as many assume, in the sunnier parts of the nation? Are the different socioeconomic groups seen by family physicians at different degrees of risk? Is it important to find and treat asymptomatic family contacts? Are low levels of streptococcal colonization, detectable only by techniques more sensitive than the one described in this paper, significant with regard to rheumatic fever risk? Would the development of a quantitative culture technique be useful?

Can the precision of clinical diagnosis be improved? How helpful are white and differential blood cell counts in the occasional case in which throat culture is impractical? Would the addition of nasopharyngeal cultures add to the precision of diagnosis, especially in younger children? Is it true that streptococcal throat infections are self-limited within six days and that such etiology can be excluded clinically in the patient whose sore throat is of seven days duration or longer? Can we build on the work of Forsyth<sup>22</sup> to develop precise cost-benefit data about diagnostic and treatment methods? The investigation of these and other questions offers a fertile field for the investigator seek-

ing better methods of managing streptococcal throat infection.

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