A program for rapid streptococcal diagnosis, including fluorescent antibody identification of Group A was established by the Wisconsin State Laboratory of Hygiene. This report presents the experiences encountered in this program, and illustrates the opportunities offered to study facets of streptococcal infection, including familial infection and the magnitude of the current incidence of rheumatic heart disease.

STREPTOCOCCAL INFECTIONS: OBSERVATIONS FROM A PUBLIC HEALTH LABORATORY

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MOODY, et al.,[1] showed that streptococci can be grouped rapidly by the use of fluorescent antibody. The interest of the United States Public Health Service in application of this newer technology in the diagnosis of infections due to Group A streptococci stimulated the establishment throughout the United States of several extensive programs directed against rheumatic fever and rheumatic heart disease. The program of the Wisconsin State Laboratory of Hygiene was initiated in March, 1961. Its main objective was to offer practicing physicians a service of examining throat swabs received by mail and provide rapid telephone reporting of all those positive for Group A streptococci. In addition an educational effort was made to direct the attention of physicians and the public to the important relationship between infections with Group A streptococci and acute rheumatic fever* and the need for penicillin treatment over a 10-day period in the prevention of this complication.

Personnel from this laboratory received training, equipment, and reagents through the Communicable Disease Center and the Heart Disease Control Program of the USPHS. Bacteriologists were trained in the culturing of throat specimens and the grouping of streptococci by both the conventional precipitin and the new fluorescent antibody methods. In contrast to the four to seven days often required by the older standard precipitin method to group streptococci, the same information is now available and telephoned to the physician 24 to 36 hours after the specimen is received in the laboratory.

This report presents the experiences encountered in this program and illustrates how such programs in a large public health laboratory may offer opportunities to study some facets of streptococcal infection including the importance of familial infection with this organism and the magnitude of the current incidence of rheumatic heart disease.

* This program was established through grants from the Wisconsin Heart Association and the Heart Disease Control Section of the USPHS.

Methods of Culturing and Grouping of Streptococci

Group A streptococci can be identified rapidly by the fluorescent antibody method[2,5] by staining smears made from a two-hour broth culture inoculated with a swab. Practical considerations, however, do not permit the application of this technic to large numbers of routine specimens. Therefore, we have adopted the following method: throat swabs are inoculated into tubes containing 1.0 ml of Streptocel* broth where they remain for approximately an hour. The swabs are then removed and used to inoculate tubes of melted veal infusion agar to which 7.5 per cent sheep's blood has been added. The inoculated blood agar is mixed and poured into petri dishes. Both the Streptocel broths and the blood agar pour plates are incubated aerobically overnight at 37° C. The following morning the plates are examined for beta hemolytic streptococci; the companion Streptocel broth cultures of positive plates are then centrifuged to determine if the streptococci belong to Group A. Smears are prepared from the sediment, stained with fluorescent specific anti-Group A streptococcus globulin, and examined under a fluorescent microscope.† When examination of smears fails to reveal streptococci, this may be because the broth cultures may contain hemolytic streptococci of other groups or the number of Group A streptococci may be insufficient to be found in a microscopic examination. In such cases further testing is done by the precipitin method. From the original pour plate a colony is picked and streaked onto a fresh blood agar plate. The pure growth of streptococci thus obtained is subcultured into a large volume of Trypticase soy broth to serve as growth for the standard Lancefield[3] precipitin test. This has been the pattern of our procedure from the beginning of the program.

In order to establish the accuracy of the fluorescent antibody procedure, beta hemolytic streptococci in each positive specimen were grouped by both the precipitin and the fluorescent antibody methods in the early phase of the study. The first 2,500 specimens yielded 343 cultures of beta hemolytic streptococci. These were grouped by both technics and the results, shown in Table 1, used to compare the two methods. It can be seen that of the 81.9 per cent which were fluorescent antibody positive, 75.5 per cent were confirmed by the precipitin method and 6.4 per cent were not confirmed. When the fluorescent antibody test was negative for Group A, the precipitin method picked up

Table 1—Comparison of Precipitin and Fluorescent Antibody Tests on First 2,500 Swabs Received

Results of Tests for Group A on Beta Hemolytic Cultures

A. Number of typable strains:

		Precipitin Method		
		+	−	Total
Fluorescent Antibody method	+	258	23	281
	−	13	49	62
Total		271	72	343

B. Per cent of typable strains:

		Precipitin Method		
		+	−	Total
Fluorescent Antibody method	+	75.5	6.4	81.9
	−	3.8	14.3	18.1
Total		79.3	20.7	100.0

* Todd-Hewitt broth is now used in place of Streptocel.

† Both Reichart and Leitz Ortholux fluorescent microscopes were used in this study.

Table 2—Summary of Experience with Fluorescent Antibody and Precipitin Methods for Identifying Group A Streptococci

Year	Specimens Received	Cultures Yielding B-hemol. Strep.		% of Hemolytic Cultures Identified Group A				Total %
				by FA		Add'l. by Pptn.		
		No.	%	No.	%	No.	%	
1961	20,043	3,709	18.5	2,606	70.2	330	8.8	79.0
1962	32,752	7,311	22.3	6,361	87.0	334	4.6	91.6
1963	43,795	10,914	24.9	9,809	89.9	443	4.1	94.0
Totals	96,590	21,934	22.7	18,776	85.6	1,107	5.0	90.6

an additional 3.8 per cent in this initial study. The over-all agreement (307/343) between fluorescent antibody and precipitin methods was 89.8 per cent. In summary, taking the precipitin test as a standard of comparison, the fluorescent antibody method proved highly successful in the rapid identification of Group A streptococci.

Subsequent data are based on the application of the fluorescent method to all cultures of beta hemolytic streptococci and the precipitin method to only those cultures which were found to be not Group A by the fluorescent antibody method.

Recovery of Group A Streptococci from Specimens

Table 2 summarizes our experiences of the three years the program has been in operation. In 1963, 43,795 specimens were received, an increase of somewhat more than 100 per cent beyond the number received in the first year this service was offered. In almost 100,000 throat cultures tested, 22.7 per cent grew out hemolytic streptococci of which 90 per cent were identified as Group A. The larger percentage of hemolytic cultures identified as Group A in successive years of the program probably reflects increasing technical proficiency with the fluorescent antibody technics. On the other hand, part of these differences may reflect an actual increase in the incidence of streptococcal infections during the three-year period.

Marked seasonal fluctuations of similar magnitude occurred in each year. These are shown graphically in Figure 1. The highest incidence period began in October and November and reached

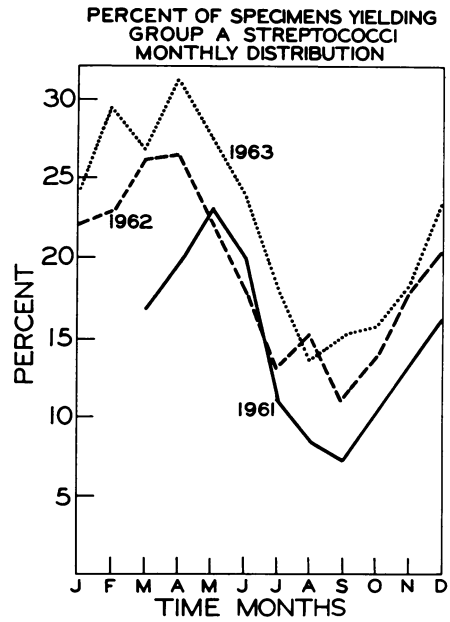

Figure 1—Monthly Distribution of Throat Cultures Positive for Group A Hemolytic Streptococci Over a 3-Year Period.

Table 3—Recovery Rates of Group A Streptococci from Swabs Held Dry, in 1 Per cent Agar, in Stuart's Medium, and in Transport Medium at Room Temperature

Holding Time (Days)	Dry Swab	1 % Agar	Stuart's Medium	Transport Medium
0 (Initial)	300*	300	300	300
1	0	37	300	300
3	0	0	300	300
6	0	0	74	85
7	0	0	75	97
9	0	0	3	4

* All figures are the average number of Group A streptococci per plate based on three separate plate counts.

a peak about April which was 23.1 per cent in 1961 and 31.2 per cent in 1963. The rate then dropped off sharply after June, reaching a low in August or September at which time it was 7.5 per cent in 1961 and 13.7 per cent in 1963. The apparent yearly increase in the incidence of Group A streptococci is also reflected in this figure. Each of the ten comparable months, except May and June of 1962, had more Group A streptococcal isolations than the corresponding months of 1961, and all months except August, 1963, had more than 1962.

Use of Transport Medium

The great majority of specimens we receive are sent through the mails. Our observations indicated that time and temperature, especially during the summer months, adversely affected cultivation of throat specimens submitted on dry swabs. Therefore, a transport medium similar in composition to Stuart's Transport Medium was devised and tested in the laboratory as well as in a field trial.* It consists of a soft agar gel, a reducing agent, and phosphate buffered saline; it contains no nutrients. It reduces oxidation and prevents drying of the specimen. In the laboratory testing, known numbers of several organisms in pure culture and in mixtures were inoculated onto swabs which were stored dry, in 1 per cent aqueous agar, in Stuart's Medium (Difco), and in this laboratory's Transport Medium. All were held at room temperature. The Transport Medium resulted in prolonged recovery of streptococci as shown in Table 3 when compared to their recovery from swabs held dry or in 1 per cent aqueous agar, but there was no significant difference in recovery when compared to swabs held in Stuart's Transport Medium. Other respiratory pathogens including Diplococcus pneumoniae and Corynebacterium diphtheriae as well as commonly encountered bacteria such as Staphylococcus aureus and Escherichia coli were recovered without reduction in numbers of organisms, for three days in the case of D. pneumoniae and for eight days in the case of C. diphtheriae

A field trial of the Transport Medium was then made with the cooperation of two clinics. Paired swabs were used simultaneously to collect the specimen. They were then separated by the

* Composition of transport media: Bacto-agar, 0.75 per cent; Bacto-sodium thioglycollate, 0.075 per cent; Phosphate buffer at pH 7.2-7.4, 0.01 M; Sodium chloride, 0.15 M.

Table 4—Comparison of Viable Streptococci on Dry Swabs and on Transport Agar Swabs During Field Trial on Paired Specimens

Magnitude of Difference (No. of Colonies/ Swab)	No. of Cultures in Which Transport Swab Count Was Larger	No. of Cultures in Which Dry Swab Count Was Larger	Total
10	13	4	17
10 –10^2	21	1	22
10^2–10^3	11	0	11
10^3–10^4	7	0	7
10^4–10^5	3	0	3
Total	55	5	60

physician or nurse and one submitted dry and the other jabbed into the Transport Medium. A total of 257 pairs of swabs were received. From these swabs beta hemolytic streptococci were recovered from one or both of the pair in 63 instances (24.5 per cent). In three instances both swabs in the pair yielded the same numbers of beta hemolytic streptococci. Of the remaining 60 pairs, as shown in Table 4, a significantly larger number of swabs in Transport Medium yielded beta hemolytic streptococci in great number of colonies than swabs submitted dry.

Following these laboratory and field studies the laboratory supplied the Transport Medium routinely in mailing outfits for throat swabs. During this change-over period some physicians continued to use the dry swab method while others used the new Transport Medium. Comparison of the frequency of the isolation of beta hemolytic streptococci as shown in Table 5 was 20.7 per cent on the dry swab and 31.8 per cent using the Transport Medium. This 11.1 per cent difference was highly significant statistically ($P=0.0027$).

Educational Efforts

Repeated educational efforts were made from the inception of this program to present its significance to both the physicians and the public. Repeated notices were distributed to emphasize the importance of utilizing laboratory methods to substantiate a clinical diagnosis of streptococcal sore throat. The printed therapeutic recommendation of the American Heart Association and the World Health Organization on Prevention of Rheumatic Fever were sent to participating physicians. With each report of Group A streptococci by phone and in the written report the recommendations of the American Heart Association were given on the effectiveness of ten days' therapy with penicillin for the prevention of rheumatic fever. The increasing popularity of this program among physicians is indicated in Table 6. The number using the service now has approximately doubled. Many specimens are also being collected from contacts of cases of streptococcal infection, especially family contacts.

Age Incidence

The age distribution is shown in Table 7. The highest age-specific attack rate was clearly in the 5-14 age group; it was nearly twice as much as in any

Table 5—Recovery of Beta Hemolytic Streptococci from Swabs Submitted Dry and in Transport Material

Method of Submitting Specimen	No. of Specimens	% Specimens Yielding Beta Strep*
Dry swab in glass tube	2,207	20.7
Swab in transport material	4,862	31.8

* 97 specimens failed to produce any growth: Dry 84; Transport 13.

Table 6—Physicians Using Laboratory for Examination of Throat Swabs

Six-Month Periods	No. of Physicians*
11–60 through 6–61†	119
7–61 " 12–61	112
1–62 " 6–62	277
7–62 " 12–62	249
1–63 " 6–63	348

* Number based on physicians who received one or more reports of positive beta hemolytic streptococci.
† Initiation of record system began November 14, 1960.

other age grouping. About 30 positive cultures for hemolytic streptococcus were obtained from each 100 received in the 5-14 period. The next highest frequency, 17 positives per 100 throat cultures, was nearly tied in four age groups: 0-4, 15-24, 25-34, and 35-44. There was a decrease in age group 45-54, then gradually fewer positives until at age 75 and over no positives were noted.

On the basis of the age distribution of all positive cultures, the 5-14 age group again led the rest and accounted for a little over half of all positive cultures. The frequency in the four-year and under age group is interesting because streptococcal infections in the very young may not be clinically characteristic; runny nose, ill defined febrile illnesses, and other manifestations of streptococcosis may occur. This group also has a relatively low risk to rheumatic fever.

Familial Incidence of Infection

An estimation of the incidence of familial streptococcal infections was obtained from the data provided by physicians when specimens were submitted. These data were recorded on a Remington-Rand 40-column mark-sense card. Six months of 1961 were examined: January through March, and October through December, representing the months when the largest number of specimens were processed. Analysis of data recorded in this system necessitates certain assumptions. Patients' names were coded and identified according to a Soundex system while physicians were identified by number. The number of

Table 7—Age Distribution of Cultures Positive for Beta Hemolytic Streptococci (July-December, 1962)

Age Group	No. Tested	No. Positive	Age-Specific Positive Rates	% Distribution of All Positives
0–4	2,126	362	17.0	18.1
5–14	3,488	1,029	30.0	51.6
15–24	1,471	245	16.6	12.3
25–34	1,091	194	17.7	9.7
35–44	637	102	16.0	5.1
45–54	281	36	12.8	1.8
55–64	167	18	10.7	0.9
65–74	72	7	9.7	0.3
75–84	14	0	0	0
85+	1	0	0	0
Totals	9,348	1,993	21.3	100

Table 8—Study of Familial Illness

	Number of Families					
	Positive for Group A		With Only One Infected Member		With Several Infected Members	
Cultured	No.	%	No.	%	No.	%
738	206	27.9	150	73	56	27

family units from which specimens had been received was determined by analysis. A family unit was defined as two or more persons whose last names bore the same code in the Soundex system, whose age and sex had been recorded, and who had been seen by the same physician within two weeks of one another. The laboratory did not receive information indicating the number of members which constituted any given family or the number of members not sampled in any family. We can, therefore, determine only that multiple infections occurred within a family but cannot determine the actual secondary rate because we do not know the number at risk to infection.

Specimens were received from 738 families in the six-month period analyzed. As shown in Table 8, 206 families had Group A streptococcal infections. Of these 206 families, 150 had only one member infected, while 56 or 27 per cent had more than one member infected. Data from the 56 families having multiple cases were analyzed with respect to the number of cases within each family; the times of onset of illness; the number of initial and secondary cases as well as their age and sex as shown in Table 9.

Table 9—Distribution of Group A Streptococcal Infection in 56 Families Having Multiple Cases

	No. of Index Cases*			No. Secondary Cases*			Av. No. Days Between Initial and Secondary Cases
Age	Male	Female	Total	Male	Female	Total	
0–4	15	15	30	4	5	9	4.0 days
5–9	23	20	43	5	2	7	7.1 "
10–14	5	7	12	1	1	2	2.5 "
15–19	3	1	4		2	2	5.5 "
20–24	1	4	5				
25–29	1	3	4				
30–34	4	3	7	1		1	
35–39	2	3	5	1		1	
40–44	2	1	3				
45–over							
Totals	56	57	113	12	10	22	

* Sixteen families had (18) index and (22) secondary cases. Forty families had (94) initial cases only.

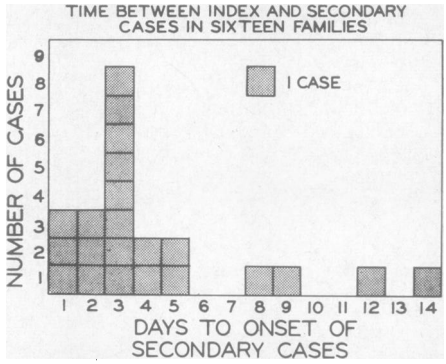

Figure 2—Days Between Index Case and Secondary Streptococcal Cases in Families.

Of the 56 families only 16 had secondary cases. A case was defined as secondary if a different member of the family yielded a positive specimen which was received one to fourteen days after the index case(s). In the 0-19-year age group secondary cases appeared within an average of 2.5 to 7.1 days after the index case, the actual time as being shown in Figure 2. The average age of index cases was 20 years; the average age of secondary cases was 9 years. This was surprising to us as we had expected that infection would have been introduced by a school-age member; this may be due to the small sample involved or to some other bias not easily recognized.

Of the 56 families 40 had no secondary cases but many members were ill on the same days. In some families different members suffered new attacks separated in time from one to eleven months. The 0-14-year age group accounted for 75 per cent of the initial as well as 81 per cent of the secondary cases indicated in Table 9, while there was no significant difference between the sexes.

Summary of Questionnaires on the Management of Respiratory Infections

At the beginning of the service in March, 1961, a questionnaire was sent to all physicians submitting specimens for throat cultures during the preceding six-month period inquiring their attitude toward penicillin therapy, their concept of the relationship between the streptococcus and rheumatic fever, and finally to learn certain other details of their method of management of such cases. One hundred questionnaires were sent out; 87 completed questionnaires were returned or a return rate of 87 per cent. Again in May, 1963, questionnaires were sent out to approximately 450 physicians and 263 or 58 per cent were completed and returned.

The physician did not await the result of the throat culture to initiate antibiotic therapy as shown in Table 10; two thirds of the physicians did modify the treatment schedule if necessary when the report of culture was received. Almost all physicians used penicillin in one form or another. An increasing percentage gave antibiotic therapy over ten days as repeatedly urged, but there were still 23

Table 10—Management of Acute Pharyngitis/Tonsillitis as Reported in Questionnaires

	March, 1961	May, 1963
	%	
1. Wait for result of throat culture before starting treatment	16	5
2. Treatment schedule modified on basis of culture report	67	66
3. Choice of antibiotic		
Oral penicillin	22	16
Benzathine penicillin	55	61
Tetracycline	2	3
Erythromycin	2	4
Sulfonamide	2	4
4. Duration of antibiotic therapy		
Under 10 days	29	23
10 days	50	77

Table 11—Incidence and Age of Rheumatic Fever

New Cases of Rheumatic Fever Seen	1960	1961	1962
Total number reported	115	283	256
Number with age given	109	83	102
Age Distribution	% of Cases with Age Given		
0–4	0.9	3.6	4.1
5–9	22.9	30.0	26.2
10–14	53.2*	37.2	31.2
15–19	8.2	14.4	20.6
20–24	2.7	4.8	2.9
Over 25	8.2	9.6	10.8

* 32 cases reported by physicians as in 7-12 or 8-14 age group without exact age given.

per cent who treated for a shorter period even after two years of educational efforts.

Occurrence of Acute Rheumatic Fever

An estimate of the occurrence of this sequelae might give some indication of the effectiveness of the program. Data on this point was solicited in the questionnaires mentioned above. The number and age distribution are tabulated in Table 11. It is evident that acute rheumatic fever still occurred, primarily in the 10-14 age group.

A more detailed analysis from questionnaire data was made on 158 patients with primary attacks of rheumatic fever. The information is summarized in Table 12. A history of pharyngitis was recorded in 83 per cent of the total group and in 36 per cent of the 133 who visited their physician at this time: of the total of 158 patients with acute rheumatic fever, therefore, 36 per cent went to their doctors and fall into the "potentially preventable category," while the remaining 64 per cent did not visit their physician and rheumatic fever would not be preventable. Analysis of the treatment employed by the physician revealed the disturbing fact that penicillin treatment for ten days had been given to 22 patients who presumedly developed rheumatic fever; in 16 of these benzathine penicillin had been used. No further details of the treatment are given. It is not known, for example, whether the patient may have been seen too late in the course of the streptococcal infection to prevent rheumatic fever. It is also possible that the physician may have misunderstood the question and indicated the treatment that he gave at the time the acute rheumatic fever was diagnosed.

An overwhelming majority of physicians indicated the program is useful; many stated the service often proved valuable in providing laboratory evidence substantiating their clinical diagnosis of streptococcal infection as well as indicating streptococcal infection in many instances where clinical signs were poorly defined.

Table 12—Features of Patients with Initial Episodes of Acute Rheumatic Fever

	No.	%
A. Number of cases	158	100
B. History of preceding pharyngitis	133	83
without preceding pharyngitis	15	
unknown	10	
C. Seen by physician at time of preceding pharyngitis		
Yes	48	36
No	85	
D. Treatment given		
Penicillin for 10 days	22	
Penicillin for 4-5 days	4	
Penicillin, duration unknown	19	
No antibiotic	1	
Answer not clear or unknown	39	
	85	

Discussion

Although the exact etiology of rheumatic fever remains unknown the causal relationship between Group A streptococcal infections and rheumatic fever is firmly established,[4] and prevention is based, therefore, upon prompt and effective therapy of infections with these organisms. On clinical evidence alone, it often is difficult to recognize upper respiratory infections caused by streptococci and the value of bacteriological laboratory testing is becoming increasingly recognized. The method of grouping streptococci by the use of fluorescent antibody[1] is a significant advance in the control of rheumatic fever by providing the practicing physician with accurate, rapid bacteriological information. This method has been carefully evaluated,[5] is gaining widespread usage, and makes possible the grouping of streptococci on a scale and with a speed which heretofore was not practical using the old precipitin method. In this laboratory the initial comparison of the two methods is in close agreement with a correlation and sensitivity reported from other laboratories.[5]

It is generally true that cultures from the majority of individuals with acute streptococcal sore throat will show a heavy predominance of Group A beta hemolytic streptococci while cultures from asymptomatic persons or carriers usually show only small numbers of Group A streptococci.[7] Because many factors most difficult to control affect the quantitation of throat cultures, it is impossible to express the results in precise quantitative terms. Nevertheless, to assist physicians in evaluating the cultural results, the laboratory reports the presence of beta hemolytic streptococci in the culture in semiquantitative terms indicating less than 10 colonies, 10-100 colonies, or more than 100 colonies. Thus, a single colony of beta hemolytic streptococci on the original blood agar plate results in a report of a "positive" culture. The broth cultures corresponding to such plates, however, often contain too few streptococci to be found on a microscopic examination of smears and, therefore, cannot be grouped by the fluorescent antibody method. In the original culture the possible co-existence of streptococci belonging to two groups has been reported by other workers[6] and has been recognized occasionally in this laboratory. In such cases it is possible that by picking a few colonies for subculturing for grouping by the precipitin method streptococci belonging to Group A might remain undetected.

In recent years renewed interest has been evident[16,17] in a re-examination of the practical problems related to the delay between collection of the specimen and its cultivation in a distant laboratory. The development of a practical method for receiving better throat specimens was spurred in this laboratory by observations that the number of specimens which failed to yield any growth in cultures or yielded minimal growth of any flora was greatest after week-end delays in the mails, or during extremely hot weather. Consideration was given to the use of filter paper strips used elsewhere in similar programs and advocated[21] for the transport of streptococcal specimens. The desirability, however, of being able in cases of necessity to transport other respiratory pathogens led to the development of the Transport Medium. Although for several years beta hemolytic streptococci and other pathogens have been successfully cultured from many specimens transported on dry swabs to the laboratory, nevertheless many more streptococci survive in this newer method of submitting specimens. The Transport Medium has proved advantageous in this program particularly when mailed specimens are subjected to adverse conditions of time and temperature. Further studies may prove that

most kinds of other specimens now submitted on dry swabs may be better sent in this material.

During the time the program has been in progress seasonal fluctuations in the incidence of Group A streptococci have been encountered. In addition, the incidence of Group A streptococci appears to have increased in 1962 and 1963. These observations based on specimens submitted to a public health laboratory for routine diagnostic service are similar to several reports of controlled studies.[9-11] Kincaid[8] in a three-year study of school children followed during the school year reported the highest percentage of children having positive cultures occurred between February and June with distinct differences in the annual incidence of positive cultures. Other groups[12-14] report no seasonal relationship.

By its growth and its ready acceptance indicated by questionnaires, this program demonstrates the practicality of providing physicians practicing in distant communities information with which new inroads may be made upon the problem of rheumatic fever. In a study of service personnel[15] "admitted to the hospital with exudative tonsillitis or pharyngitis from whom typable Group A streptococci were isolated—none of whom received antibacterial therapy . . .," about 3 per cent were reported to have developed rheumatic fever within 35 days of the initial streptococcal infection. In nonepidemic situations, it now appears that in civilian populations the attack rate is less than this figure which is based on a study of military populations. Despite some evidence that the prevalence of acute rheumatic fever is declining, it remains an important public health problem as evidenced by recent studies[18,19] and by the 654 cases reported in a three-year period in questionnaires returned by 350 Wisconsin physicians using the facilities of this laboratory.

The system recently installed in this laboratory[20] for recording and analyzing data made possible estimations of the incidence of familial streptococcal infections. In the careful studies of streptococcal infections in families in Cleveland,[11] James, et al., found there was a 25 per cent risk of spread within the family when the index case had streptococcal illness but only 9 per cent when infection was not accompanied by illness. The majority of specimens received in this laboratory are from individuals who have sought medical care for illness, and analysis of our data yielded the estimate that 27 per cent of infected families had more than one member infected with Group A streptococci. While this program was not primarily directed to a study of families, nevertheless, certain epidemiological information regarding the roll of familial infection, age of initial and secondary cases, and the time of onset of secondary cases can be approached through use of a system of gathering and analyzing data as described. Our studies indicate that some individuals in families are subject to repeated infections, sometimes separated by long periods between attacks. This is reported by James, et al.,[11] who noted that other individuals and other families are relatively free of streptococcal infections. Extensive opportunities remain for the study of the factors influencing the spread of infection within families as well as the reasons why some families are more susceptible than others to repeated attacks.

Attempts to evaluate the success of this program by a quesionnaire given at the beginning and two years later were not very successful. It was apparent, however, that provision of diagnostic facilities was not affecting the physician's initial decision as to whether or not to give antibiotic therapy when the patient was first seen, but did appear to provide a means of modifying the treatment program after the report of the culture had been received. On this basis the need for so rapid a reporting of cultures does not seem so great. On the other hand if

procaine penicillin is given, then the culture result should be at hand at the end of the 72-hour period in order to provide a basis for the next step in management. It is also clear that physicians continued to see acute rheumatic fever in their practice.

The development of services for streptococcal diagnosis in this state, as was true in many other states, was predicated in the belief that the provision of grouping facilities through the fluorescent antibody technic would be an important contribution to the prevention of rheumatic fever. The observations recorded in this paper that 90 per cent or more of hemolytic streptococcal infections, in Wisconsin at least, are Group A suggest that the fluorescent grouping might be discontinued without significant loss of practical diagnostic information. Indeed, this would permit and encourage the development of more extensive local diagnostic facilities in private laboratories, clinics, hospitals, and even in physicians' offices. When done under the latter circumstances it may even be possible for the physician to wait for the culture result before initiating treatment.

Summary

1. The Wisconsin State Laboratory of Hygiene established a program for rapid streptococcal diagnosis including fluorescent antibody identification of Group A in March, 1961.

2. In a three-year period approximately 100,000 throat cultures have been received of which 22.7 per cent have been positive for beta hemolytic streptococcus. Of the hemolytic cultures, 90.6 per cent were identified as Group A.

3. A simple and effective agar Transport Medium has been developed and field-tested for shipment of streptococcal cultures through the mail.

4. Age, seasonal, and familial aspects of streptococcal infections have been reviewed from data received in the laboratory.

5. Questionnaires to physicians revealed acute rheumatic fever to be a continuing public health problem.

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ADDENDUM

In 1964 the Wisconsin State Laboratory did 56,000 throat cultures for hemolytic streptococci and will be well above this level in 1965. Twenty-six per

cent yielded hemolytic streptococci of which 87 per cent were identified as Group A. Age group analysis of an additional 6,294 positive cultures confirmed the distribution reported in this paper: 52 per cent of all positive cultures were in the 5-14 age group in whom 41.4 per cent of all throat cultures submitted yielded Group A hemolytic streptococci.

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Fellowships in Industrial Medicine

The Atomic Energy Commission is offering eight fellowships in Industrial Medicine for the academic year, 1966-1967. They are designed to provide advanced training in the field of industrial medicine, particularly in relation to the atomic energy industry. Fellowships are open to physicians graduated from an approved college of medicine after they have completed at least one year of internship. They must be licensed to practice in the states and territories of the United States and intend to enter the practice of industrial medicine.

The recommended training program consists of two parts, and is geared to satisfy the special board requirements in occupational medicine. The first two years will include lecture and laboratory instruction in the practice of industrial medicine, industrial hygiene, industrial toxicology, nuclear physics, biophysics, biostatistics, and the public health aspects of occupational medicine. The third year would be an inplant or field training year during which the trainee would have an opportunity to apply the material learned in the first two years and to observe and participate in, under competent supervision, the operation of an active industrial medical service.

The stipend during each of the fellowship or academic years is $7,500. This is usually divided into a minimum of 9 or a maximum of 12 equal payments, depending upon the starting date elected by the Fellow. The sum of $500 is added to the total stipend for each legal dependent up to a limit of three. Tuition and laboratory fees, which would be required of students of similar university status, will be paid in academic courses. Certain other expenses incident to the work of the Fellow will be paid when approved by the committee. During the inplant year the stipend is paid by the organization providing training experience and the amount is not subject to the above restriction.

The selection of Fellows is made by the Atomic Energy Commission on recommendation of the Committee on A.E.C. Fellowships in Industrial Medicine. Application must be filed before January 1, 1966. For applications and information write: Dr. Henry A. Blair, Secretary, A.E.C. Industrial Medicine Fellowship Committee, P.O. Box 287, Station 3, Rochester, N. Y. 14620.