

Pericardium.—Infections of this serous membrane have been encountered in a small proportion of cases. Considering the close topographic relation of the pleura and the pericardium, it has seemed remarkable to find so few extensions from one to the other.

Peritoneum.—Peritonitis of streptococcic origin has likewise been a comparatively unusual finding. Several of those discovered were subphrenic localizations. Not a single case of appendicitis out of more than 200 coming to operation has been shown to be produced by *Streptococcus hemolyticus*. In one case, only, of periappendicitis was this organism demonstrated.

Mastoiditis.—An unusual number of cases of streptococcic mastoiditis have arisen and have run very acute and stormy courses. Half of these have appeared since the influenza epidemic. About eighty such cases have come to operation. Thirteen per cent. have terminated fatally. Mastoiditis has unquestionably been one of the most serious late complications of influenza. Associated with mastoiditis, sinus and jugular vein thrombosis have been encountered four times each. Two patients developed meningitis and two brain abscesses.

Wounds.—Many infected wounds have shown the presence of the hemolytic streptococcus, in a majority of cases in pure culture. On many occasions this organism has occurred following clean operations the technic of which had the most critical scrutiny and laboratory control. Considering the very wide distribution of hemolytic streptococci in so-called normal mouths, such infections are more easily explained.

Among other localizations of streptococci have been cellulitis, arthritis, phlebitis, sinusitis, endocarditis, osteomyelitis, abscess of the thyroid, and abscesses of the kidney. Streptococci have been recovered in large numbers from many cases of tonsillitis. Erysipelas has been a common complication. It has been noted that streptococcic empyemas tend to remain uncontaminated by other organisms over long periods of time. Empyemas originally caused by pneumococci and other organisms have in spite of scrupulous surgical care in dressing later shown hemolytic streptococci, which ultimately were the only organisms recoverable from such cavities.

SUMMARY

1. Streptococci as observed at Camp Custer have manifested themselves almost uniformly as secondary invaders.

2. It is impossible to divorce a discussion of streptococcic infection from such antecedent diseases as influenza, measles and the acute upper respiratory inflammations.

3. Important factors in the incidence of streptococcic infections and their outcome are disclosed after investigating the effects of length of service, rural and city life, and bodily fatigue and exhaustion.

4. Streptococci have been responsible for a variety of lesions, but their predilection for the respiratory system far exceeds all other localizations.

Antitoxin in Diphtheria.—Depending on the way it is treated, diphtheria is one of the least dangerous or one of the most dangerous diseases. It is one of the least dangerous when promptly treated with antitoxin; it is one of the most dangerous when the antitoxin treatment is not given or is delayed or is insufficient.—Keep Well Series No. 4, U. S. Public Health Service.

REPORT OF THROAT CULTURES IN MEASLES

R. H. KNOWLTON, M.D. (ST. PETERSBURG, FLA.)

First Lieutenant, M. C., U. S. Army

TAKOMA PARK, D. C.

From Oct. 20, 1918, to the present date, a routine throat culture has been made in each case of measles as soon as possible after the patient enters the wards. This was done for the purpose of selecting those patients harboring hemolytic streptococci and isolating them, usually in a separate ward. The cubicle system as used in this hospital undoubtedly offers a large degree of protection against the spread of infection by coughing, but as the sheets are not always properly placed, the special ward was thought to be best. The statistics of these cases were kept to determine what relation was shown between the throat cultures and the complications. The diagnosis of complications was made by the different ward surgeons and the personnel changed from time to time. The presence of pathogenic organisms was determined by various persons of the regular laboratory force, so that their opinions were quite unbiased. This report, therefore, is largely a correlation of the findings of the ward surgeons by physical examination and the reports of the laboratory on the throat cultures.

The tables included show records of 458 cases of measles covering a period of eight weeks, from Oct. 20 to Dec. 13, 1918. The cultures were taken post-nasally with a wire swab, bent at right angles, and applied to a small area of a human blood agar plate. The spread was made with a platinum loop wet with a drop of salt solution. From this point the work was taken up by the regular laboratory force. The culture was examined next day and colonies resembling hemolytic streptococci picked and planted in broth. The following day the broth was examined and mixed with an equal amount of 5 per cent. suspension of red blood corpuscles and incubated for not over an hour, to determine the presence of hemolysis. Only those showing this reaction were considered positive. The percentage of positives for hemolytic streptococci varied materially in different weeks, the lowest being 19 per cent. the fourth week, and the highest 45 per cent. the eighth week. It also varied in different wards, the highest percentage being in B-4, where, of the twenty-three cases, there were fourteen positives. This ward was taken over for measles rather unexpectedly and for the first day or two there were no cubicles, which may account for the high percentage of positives. Also, cultures were taken in this ward three times, the first time determining nine positives, the second four more and the third time one more.

The chief interest lies in the relation between the throat organisms and the principal complications, pneumonia and otitis media. Pharyngitis, laryngitis and bronchitis have not been considered as complications but as more properly a part of the disease. While acute tonsillitis occurred not infrequently, it is hard to say whether it was a complication or not since it sometimes came after the patient was convalescent. The presence of bronchopneumonia is sometimes a matter of opinion, but the diagnosis of the ward surgeon was taken in all cases. Cases of otitis media have not been included unless the process went on to suppuration. Mortality statistics are practically com-

plete at the time of writing, as six weeks have elapsed since the last case included in this series was admitted. There have been thirteen deaths in the 458 cases, a mortality of 2.7 per cent. Among the forty-eight pneumonias there have been ten empyemas, the hemolytic streptococcus being the predominating organism, and six of these patients are now dead. From the forty-three cases of suppurative otitis media there have been five cases of mastoiditis. There were also noted three cases of frontal sinusitis and two of peritonsillar abscess and one acute appendicitis. There were two cases of meningitis; one due to the meningococcus, and four carriers were found in this ward. In the other case hemolytic streptococci were found in the spinal fluid and the case went on to a rapidly fatal termination. This case presented a streptococcus otitis media, but at the necropsy there was no evidence of direct extension to the brain. The milder affections of the throat and nose are sometimes mentioned on the diagnosis sheet and sometimes not, and so for the sake of greater accuracy the comparison is made only between the throat organisms and the incidence of pneumonia, with or without empyema and otitis media with or without mastoiditis. The summary of these records is shown in Tables 1 and 2.

TABLE 1.—RELATION OF HEMOLYTIC STREPTOCOCCI IN THROATS TO COMPLICATIONS OF MEASLES

	Cases Positive for Hem. Strep. in Throats		Cases Negative for Hem. Strep. in Throats	
	No.	Per Cent.	No.	Per Cent.
Total number	122		336	
Pneumonia complicating each group	13	10.6	35	10.4
Otitis media complicating each group	11	9.0	33	9.8

TABLE 2.—RESULTS OF THROAT CULTURES IN ALL CASES OF MEASLES AND ITS COMPLICATIONS

	Number	Number Positive for Hem. Strep.	Per Cent. Positive for Hem. Strep.
All cases measles	458	122	26.6
Measles complicated by pneumonia	48	13	27.1
Measles complicated by otitis media	43	11	25.6

It will be seen from these figures that in this series of cases pneumonia and otitis media occurred in the same proportion in the streptococcic and nonstreptococcic throats.

In this connection it is interesting to note that in Ward B-4, where fourteen of the twenty-three patients were positive, there was only one pneumonia and that of a lobar type and no other complications at all.

The great majority of these boys were from the country or small towns as the following figures indicate: men from country, 415; men from small towns, 26; men from cities, 17, or 3.7 per cent.

Each patient was asked if he had ever had measles before, with the following results: never had measles, 385; German measles only, 44; had measles before, 29, or 6.3 per cent. That is to say 96.3 per cent. of the measles cases came from the country and 93.7 per cent. of the patients had not had measles before.

The state from which each patient came was noted and it was found that thirty states were represented as well as the island of Porto Rico. The states represented by more than ten patients were: North Carolina, 134; South Carolina, 95; Florida, 65; New York, 46; Ohio, 16; Missouri, 13. Two thirds of all cases came from the states of North Carolina, South Caro-

lina and Florida. At the camp personnel office it was not possible to obtain exact figures as to the population of the camp by states at this time, but it was stated that at least 60 per cent. of the men at that time were from the North. The average measles patient was then a country boy, working on a farm situated in the Carolinas or Florida.

Experiments with dichloramin-T were carried on in the streptococcus isolation ward by Major Dunham of the Surgeon-General's Office, to see what effect this spray would have in clearing up these throats. There were seventeen patients present, all previously known to harbor streptococci, and cultures were taken again. The patients were sprayed three times and a third culture taken three days after the second. Of the original seventeen cases, ten were found to be positive on the second examination, and after spraying there were nine positive. Four cases positive just before spraying were found to be negative afterward, but three cases negative before were positive after, so that this method of treatment does not promise much against this particular organism.

In presenting these figures, it is understood that one negative culture for streptococci is not final, and if the cultures were taken every day or two the proportion of positives would be somewhat higher. This does not necessarily mean that the throat has become infected in the ward, but that in the finding of positive cultures there is a certain element of chance. A number of the patients had more than one culture and of the 122 streptococcus carriers, eleven were found on subsequent examinations. Streptococci could not be found on every examination, as the cases in the isolation ward show. Of the seventeen carriers just mentioned, four were negative on both the second and third examinations; seven were negative on either the second or third, and only six were positive all three times.

The question might be raised why cultures of the throats were not taken every day or two, since more carriers might be found in this way. The reason for not doing so is that we believe that this would be an injustice to the patients as in these inflamed throats, repeated swabbings could easily stir up dormant trouble.

The figures as they stand reveal that in this hospital there was no relation between the presence of hemolytic streptococci in the throat and the occurrence of complications. This does not accord with the conclusion reached by Levy and Alexander¹ in their work at Camp Zachary Taylor. After seeing this number of cases we believe that plenty of space and abundance of fresh air are large factors in preventing complications, and that whatever may be said of the value of isolation, it cannot take the place of proper treatment.

1. Levy, R. J., and Alexander, H. L.: The Predisposition of Streptococcus Carriers to the Complications of Measles, *J. A. M. A.* 70: 1827 (June 15) 1918.

Typhus as Accident.—According to the *Nederlandsch Tijdschrift*, the supreme court in Germany decided a case, Oct. 23, 1918, to the effect that the contracting of typhus by a German physician in the exercise of his professional duties at a prisoners' camp, entitled him to the indemnity for which he had been insured against accidents. The court stated that as the fatal typhus had probably been acquired from the bite of a louse, this came under the head of "external injury," but even without this, if the virus had infected through eyes, nose or mouth, the same reasoning as to the infection being an accident would prevail.