THE RELEASE OF QUARANTINE IN DIPHTHERIA.

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One has only to learn the methods of releasing convalescent diphtheria patients in the different cities of the United States to find that a wider divergence of views attends the termination of quarantine in diphtheria than in any other infectious disease.

Although it is generally recognized that the patient ceases to be a source of danger when diphtheria bacilli disappear from his nose and throat, the uncertainty lies in the amount of evidence considered sufficient to demonstrate this fact.

There has been a rather exceptional opportunity for obtaining exact information on this point in the epidemic of diphtheria which has prevailed at the Willard State Hospital since June, 1899. The institution receives all classes of the insane, and has a population of over 2,200 patients, who are cared for by about 500 attendants and employes. In the management of the epidemic all persons ill with diphtheria were removed, as soon as the diagnosis was made, to an isolation hospital and there detained until cultures proved them to be free from infection.

Most of the employes remain in the institution for a considerable time and the average stay of the patients is over five years, many of them spending the rest of their lives in the hospital. This has permitted us to make the period of isolation as long as we desired without hardship to any of the persons detained, and has afforded an opportunity to observe the cases closely for a long time after their discharge from the isolation hospital. Cultures were taken at frequent intervals from the onset of the disease until many months had elapsed after quarantine was released.

A series of one hundred cases occurring after January 1, 1901, has been taken for the purpose of examining closely the period of infectiousness and the conditions which seem to modify it. Three fatal cases have been excluded. All but five were adults, the average age being 29.1 years, and the sexes nearly equally represented. Sixty-nine of the 100 cases were healthy young people employed as nurses and attendants.

The series includes cases of greatly varying severity.

The following table shows the number of days from the onset of the disease to the last positive culture:
Only one positive culture .................................................. 13 cases.
1 to 5 days ........................................................................... 9 "
5 to 10 days ........................................................................... 6 "
10 to 15 days ......................................................................... 17 "
15 to 20 days ......................................................................... 16 "
20 to 25 days ......................................................................... 10 "
25 to 30 days ........................................................................... 6 "
30 to 35 days ........................................................................... 6 "
35 to 40 days ........................................................................... 5 "
40 to 45 days ........................................................................... 2 "
45 to 50 days ........................................................................... 3 "
50 to 55 days ........................................................................... 1 "
More than 55 days ................................................................... 4 "

Before considering the cases in detail it may be interesting to notice
that the severity of the disease was without influence upon the length
of time the persons remained infected. The average duration of pos-
itive cultures in the severe cases was 21.86 days, in the moderately
severe cases 21.4 days, and in the mild cases 22.4 days.

I have thought that it might be profitable, in considering the period
of infectiousness, to apply to the one hundred cases the different
methods of releasing quarantine which are in use in some cities in
the United States, and to see to what extent they would have proved
efficient had they been employed.

Although there are not many large cities in which the duration of
quarantine is governed entirely by an arbitrary time-limit, yet in towns
where bacteriological laboratories are lacking and generally in the rural
districts, this is the only method for determining when the convalescent
shall be released.

If all the persons in the present series of cases had been released
two weeks after the onset of their illness, sixty would have been still
infected with diphtheria bacilli. If three weeks had been the time-limit
employed, thirty-seven persons would have been released still infected,
and if four weeks, twenty-seven.

Had the absence of diphtheria bacilli in a single culture from the
throat and in one taken synchronously from the nose been regarded
as satisfactory evidence that the convalescents were no longer infected,
fifty-four persons would have been permitted to return to their wards
still infected.

The importance of taking cultures from both nose and throat is
shown by the fact that in thirty-two pharyngeal cases, diphtheria bacilli
were found in both nose and throat, and in twelve of these they per-
sisted in the nose after the throat had ceased to be infected.

The following table shows the results which would have been ob-
tained with different methods of releasing quarantine:
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Time limit of two weeks ..................................... 60
Time limit of three weeks ..................................... 37
Time limit of four weeks ..................................... 27
One negative culture ........................................... 54
Two negative cultures .......................................... 13
Three negative cultures ........................................ 11
One negative culture after two weeks ....................... 26
Two negative cultures after two weeks ..................... 6
Three negative cultures after two weeks ................... 5
Three negative cultures after three weeks ................. 2
Three negative cultures after four weeks ................. 2

The most noticeable feature is the number of times a single negative culture was followed by positive ones.

It will doubtless be agreed that a method of releasing quarantine in which a "margin" of error of from thirty to fifty per cent. exists is not at all satisfactory and should only be employed as a step toward a more perfect method or when public opinion will admit of no other. It is scarcely preferable to a time-limit.

If, then, one negative culture is entirely unsatisfactory, what may be regarded as sufficient evidence of the final disappearance of diphtheria bacilli? From its cabalistic significance, perhaps, three has been decided upon as a maximum number of negative cultures, but at Willard only two persons less were discharged still infected after three negative cultures than when two cultures taken on alternate days had proved negative. When the two negative cultures had been obtained after a time-limit of two weeks from the onset of the disease, only six persons were subsequently found to be infected.

Short of perfection, which is unattainable even when the conditions are so entirely within the physician’s control as in public institutions for the insane, this measure seems to be the one attended by the fewest disadvantages and the greatest success. It introduces the obnoxious time-limit, which is unjust, in that it causes the detention of uninfected persons, and which is inefficient, in that it permits the release of many infected persons; but yet in less than two weeks few diphtheria patients can leave their rooms in safety. If two negative cultures, taken after two weeks from the onset of the disease, had been the sole requirement for the release of quarantine in the present series of cases, forty-five per cent. of all those who had had diphtheria would have regained their liberty in sixteen days and ninety-five per cent. of these with a certainty that they were no longer infected.

Several definite conclusions may be drawn from this study of one hundred cases because of the exceptional opportunity they offered for the collection of complete data.
I. The severity of the disease is shown to bear no relation to the duration of infection.

II. Additional proof is afforded of the unfairness of an arbitrary time-limit in the quarantine of diphtheria.

III. The occurrence of positive cultures after a single negative has been obtained is shown to be the rule rather than the exception.

IV. The importance of taking cultures from the nose as well as the throat for the release of pharyngeal cases is demonstrated by the number of cases in which the nose remained longer infected.

V. Two negative cultures taken on alternate days from both nose and throat after two weeks have elapsed from the onset of the disease, is suggested as a requirement which is not unfair to any and which permits the release of only six per cent. of infected persons.