

Result of Active Immunization of Nurses Against Scarlet Fever*

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ACTIVE immunization against scarlet fever with large doses of toxin has been found universally to render a high proportion of persons negative to the Dick test. Occasional attacks of scarlet fever due to heterologous strains may occur in persons negative to tests with the standard toxin. There is apparently a lack of specificity of the hemolytic streptococci causing various clinical forms of infection in humans. Whether the standard toxin will protect immunized persons against most clinical attacks of scarlet fever, and especially whether such immunized persons are protected against infection or only against the toxin, can be determined only by collected experiences under actual conditions of exposure.

The present report is based on observations of the nurses in the South Department, Boston City Hospital for the past 24 years.

A small group of nurses was immunized by Branch and Edwards early in 1924. Since 1925, the majority of the nurses have been immunized actively against scarlet fever. The Boston City Hospital nurses have been immunized chiefly in the probationary period by the standard method in the Department of Immunology and are assigned to the scarlet fever wards within

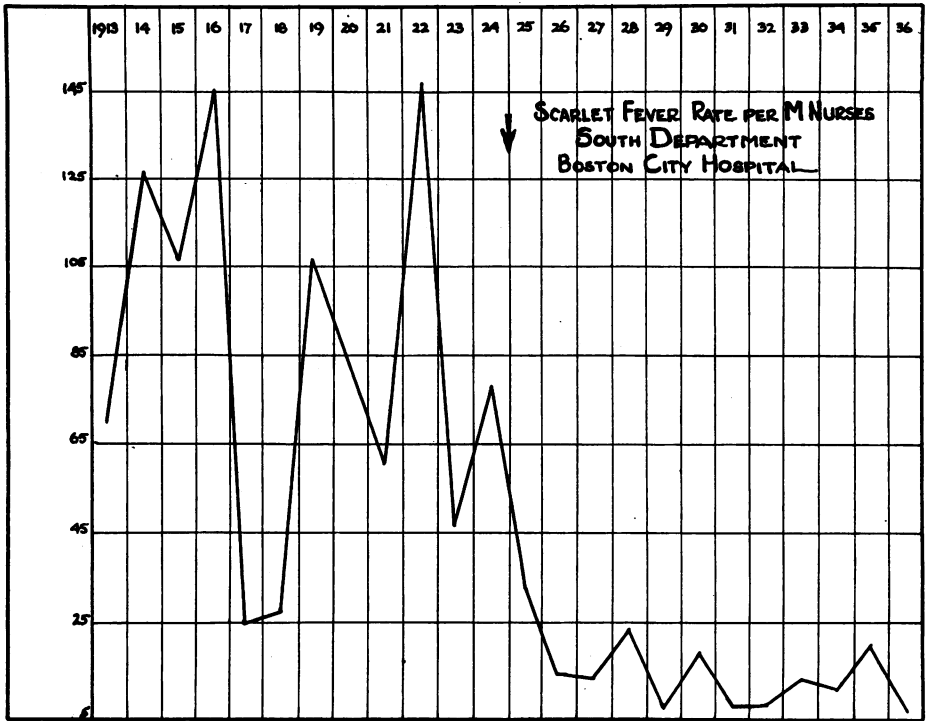
1 to 2 years. Sixty-five per cent of the nurses come from other training schools in Maine, New Hampshire, Vermont, and Massachusetts. Immunizing practice has not been universally good or standard throughout this time in some of these schools.

For the 12 years, 1913-1924, of 1,009 nurses in training 87, or 8.6 per cent, developed scarlet fever. In the following 12 years, 1925-1936, of 1,446 nurses serving in the wards, 20, or 1.3 per cent, contracted scarlet fever, a reduction to 15 per cent of the former rate. Of these 20 nurses, 13 had not been immunized, 3 had had only 500-875 units of toxin, 4½ years, 1 year, and 10 days, respectively, before scarlet fever onset, 1 had received Lilly's Antigen (Larsen) 8 months before scarlet fever, and only 3 had received the complete series of toxin injections. If the completely immunized only were considered in this group the incidence would be 0.21 per cent, a reduction to 0.24 per cent of the former rate.

Of the 3 immunized nurses who developed scarlet fever, 1 never became negative after two series of injections, and the other 2 were not tested after immunization. Two of the 3 had positive Dick tests, 1 before and 1 at the onset of scarlet fever, and 1 was not tested. Only 3 of the 20 cases of scarlet fever were in the Boston City Hospital training school, 2 of which had been immunized with small doses

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CHART I—Scarlet fever incidence in South Department, Boston City Hospital, nurses per 1,000



and 1 had had a previously negative Dick test a few months before scarlet fever.

Of the 13 non-immunized nurses who developed scarlet fever in the second period, 5 had never been Dick tested, 3 of whom were positive just before or at the attack and 2 negative early in the attack. Three of the 13 had had positive tests but had not been immunized. In 1 the result of the test was not obtainable and 4 had been negative. Of these 4 negative, 2 had positive Dick tests at the South Department and 2 were not tested here. One was reported negative although the nurse noted redness the size of a dime 10 hours later which had faded in 24 hours.

This drop from 8.6 per cent to 1.3 per cent in incidence was not associated with a corresponding decrease of scarlet fever in nurses in general in this region.

One hundred twenty-seven nurses were admitted with scarlet fever in 1913–1924 from hospitals having no contagious services, and in the next 12 years 100 nurses were admitted. Immunization in the hospitals supplying these patients either had not been generally done or had been done only during the last 3–4 years. Forty nurses were admitted from the Boston City Hospital (Proper) in the first (non-immunization) period and 35 in the second period.

The degree of exposure of the nurses in hospital service is subject to great variation and cannot be accurately estimated. The total number of scarlet fever admissions to the hospital and the incidence of scarlet fever in Boston is higher during the period of immunization (Chart I).

In 1922, the training course was re-

duced from 6 months to 3 months. The average time of assignment to the scarlet fever wards in the first period was 41.5 days and in the second period 31.3 days. The difference is actually less significant than this. For example, in the first period 28 per cent of the nurses were assigned to scarlet fever wards for 50 days or more for a total of 50 per cent of the whole nursing time. In the second period, there was much less variation, as only 1.3 per cent served in the scarlet fever wards for 50 days or more for a total of 2 per cent of the whole nursing time of this period. Also, since 1922, nursing contact with scarlet fever occurs more or less constantly

on the isolation wards in addition to scarlet fever wards. An analysis of these conditions fails to indicate any significant factor for the reduction in scarlet fever other than the toxin immunization.

But is the disease occurring unrecognized because of the abolishment of the rash? This is not so easily determined. In the 12 years before immunization, admissions of nurses with streptococcal infections other than scarlet fever occurred in 65, or 6.4 per cent, and since immunization in 67, or 4.6 per cent.

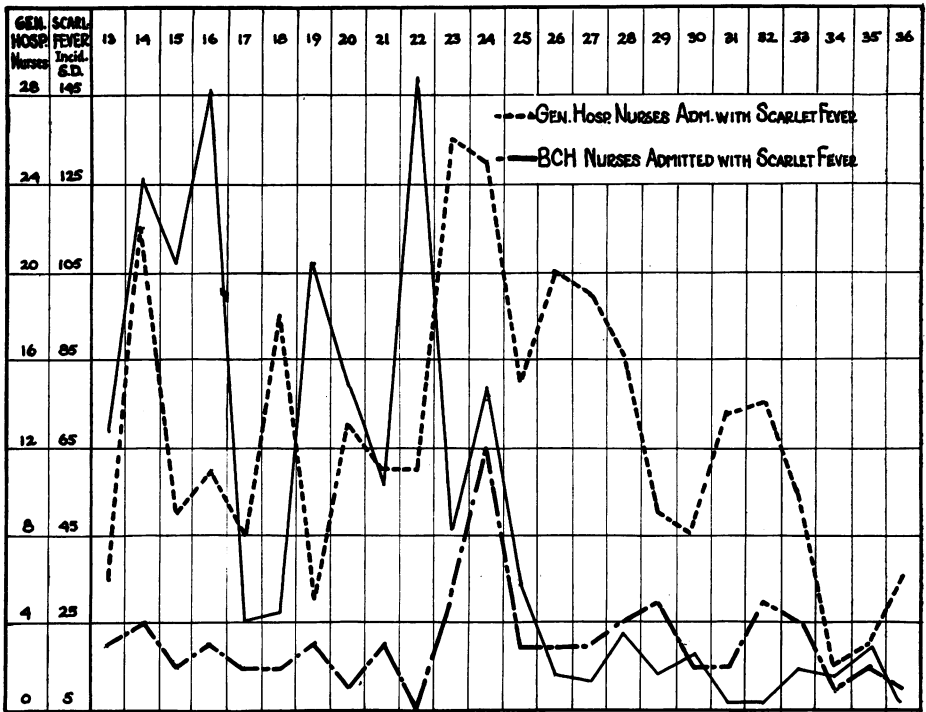
The total loss of time due to all illnesses during the first period was 11.3 days average for each nurse and during

TABLE I

Nurses Contracting Scarlet Fever in South Department, Boston City Hospital, 1913-1936

	Nurses	Nurses Ill Sc. Fev.	Rate per M.	Cases of Sc. Fev. Adm.	Sc. Fev. Morbidity, Boston, per 100,000
1913	71	5	70	801	262.25
1914	63	8	127	846	480
1915	65	7	109	1,080	400.57
1916	94	14	145	574	236.7
1917	78	2	25	531	200.5
1918	69	2	28	391	150.7
1919	122	13	106	693	290.6
1920	98	8	81	576	287.6
1921	101	6	59	693	265.7
1922	75	11	145.6	668	237.3
1923	84	4	47	933	423.1
1924	89	7	78.6	927	504.4
Total	1,009	87	86.2		
1925	87	3	34	708	375.3
1926	75	1	13	783	398.6
1927	84	1	11.9	1,049	532.3
1928	82	2	24.3	763	338
1929	142	1	7	665	353
1930	116	2	17.2	724	336.6
1931	131	1	8.2	903	453.9
1932	121	1	8.2	1,311	624.6
1933	152	2	13.1	1,011	366.3
1934	167	2	11.9	615	235.4
1935	148	3	20.2	543	232.8
1936	141	1	7	762	304.4
Total	1,446	20	13.8		

CHART II—Nurses from general hospitals admitted with scarlet fever compared with incidence in nurses in contagious hospital



the second period 4.8 days. Diphtheria immunization, begun in 1918, accounts for some of this reduction, but comparing 1920-1924 and 1925-1929, shows an average of 7.3 days illness per nurse in the former to 4.2 days for the latter period.

Prevalence of scarlet fever in nurses in the probationary period, before immunization has become fully effective, has shown no increase through contact with nurses who have served in the scarlet fever wards; and the occurrence of scarlet fever in the pediatric wards and in the diphtheria, measles, and whooping cough wards has decreased since immunization.

It is difficult to estimate the number of nurses contracting scarlet fever recognized only because of the rash, who would not even report illness if the rash were not present. From a series of

cases it does not seem probable that it would be as high as 10 per cent.

RÉSUMÉ

The incidence of scarlet fever in nurses in contact with scarlet fever in the South Department, Boston City Hospital, was 86.2 per 1,000 before immunization and 13.8 per 1,000 after immunization comparing 12 year periods. Only 3 of the 20 nurses developing scarlet fever since immunization had had the complete series of immunizing injections. Two of these had not been retested after immunization and one had remained positive after 2 series of injections.

One hundred and twenty-seven nurses were admitted in the first period (1913-1924) with scarlet fever from hospitals not supposed to accept scarlet fever, and 100 such nurses were ad-

TABLE II

Detail Data of Nurses Ill With Scarlet Fever Since Immunization Was Begun

Case	Contag. Service Began	Sc. Fever Ward Assign.	Onset of Sc. Fever	Days After Begin. of Contag. Serv.	Days After Sc. Fever Assign.	Immunized	Prev. Dick
1 A	12- 1-24	2-21-25	1-18-25	49	..	0	..
2 A	1-14-25	2-25-25	3- 8-25	54	12	0	..
3	4-19-25	6-16-25	5-17-25	29	..	875 units 4-17-24	+ 0
4 A	1-14-26	1-21-26	2-11-26	29	22	500 units 2- 1-26	+
5 A	9- 2-27	{ 9- 2-27 to 9-20-27 10-18-27	11- 3-27	63	16	Lilly Antigen 4- 4-27	+
6	2- 5-28	{ 2- 5-28 to 2- 9-28 4- 1-28	4-16-28	71	16	500 units 1925	+
7 A	7- 2-28	{ 7- 2-28 to 7- 3-28 8-11-28	8-19-28	48	5	0	+
8 A	5- 8-29	{ 6-26-29 to 7- 9-29	7-13-29	67	18	0	+
9 A	2- 1-30	3-21-30	2-19-30	19	..	0	+
10 A	10- 1-30	10- 1-30	10-12-30	12	12	0	0
11 A	3-15-31	4-26-31	3-21-31	7	..	+ 1929	+
12 A	11-30-31	1- 2-32	1-22-32	54	21	0	?
13 A	10-14-33	10-27-33	11-13-33	32	18	0	-
14	11- 1-33	11- 1-33	12- 1-33	31	31	0	0
15 A	4-15-34	5-13-34	5-19-34	29	7	0	0
16 A	11- 1-34	{ 11- 1-34 11-30-34 12-23-34	12-26-34	56	4 56	+ 9 mos.	+
17 A	12-30-34	12-30-34	1- 6-35	8	8	0	..
18 A	4- 1-35	4- 1-35	4- 7-35	7	7	Twice 1933	+
19 A	4- 5-35	4- 5-35	4-26-35	22	22	0	0
20 A	2-26-36	3-14-36	4- 8-36	43	26	0	..

A = Nurses from affiliated schools

mitted 1925-1936. In recent years many of these hospitals have begun immunization.

The conditions of contact of nurses with scarlet fever are obviously greatly variable but no significant difference could be made out to account for the striking reduction of prevalence.

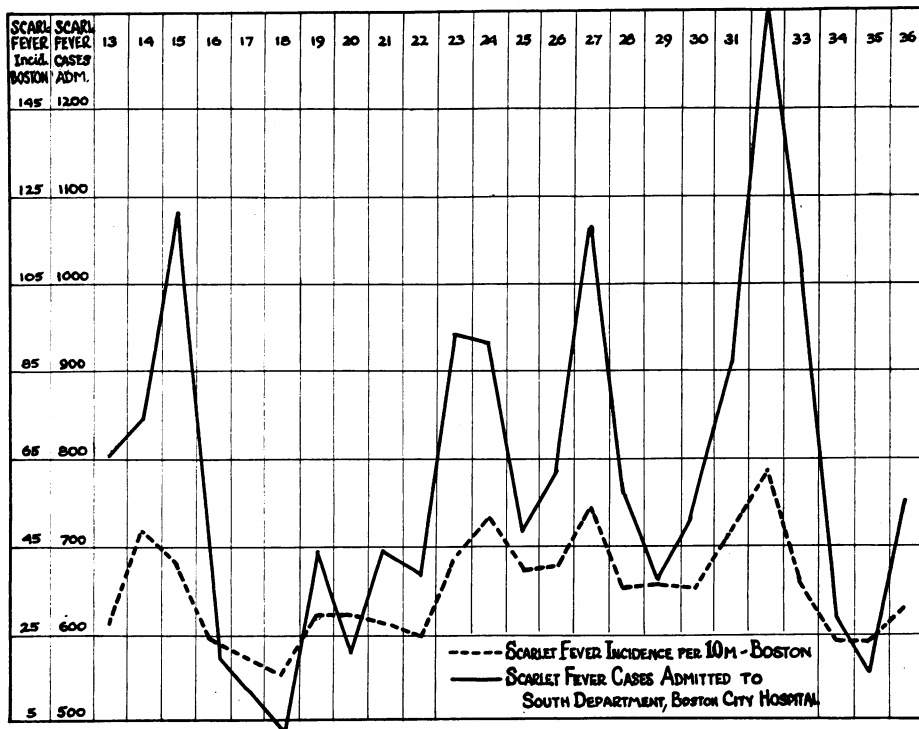
The incidence of streptococcal infections such as tonsillitis, septic sore

throat, erysipelas, and peritonsillitis (aside from scarlet fever) was 64.4 per 1,000 in the first period, and 46.6 in the period of immunization.

The total loss of time from all illnesses was 11.3 days average in the first period and 4.8 days in the second.

The prevalence of scarlet fever in the children in the pediatric, measles, whooping cough, and diphtheria wards

CHART III—Cases of scarlet fever admitted to South Department, Boston City Hospital, and scarlet fever incidence per 10,000 in Boston



has shown no increase since immunization of nurses.

CONCLUSION

Toxin immunization of nurses carefully done largely abolishes the evidence of scarlet fever during their contagious disease training. There is no evidence that the disease is still occurring in unrecognized form.

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