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NOMENCLATURE OF PNEUMOCOCCIC TYPES[1] [2]

By BERNICE E. EDDY, *Bacteriologist, United States Public Health Service*

The nomenclature of pneumococcic types is confusing because of different methods of classification. Two systems of naming have been used. In one, numbers were used for all types without consideration of antigenic components in common with other types. In the other, antigenic relationships were shown by the use of numbers and by numbers plus letters. In addition, certain types of pneumococci have been identified by names or letters.

Exponents of the first system were Cooper and her coworkers (*1*, *2*) in 1929–32. They identified 29 pneumococcic types in addition to types 1, 2, and 3, and included were the pneumococci which had been classified as 11A and 11B by Avery, IVA, IVB, and IVE by Robinson, and the atypical III by Sugg, Gaspari, Fleming, and Neill (*2*). The second method of naming was used by Kauffmann and his associates (*3*) in Denmark in 1940. They reported 20 types in addition to those described by Cooper, using numbers for types plus letters for subtypes. In 1941 the Bureau of Laboratories of New York City (*4*) abandoned the procedure of labeling all new types with numbers as had been their policy and adopted the terminology advocated by Kauffmann. Walter and her collaborators (*5*) during the same year described 17 types above 32 and designated certain of the types as subtypes. Mørch (*6*) in 1942 also reported new types, identifying some as subtypes, but she changed the nomenclature of some of the types described by Walter. In discussing these new types she stated, "It is to be emphasized once more that all the new types entered here in various groups are independent types, just like Cooper's types."

In the above papers the principal types are not consistently of broader or narrower antigenic components than the subtypes. For instance, type 19 has broader antigenic components than 19A, while 11A reacts with more heterologous types than 11.

Because of the disagreement as to which types should be regarded as subtypes, or rather because of the lack of a satisfactory definition of

[1] From the Division of Biologics Control, National Institute of Health.

[2] In part, this study on the interrelationship of the pneumococcic types was undertaken at the request of the Standard Methods Committee on Biological Products of the American Public Health Association. For the ever-ready help and advice of its members the author desires to express grateful appreciation.

a subtype, and because certain types are related not to one but to two or even more other types, it seems desirable to designate every type by a different number regardless of its close relationship to another type. The following is a list of the types, omitting all but three of the types 1 to 32, and the terminology under which they have previously been known.

Pneumococcic type numbers proposed	Terminology of Walter (4), N. Y. C., prior to 1941	Terminology of Walter (5), N. Y. C., adopted 1941	Terminology of Kauffmann (3) and Mørch (6), Denmark	Other terminology for new types
7			7A?	
26			6B	
30	30	15A	15A	
33	33	33	9A	
34	34	10A	10A	
35	35	35	35	
36	36	36	36	
37	37	37	37	
38	38	38	41	
39	39	39	33C	
40	40	40	33A	
41	41	34	34	
42	42	30	33B	
43	43	11A	11A	11-16? (7).
44	44	18A	18A	
45	45	24A	40	
46	46	23A	23A	
47	47	35A	35A	
48	48	7B	7B	
49	49	9L	9L	
50			7C	Hinman (8).
51			7	Spring Valley (5).
52				Odd (9).
53			11B?	11-16? (7).
54			15B	
55			18B	
56			18C	
57			19A	
58			19B	
59			19C	
60				
61			42?	Weingart (8).
62				
63			22A	
64			23B	
65			24A	
66			35B	Hoge (8).
67			32A	
68			9V?	
69			39	
70		40A	33	
71		26	38	
72				T (10).
73				
74				
75				

It is believed that this system of naming each type with a number will prove advantageous for the further study of type interrelationship. It is easier to recognize new types of pneumococci than it is to determine where they belong according to their antigenic components in common with other types. The use of a number for each type does not prevent related types from being grouped together whenever possible or from being changed from one group to another if it is useful to do so.

SUMMARY

Numbers have been proposed to designate every known pneumococcic type without consideration of cross reactions with other types.

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A STUDY OF CROSS REACTIONS AMONG THE PNEUMOCOCCIC TYPES AND THEIR APPLICATION TO THE IDENTIFICATION OF TYPES[1]

By Bernice E. Eddy, *Bacteriologist, United States Public Health Service*

A knowledge of the interrelationship of the pneumococcic types is important for the identification or tentative identification of types of pneumococci, for the preparation of type specific diagnostic antiserums, and for determining which types of antiserums may be combined advantageously or used for other types.

Data will be presented to show that every strain of a given type of pneumococcus reacts in essentially the same way with both homologous and heterologous type antiserums. There is also considerable regularity in the cross reactions displayed by antiserums of the same type.

[1] From the Division of Biologics Control, National Institute of Health.

MATERIALS AND METHOD

The serums studied were samples of antipneumococcic rabbit serums prepared for therapeutic or diagnostic use by manufacturers and routinely submitted for release, and, in addition, antiserums for 17 types which have not been produced commercially. These include 10 unabsorbed antiserums sent by the New York City Laboratories, 3 diagnostic antiserums supplied by the Lederle Laboratories, 1 prepared at the National Institute of Health, and 4 submitted for consideration for license. The therapeutic antiserums were concentrated and unabsorbed. The diagnostic antiserums had all been routinely tested for cross reactions with heterologous types of pneumococci 1 to 32, inclusive (omitting types 26 and 30), and some also with types 33 and 34. Any cross reactions which were found were removed before the serum was submitted for release.

Cultures of types 1 to 34, inclusive, were obtained from different commercial laboratories and from clinical material or as cultures sent to the National Institute of Health for identification. For many of the new types of pneumococci, the author is indebted to Annabel Walter, of the Bureau of Laboratories of New York City. The latter types include the 17 new types described by Walter and her coworkers (*1*, *2*), all but 4 of the types reported by the Danish workers (*3*, *4*, *5*), 2 types isolated by Ordman (*6*), and 5 previously unidentified types. Three types were obtained through the courtesy of Dr. G. F. Forster, of the Illinois Department of Health, and 6 types from Frances Clapp, of the Lederle Laboratories, Inc. Dr. J. E. Noble and Emily Godfrey, of the Department of Health of the District of Columbia, supplied specimens of sputum from pneumonia patients from which were isolated 7 strains of pneumococci belonging to types above 34. New types of pneumococci obtained from clinical material or as cultures sent to the National Institute of Health for identification were:

Type 26 from the spinal fluid of an infant ill with meningitis, January 1939.

Type 54 from a nonfatal case of meningitis in a 16-year-old girl, May 1940.

Type 52 described by Chinn and Eddy (*7*) in 1941.

Type 55 from a fatal case of meningitis in an infant, January 1941.

Type 43 from an infant ill with meningitis, February 1941.

Type 64 from the sputum of a mild case of pneumonia in an adult, May 1941.

Type 42 from a fatal case of meningitis in an adult, October 1942. Meningitis developed a few days after the patient's skull had been fractured.

Type 61 from the throat of an adult with chronic sinusitis, June 1943.

Other strains of pneumococci were received from different commercial laboratories for the purpose of checking certain lots of antipneumococcic serums.

The terminology for the different types is given in the preceding article. In all the tables, subtypes or other names of strains previously described in the literature are given in parentheses.

For determining the extent or degree of cross reactions the test (*8*) used at the National Institute of Health for determining the potency of diagnostic antiserums was employed. It has been shown that if the antigens are carefully prepared and standardized, the results of the tests may be duplicated with regularity. A uniform method of recording the amount of capsular swelling was employed throughout. A reaction was considered positive when at least 90 percent of the pneumococci in a preparation exhibited swollen capsules with definite outlines comparable to those produced by a control serum. The titers shown in all the tables represent the highest dilution of antiserum that gave a positive reaction. If some, but less than 90 percent, of the organisms showed swollen capsules with well-defined outlines with a serum dilution, a plus was added to the next lower dilution which gave a positive reaction; with undiluted antiserum the reaction was indicated by the letter "P." The letter "T" denoted that undiluted antiserum swelled the capsules so slightly that definite outlines could not be discerned and "0" indicated that no capsular swelling occurred.

IDENTIFICATION OF PNEUMOCOCCIC TYPES

Antipneumococcic serum for an homologous strain not only gave similar capsular swelling titers for other strains of the same type but the different strains were reacted upon by the same heterologous type antiserums. The degree of the cross reactions was also essentially the same. For example, in table 1 it may be noted that the three strains of type 2 pneumococci appear to be antigenically identical. Type 2 anti-

TABLE 1.—*Data illustrating the similarity of the reactions of homologous and heterologous type antiserums with different strains of pneumococci of the same type as compared with a related type*

Antiserums			Capsular swelling titers for—				
Use	Type	Lot	Homologous types	Type 2—Strain			Type 45 (24A) (40)—Strain
				S	R	N	Colemore
Therapeutic	1	101	1:128+	T	T	T	0
Do	2	201	1:256	1:256	1:256	1:256	1:4
Diagnostic	2	212	1:32+	1:32+	1:32+	1:32+	P
Therapeutic	5	503	1:64+	P	P	P	0
Do	6	604	1:64+	T	T	T	0
Do	7	701	1:128+	0	0	----	T
Do	10	1001	1:128	P	P	P	0
Do	11	1104	1:128	1:4+	1:4+	1:4+	0
Do	12	1201	1:128	T	P	T	0
Do	14	1406	1:128	T	T	T	0
Do	20	2003	1:128	<1:4	<1:4	<1:4	1:8+
Diagnostic	20	2009	1:32+	----	0	----	1:4+
Therapeutic	24	2401	1:128	0	0	0	1:16
Diagnostic	24	2408	1:16+	0	----	----	1:4+
Therapeutic	32	3202	1:128+	T	P	P	0
Experimental	59	(1)	1:16+	0	----	----	T

[1] Unabsorbed antiserum prepared at the New York City Laboratories.

The figures state the capsular swelling titers of the antiserums. "P" indicates that undiluted serum caused capsular swelling but that less than 90 percent of the organisms had capsules with distinct outlines, "T" that there was perceptible swelling but that none of the pneumococci had capsules with distinct outlines, and "0" that no capsular swelling occurred.

serums gave cross reactions with type 45, but the type 2 pneumococci differed from this type by showing capsular swelling with certain heterologous type antiserums which did not cross with type 45, or by being reacted upon to a different degree.

Likewise, the similarities and differences of pneumococci of type 7 and three types which cross with 7 are shown in table 2. Types 7 and 51 are examples of types which are so much alike that it would be impractical to produce antiserums for each of them. Kauffmann (*4*) by means of cross absorption experiments demonstrated the existence of two closely related types which he named 7 and 7A. The present type 51 is the same as the Danish type 7 and it is probable that the type 7 in this study corresponds to the Danish 7A. It may be noted that antipneumococcic serums for types 18 and 21 displayed cross reactions for type 7 but not for 51. The cross between types 7 and 18 was first noted by Cooper and her collaborators (*11*) who stated that they had tested many strains of 7 and 18 for their cross agglutination reactions and found them to differ considerably.

The regularity with which different strains of pneumococci of the same type exhibited capsular swelling with highly potent antiserums for heterologous types has made possible a useful and time-saving method of identification of pneumococci of some of the more recently identified types. Thus a pneumococcus which manifests capsular swelling with an unabsorbed type 7 antiserum might be any of four types. The type could be determined by testing with potent heterologous type antiserums, particularly those listed in table 2. For example, capsular swelling titers of 1:8+ with the antiserums, type 7, lot 701, and type 24, lot 2401, and 1:4+ with the type 20 antiserum lot 2001, and no reaction with other antiserums of types 1 to 34, inclusive, would indicate that the pneumococcus was a type 50. Every new type of pneumococcus, with the exception of one which was not reacted upon by any of the antiserums employed in this study, showed capsular swelling with antiserums of different heterologous types or the extent or degree of the cross reactions was different. This disproves, at least for some of the types, the view advanced by Kauffmann (*4*) and Mørch (*5*) that exact type diagnosis can be made only by cross absorption.

CROSS REACTIONS

One potent concentrated commercial therapeutic antiserum was selected for each of the types and tested for potency with the same strain with which the antiserum was prepared, with other strains of the same type, and for cross reactions with all available remaining types. When capsular swelling was observed, a quantitative Neufeld test was performed to determine the extent of the cross. Samples of antiserums of the same type but prepared in other laboratories

TABLE 2.—*Data illustrating the use of heterologous types of antiserum for comparing or identifying strains of pneumococci*

Antiserums			Capsular swelling titers for—											
Use	Type	Lot	Homologous types	Type 7 (7A?)—Strain M	Type 51 (7)—Strain S	E	492	537	G	L	451	459	Type 48 (7B)—Strain, Johnson	Type 50 (7C)—Strain Copenhagen	Type 50 (7C)—Strain Hinman
Therapeutic	2	201	1:256	P	P	P	<1:4	<1:4	P	<1:4	P	----------	0	0	0
Do	5	503	1:64+	P	P	T	<1:4	<1:4	<1:4	P	P	----------	0	0	0
Do	7	701	1:128+	1:128+	1:128+	1:128+	1:128+	1:128+	----------	----------	1:128+	1:128+	1:16	1:8+	1:8+
Diagnostic	7	716	1:32+	1:32+	1:32+	----------	1:32+	1:32+	1:32+	1:32+	1:32+	----------	1:4+	1:4+	----------
Therapeutic	8	804	1:64+	<1:4	<1:4	----------	<1:4	----------	----------	<1:4	<1:4	<1:4	T	0	0
Do	15	1502	1:128	<1:4	P	----------	P	----------	P	P	P	----------	0	0	----------
Do	18	1801	1:128	<1:4	T	T	T	T	T	T	----------	----------	0	0	0
Diagnostic	18	1811	1:32+	P	0	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------
Do	18	1812	1:16+	P	----------	----------	----------	----------	----------	----------	0	----------	----------	----------	----------
Therapeutic	20	2001	1:128	0	0	0	----------	----------	----------	----------	----------	----------	0	1:4+	----------
Do	20	2003	1:128	0	0	----------	0	0	0	0	0	----------	T	1:4+	1:4+
Do	21	2101	1:128	P	0	0	0	0	0	0	0	0	0	0	0
Do	24	2401	1:128	T	0	0	0	0	0	0	0	0	1:4+	1:8+	1:8+
Diagnostic	24	2404	1:16+	----------	----------	----------	----------	----------	----------	----------	----------	----------	1:4	1:4+	1:4+
Therapeutic	28	2801	1:128	T	0	0	----------	----------	----------	----------	----------	----------	0	0	0
Do	29	2902	1:128+	0	T	----------	----------	----------	----------	----------	----------	----------	T	0	----------
Experimental	59	(1)	1:16+	0	----------	0	----------	----------	----------	----------	----------	----------	<1:4	<1:4	----------
Do	66	(1)	1:32+	0	0	0	----------	----------	----------	----------	----------	----------	T	0	----------

[1] Unabsorbed antiserum prepared at the New York City Laboratories.

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were also examined. Because of the small volumes of the antiserums for types which have not been on the market, tests for cross reactions were not carried out with all types of pneumococci.

In tables 3 and 4 are given examples of the tests which were carried out on commercial antiserums for each type. The potent concentrated antiserums, type 2, lot 201, and type 10, lot 1001, were each tested for potency with the homologous type strains and for cross reactions with 74 heterologous types of pneumococci. Pneumococci which displayed capsular swelling with one of these antiserums were used to test other antiserums of the same type.

TABLE 3.—*A comparison of the specificity of type 2 antiserums produced in different laboratories as indicated by cross reactions with pneumococci of other types*

Antiserums			Capsular swelling titers for types—							
Use	Producing laboratory	Lot	2	1	5	7 (7A?)	20	38	45 (24A) (40)	51 (7)
Therapeutic	B	201	1:256	P	0	P	P	T	1:4	P
Do	B	202	1:256	P	0	0	-------	T	1:4	T
Do	G	208	1:128+	0	0	0	<1:4	0	1:4	T
Do	E	206	1:128+	T	T	0	<1:4	T	1:4	0
Do	C	204	1:64+	T	0	-------	<1:4	T	---------	0
Do	F	207	1:64+	0	0	0	<1:4	0	---------	0
Do	D	205	1:64+	0	0	0	0	T	---------	0
Do	A	203	1:32	0	P	0	T	0	---------	0
Diagnostic	B	209	1:16+	------	------	---------	0	0	T	---------
Do	G	210	1:32+	0	------	---------	0	0	<1:4	---------
Do	E	212	1:32+	0	------	---------	0	0	P	---------
Do	C	213	1:8	------	------	---------	0	0	0	---------
Do	F	214	1:8+	0	------	---------	0	0	T	---------
Do	H	215	1:32+	0	------	---------	0	0	T	---------
Do	I	216	1:16	0	------	---------	0	0	0	---------

It may be observed that the therapeutic antiserums for type 2 regularly produced cross reactions with pneumococci of types 20 and 45 and that more than one antiserum caused capsular swelling of certain other types. In general, the most potent antiserums manifested the strongest cross reactions, although other factors seemed to be involved. The length of time during which rabbits are immunized (*2*) and differences in individual rabbits (*5*) have been mentioned as influencing factors.

All of the type 10 therapeutic antiserums yielded cross reactions with pneumococci of types 20, 34, 35, 47, 52, 61, 62, and 66, and one or two reacted with types 2, 13, 17, 29, 30, 36, 42, and 69. In order to prepare specific diagnostic antiserum for type 10 it is possible that absorption would not have to be carried out with pneumococci of each of the above types although further investigation will be necessary to determine which types, if any, could be omitted. Types which manifested many serologic reactions in common were types 20, 47, 61, 62; types 29 and 66; and types 34 and 69.

TABLE 4.—*A comparison of the specificity of type 10 antiserums prepared in different laboratories as indicated by cross reactions with pneumococci of other types*

Antiserums			Capsular swelling titers for types—																
Use	Producing laboratory	Lot	10	2	13	17	20	29	30 (15A)	34	35	36	42 (30) (33B)	47 (35A)	52 (Odd)	61 (427) (Weingart)	62	66 (35B) (Hoge)	69 (39)
Therapeutic	J	1001	1:128	P	<1:4	T	1:4+	<1:4	0	1:16+	1:4+	T	T	1:4	1:4+	1:4+	1:4+	1:4+	P
Do	A	1002	1:32+	0	0	0	<1:4	T	T	1:8+	<1:4	0	0	<1:4	1:4	<1:4	-------	<1:4	T
Do	B	1003	1:32	0	0	0	P	0	0	1:4+	P	0	0	P	P	P	P	P	0
Diagnostic	J	1004	1:16+	------	0	------	0	0	-------	0	<1:4	------	0	<1:4	P	<1:4	-------	<1:4	0
Do	E	1007	1:16	------	0	------	0	-------	-------	0	T	------	0	0	<1:4	<1:4	-------	<1:4	0
Do	F	[1] 1008	1:32	------	0	------	0	T	-------	1:4	------	------	-------	-------	P	P	<1:4	P	T
Do	A	1009	1:8+	------	-------	------	0	-------	-------	0	P	------	0	T	T	-------	-------	-------	0
Do	A	[1] 1010	1:16	------	0	------	T	-------	-------	<1:4	T	------	-------	0	T	P	-------	P	0
Do	B	[1] 1011	1:8+	------	0	------	T	-------	-------	<1:4	T	------	0	0	T	P	-------	P	0
Do	D	[1] 1012	1:32	------	0	------	0	-------	-------	1:4	T	------	0	0	0	0	-------	0	0
Do	C	[1] 1013	1:16	------	0	------	0	-------	-------	1:4+	0	------	0	0	T	0	0	P	T

[1] Not tested for a cross reaction with type 34 before being submitted for release.

Table 5 represents a tabulation of the capsular swelling reactions obtained when concentrated therapeutic antiserums for each of the types available commercially were titrated with pneumococci of 75 types. Similar titrations of unconcentrated antiserums of types not commercially used were also carried out. The data presented are in general agreement with results obtained through the use of many similar antiserums. A few additional weak cross reactions were shown by other antiserums and these are listed in the last column of the table. As in the case of the antiserums for types 2 and 10 shown in tables 3 and 4, many of the stronger cross reactions occurred regularly in all or almost all of the antiserums of the same type. Others were found in only one or two.

It may be observed that many types of pneumococci appear to have antigenic components in common. Some types were so distantly related that only slight cross reactions were given by highly potent concentrated antiserums. Other types were so much alike that the distinguishing differences were in their reactions or lack of reactions with selected antiserums of heterologous types. Between the two extremes were types showing all gradations of cross reactions.

The types which evinced weak cross reactions and those that manifested very strong cross reactions present few difficulties. An antiserum which shows a weak cross reaction may be easily made specific by absorption. Antiserum for one of two closely related types may be used for both types.

The importance of distinguishing between similar types lies not always in producing antiserum for the types but in preparing specific diagnostic antiserums for other types. Thus type 33 could be differentiated from type 68 with certainty only by means of the capsular swelling caused by a potent concentrated antiserum for type 15. A type 15 diagnostic antiserum, therefore, might not be specific if it were tested for a cross reaction with the type 68 pneumococcus rather than with the closely related type 33 organism. The capsular swelling titers of type 33 antiserums were almost as high for type 68 as for the homologous type 33. Also, absorption of one type 1 diagnostic antiserum, which had produced swollen capsules of pneumococci, types 33 and 68, with type 33 pneumococci removed the cross for both types. An antiserum for type 68 was not tested nor was it determined if absorption of a type 1 antiserum with 68 would remove the cross reactions for type 33 as well as 68.

The extent or degree of cross reactions between related types may be unequal. It may be noted that antiserum for type 6 yielded almost equally high titers for types 6 and 26. Antiserum for type 26,

however, was not uniformly effective for both types. Likewise, antiserums for type 19 showed high titers for both types 19 and 57, but antiserum for type 57 exhibited a considerably lower titer for type 19 than for the homologous type.

Other types which displayed similarities in their serologic reactions and for which it appears that antiserum for more than one of the types is unnecessary are types 7 and 51; 9 and 49; 11 and 43; 15 and 54; 18 and 56; 20, 40, 47, 61, and 62; 22 and 63; 24 and 65; 29 and 66; and 32 and 67. Types 7 and 51 were much alike as was shown in table 2. Pneumococci of type 49 were reacted upon by type 33 antiserums in higher dilutions than were type 9 pneumococci. And diagnostic type 33 antiserums could be freed from cross reactions for both types 9 and 49 by absorption with pneumococci of type 49 but not with type 9. The cross reactions of certain heterologous type antiserums for pneumococci of types 43 and 54 were stronger than for the closely related types 11 and 15, respectively.

For testing diagnostic antiserums for cross reactions, pneumococci of type 43 would appear to be preferable to type 11, and type 54 to type 15. For carrying out mouse protective tests of treatment antiserums of either type 11 or 15, pneumococci of the homologous type proved more suitable. The strains of type 43 tested were less virulent for mice than type 11 and the type 54 pneumococci were less virulent than the type 15. Types 18 and 56, and also types 32 and 67, were so much alike that it would be difficult to identify the types with certainty by means of the antiserums employed in this study. Type 56 showed slight capsular swelling with antiserums of types 64 and 72. Had more potent antiserums for these types been examined, possibly more striking differences would have been observed. Pneumococci of types 20, 40, 47, 61, and 62 and also types 29 and 66 appear to possess complex antigenic components. Type 63 but not type 22 pneumococci showed swollen capsules with type 17 antiserums. However, certain other heterologous type antiserums produced slightly stronger cross reactions with type 22 than 63. To insure the specificity of type 17 antiserums, tests for cross reactions would have to be carried out with type 63. Whether type 63 could be substituted for type 22 as a test organism must await further experimentation. On the basis of the antiserums used in this study it was not clear whether type 24 or type 65 had the broadest antigenic components. According to Mørch (*5*) type 24 but not type 65 (the type 24A of Denmark) crossed with types 45, 48, 50, 58, and 59. This would suggest that type 24 is the better of the two types for a test organism.

TABLE 5.—*Capsular swelling reactions produced by antiserums of different types titrated with 75 types of pneumococci*

Type	Test antiserums	Types of pneumococci																			
		1	2	3	4	5	6	7 (7A?)	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Therapeutic (concentrated)	1:128+	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	do	P	1:256	0	0	0	0	P	0	0	0	0	0	0	0	0	0	0	0	0	P
3	do	0	0	1:64	0	0	0	0	<1:4	0	0	0	0	0	0	0	0	0	0	0	0
4	do	0	0	0	1:128+	0	0	T	0	P	0	0	T	0	1:8	0	0	0	0	0	0
5	do	T	T	0	0	1:128	0	T	0	0	0	0	0	0	0	0	0	0	0	0	0
6	do	0	0	0	0	0	1:128+	T	0	0	0	T	0	0	0	0	0	0	0	T	0
7	do	T	0	0	0	0	0	1:128+	0	0	0	0	0	0	0	0	0	0	0	P	0
8	do	0	0	<1:4	0	0	0	0	1:128	0	0	0	0	0	0	0	0	0	0	0	0
9	do	0	0	0	0	0	0	0	0	1:128+	0	0	0	0	0	0	0	0	0	0	0
10	do	0	T	0	0	0	0	0	0	0	1:128	0	0	<1:4	0	0	0	T	0	0	1:4+
11	do	P	T	0	0	0	0	0	0	P	0	1:128	0	0	0	T	T	0	0	0	0
12	do	0	T	0	0	T	0	0	0	0	<1:4	0	1:128	0	0	0	0	T	P	<1:4	<1:4
13	do	0	0	0	0	0	0	0	T	0	0	0	0	1:256	1:128+	T	0	P	0	0	T
14	do	0	0	0	0	0	0	0	0	0	0	0	0	0	T	1:128	0	0	0	0	0
15	do	0	0	0	0	0	0	0	0	0	0	1:4	0	0	0	0	1:128+	0	P	0	0
16	do	0	0	0	0	0	0	0	0	0	0	0	0	T	0	T	0	1:128	0	T	0
17	do	P	T	0	0	0	0	0	0	0	<1:4	0	0	0	0	0	P	0	1:128	0	1:128+
18	do	0	T	0	0	T	0	0	T	0	0	0	0	0	0	T	0	P	0	0	0
19	do	0	0	P	0	0	0	0	0	T	0	0	0	T	T	0	P	0	0	0	0
20	do	0	<1:4	0	0	0	0	0	0	0	1:4	0	0	P	0	T	0	0	0	0	1:128
21	do	0	0	0	0	0	0	P	T	0	0	0	0	0	P	0	0	0	0	0	0
22	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<1:4	0	0
24	do	T	P	0	0	0	0	T	0	0	0	0	0	0	0	0	0	0	0	0	0
25	do	0	P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Diagnostic [1]						1:4											0		0	
27	Therapeutic (concentrated)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	do	0	0	0	0	0	0	T	0	0	0	0	0	P	0	P	1:8+	0	T	0	0
29	do	0	0	0	0	0	0	0	0	0	T	0	0	0	0	0	0	0	0	0	0
31	do	0	T	0	0	0	0	0	0	0	0	0	0	0	0	T	0	0	0	T	1:32+
32	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	do	0	T	0	0	0	0	0	0	1:4	0	0	0	0	0	0	0	0	0	T	0
34	do	0	0	0	0	0	0	0	0	0	1:16	0	0	0	0	0	0	0	0	0	0

41.	Experimental [3]		0							0	0			0								0	
42.	Diagnostic		0		0			0	0	0	0		0		0	0		0	0			0	
43.	Experimental [3]	0				0		0		0		1:16+				0	<1:4		0				
44.	do [3]							0	0				0	0		0	0			0	0		
44.	do [3]		0		0			0	0	T	0	0	0	0	0	T	T		1:4+	0	0		
52.	do					0	0	0			T	0		0	0	0	0		0	0	0		
53.	Diagnostic [4]	0					0	0		0		1:4+				0	0		0				
57	do [3]			0			0	0	0					0				0	0	<1:4			
59.	Experimental [3]		0	0	0		0	0	0	0	0			0	0			0	0	<1:4			
62.	do [3]		0		0	0		0	0	0	T	0		0	0	0	0				<1:4		
64.	do [3]		0		0			0	0	0	0		0		0	0	0		0				
66.	do [3]		0		0	0		0	0	0	T	0	0	0	0	0			0		0		
70.	do [3]		0		0			0	0	0	P		0	0	0	0	0	0	0	0	0		
72.	do [3]		0		0			0	0	0	0	0	0		0		P		0		0		
73.	do [3]		0		0			0	0	0	0		T		0		0		0				
74.	do [3]		0	0	0	0		0	0	0	0		0	P	0		0		0				
75.	do [3]		0		0			0	0	0	0		0		0				0				

Type	Test antiserum	Types of pneumococci																			
		21	22	23	24	25	26	27	28	29	30 (15A)	31	32	33 (9A)	34 (10A)	35	36	37	38 (41)	39 (33C)	40 (33A)
1.	Therapeutic (concentrated)	0	0	0	0	0	0	0	0	0	0	0	0	T	0	0	0	0	0	0	0
2.	do	0	0	0	0	0	0	0	0	0	T	0	0	0	0	0	0	0	T	0	0
3.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	T	0	0
6.	do	0	0	0	0	0	1:128	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.	do	0	0	0	0	0	0	T	T	0	T	0	0	0	0	0	0	0	0	0	0
8.	do	0	0	0	0	0	0	T	0	0	0	0	0	1:8+	0	0	0	0	T	0	0
9.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	1:16+	1:4+	T	0	T	0	0
10.	do	0	0	0	0	0	0	0	0	<1:4	0	0	0	0	0	0	0	0	0	0	0
11.	do	0	0	0	0	0	0	0	T	0	0	0	0	0	0	0	T	0	T	0	0
12.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13.	do	0	0	0	0	0	0	0	0	0	T	0	0	0	0	0	0	0	T	0	0
14.	do	0	T	0	0	0	0	0	0	0	P	0	0	0	0	0	0	0	0	0	0
15.	do	0	0	0	0	0	0	T	0	0	1:32+	0	0	P	0	0	0	0	T	0	0
16.	do	0	0	0	0	0	0	0	1:4	0	T	0	T	0	0	0	0	0	0	0	0
17.	do	0	0	0	0	0	0	0	0	0	T	0	0	0	0	0	0	0	0	0	0
18.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20.	do	0	0	0	0	0	0	0	0	0	T	1:32	0	0	0	<1:4	0	T	0	0	1:64+

See footnotes at end of table.

TABLE 5.—*Capsular swelling reactions produced by antiserums of different types titrated with 75 types of pneumococci*—Continued

Type	Test antiserums	Types of pneumococci																			
		21	22	23	24	25	26	27	28	29	30 (15A)	31	32	33 (9A)	34 (10A)	35	36	37	38 (41)	39 (33C)	40 (33A)
21.	Therapeutic (concentrated)	1:128	0	0	0	0	0	0	0	T	T	0	0	0	<1:4	T	0	0	T	<1:4	0
22.	do	P	1:128	0	0	0	0	0	T	0	T	1:8	0	0	0	0	<1:4	0	<1:4	0	0
23.	do	0	0	1:128	0	0	0	0	T	0	T	0	<1:4	0	0	0	0	0	T	0	0
24.	do	P	P	0	1:128	0	0	0	T	0	T	0	0	0	0	0	0	0	0	0	0
25.	do	T	0	0	0	1:128	0	0	T	0	0	0	0	0	P	0	0	0	0	0	0
26.	Diagnostic [1]						1:16										0			0	
27.	Therapeutic (concentrated)	0	0	0	0	0	0	1:128	0	0	P	0	P	0	0	0	0	0	0	0	0
28.	do	0	0	0	0	0	0	0	1:128	0	T	0	0	0	0	0	0	0	0	0	0
29.	do	Q	1:4	0	0	0	0	0	0	1:128	T	0	0	0	T	1:4	<1:4	0	0	0	0
31.	do	0	T	0	0	0	0	0	0	0	0	1:128	0	0	0	0	0	0	0	0	1:32+
32.	do	0	0	P	0	0	0	0	0	0	0	T	1:128	0	0	0	0	0	T	0	T
33.	do	0	0	P	0	0	0	0	0	0	T	0	0	1:128+	0	0	0	0	T	0	0
34.	do	T	0	0	0	0	0	0	0	T	T	0	0	0	1:64	P	0	0	0	0	0
41.	Experimental [2]	0								0		0		0	T	<1:4	0		0	0	0
42.	Diagnostic	0						0		0		0		0	0	0	0	0	0	<1:4	1:4
43.	Experimental [2]		0	0			0		0		0			0	0	0		0	0	0	
44.	do [3]			0					0	0	0	0		0		0					
44.	do [3]	0		0	0				0	0	0	0	0		0	0	0	0	0	0	0
52	do	T	0				0	0		0	T	0		0	0	1:8+	0		P	0	T
53	Diagnostic [4]						0		0		0			T	0	0					
57.	do [3]						0							0			0				
59.	Experimental [2]	0			T				0			0		0	0	0	0	0	0	0	0
62.	do [3]	0	0	0	0				0	0	T	<1:4		0	0	1:4+	0	0	0	0	<1:4
64.	do [3]	0		0				0	<1:4	P	0	0	0	0	0	0	0	0	0	T	0
66.	do [3]	0		0	0				0	1:16	0	0		0	0	1:8+	0	0	0	0	T
70.	do [3]	0		0	0				0	0	0	0		0	P	0	0	0	0	<1:4	1:8
72.	do [3]	0		0					0					0	0	0	0	0	0	0	0
73.	do [3]	0		0					T			0		0	0	0	0	0	0	0	T
74.	do [3]	0		0				0	0	0		0	T	0	0	0	T	0	1:8	0	0
75.	do [3]	0							0			0		0	0	0	0	0	0	0	0

[1] Routinely submitted for release as type 6.
[2] Diagnostic antiserum prepared at Lederle Laboratories, Inc.
[3] Unabsorbed antiserum prepared at the New York City Laboratories.
[4] Routinely submitted for release as type 11.
[5] Routinely submitted for release as type 19.

Type	Test antiserums	Types of pneumococci																			
		41 (34)	42 (30) (33B)	43 (11A)	44 (18A)	45 (24A) (40)	46 (23A)	47 (35A)	48 (7B)	49 (9L)	50 (7C) (Hinman)	51 (7)	52 (Odd)	53 (11B?)	54 (15B)	55 (18B)	56 (18C)	57 (19A)	58 (19B)	59 (19C)	60
1.	Therapeutic (concentrated)	0	0	0	0	0	0	0	0	0	0	0 P	0	0	0	0	0	0	0	0	0
2.	do	0	0	0	0	1:4	0	0	0	0	0	0	0	0	0	0	0 T	0	0	0	0
3.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0 T	0	0	0	0	0	0
4.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5.	do	0	0	0	0	0	0	0	0	0	0	0 T	0	0	0	0	0	0	0	0	0
6.	do	0	0	0	0	0 T	0	T	0	0	0	T	T	0	0 T	0	T	T	T	T	0
7.	do	0	0	0	0	T	0	0	1:16	0	1:8+	1:128+	0	0	0	0	0	T	T	T	0
8.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9.	do	0	0	0	0 P	0	0	0	0	1:128	0	0	0	0	0	0	0	0	0	0	0
10.	do	0	0 T	0	0	0	0	1:4	0	0	0	0	1:4+	0	0	0	0	0	0	0	0
11.	do	0	0	1:128	0	0	0	0	0	0	0	0	P	1:4+	0	0	0	0	0	0	0
12.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 P	0	0	0	0
14.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	1:4	0	0	0	0	0	0
15.	do	0	0	1:8	T	0	1:4+	T	0	0	0	0	T	0	1:128	0	0	0	0	0	0
16.	do	0	0	1:4+	P	0	0	0	0	0	0	0	0 T	1:4	0	P	P	0 T	0 T	0 T	0 1:8+
17.	do	0	0	0	0	0	0	0	0	0	0	0 T	0	0 P	0	0	0	0	0	0	0
18.	do	0	0	1:4	1:16	0	0	0	0	0 T	0	0	0 T	0	0	1:16	1:128	0 1:64+	0 1:8+	0 1:8+	0
19.	do	0	0	0	T	0	0	0	0	0	0	0	0	0	0	T	T	0	0	0	0
20.	do	0	0	0	0	1:8	T	1:64	0	0	1:4+	0	1:4	0	1:4	0	0	0	0	0	0
21.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	T	0	0	0	0	0	0
22.	do	0	0	0	0	0	0	0 T	0	0	0	0	0	0	0 P	0	0	0	0	0	0
23.	do	0	0	0	0 1:4	0	1:16+	0	0	0	0	0	0	0	0	0 1:4	0 1:4	0	0	0	0
24.	do	0	0	0	0	1:16	0	0	1:4+	0	1:8+	0 T	0	0	0	0	0	0	0 1:4	0 1:4+	0 1:8+
25.	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26.	Diagnostic [1]	-------	-------	0	-------	0	-------	-------	-------	-------	-------	-------	0	0	-------	-------	-------	0	0	0	------
27.	Therapeutic (concentrated)	0	0	0	0	0	0 T	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28.	do	0	0 T	0	0	0	0	0	0 T	0	0	0 T	0	0	0 T	0	0	0	0	0	0
29.	do	0	T	0	0	0	0	1:8	T	0	0	T	1:4	0	T	0	0	0	0	0	0

See footnotes at end of table.

TABLE 5.—*Capsular swelling reactions produced by antiserums of different types titrated with 75 types of pneumococci*—Continued

Type	Test antiserums	Types of pneumococci																			
		41 (34)	42 (30) (33B)	43 (11A)	44 (18A)	45 (24A) (40)	46 (23A)	47 (35A)	48 (7B)	49 (9L)	50 (7C) (Hinman)	51 (7)	52 (Odd)	53 (11B?)	54 (15B)	55 (18B)	56 (18C)	57 (19A)	58 (19B)	59 (19C)	60
31.	Therapeutic (concentrated)	0	0	0	0	0	0	1:32+	0	0	0	0	<1:4	0	0	0	0	0	0	0	0
32.	do	0	0	0	0	0	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33.	do	P	0	T	T	0	0	0	0	1:8+	0	0	0	P	0	0	0	T	T	T	0
34.	do	T	0	0	0	0	0	0	0	0	0	0	T	0	0	0	0	0	0	0	0
41.	Experimental [2]	1:8+						0		0			<1:4								
42.	Diagnostic	0	1:32	0	0			0	0	0	0	0	0	0		0	0	0	0	0	0
43.	Experimental [2]	0	0	1:32+	0		0	0	0	0	0	0	T	1:4+	0	0					
44.	do.[3]			0	1:8+		0	0	0	0	0	0	0	0	0	T	0	0	0	0	
44.	do.[3]		0	T	1:16	0	0	0	0	T	0	0	0	T	0	1:8+	1:4+	0	0	0	0
52.	do	0	0	0	0			<1:4	0		0	0	1:16+	0	0	0	0	0	0	0	
53.	Diagnostic [4]		0	T	0			0	0	0	0	0	0	1:16+		0	0				
57.	do.[5]				0				0	0	0	0				0	0	1:8+	0	0	0
59.	Experimental [3]		0		0	T	0	0	<1:4	0	<1:4	0	0			0	0	<1:4	1:4+	1:16+	1:16
62.	do.[3]	P	0		0	0	0	1:32+	0	0	0	0	1:8		0			0	0	0	0
64.	do.[3]	0	0		0	0	0	0	0	0	0	0	0		0	0	T	0	0	0	0
66.	do.[3]	0	0	0	0	0	0	1:16	T	0	0	0	1:8+	0	0	0	0	0	0	0	0
70.	do.[3]	0	<1:4	0	0	0	0	<1:4	0	0	0	0	T	0	0	0	0	0	0	0	0
72.	do.[3]	0	0	T	0		0	0		0	0	0	0	T		T	T	0	0	0	0
73.	do.[3]	0	0	0			0	0		0	0	0	0	0			0	0	0	0	0
74.	do.[3]	0	0	0			0	0		0	0	0	0	0	0		0	0	0	0	0
75.	do.[3]	0	0	0			0	0		0	0	0	T	0			0	0	0	0	0

[1] Routinely submitted for release as type 6.
[2] Diagnostic antiserum prepared at Lederle Laboratories, Inc.
[3] Unabsorbed antiserum prepared at the New York City Laboratories
[4] Routinely submitted for release as type 11.
[5] Routinely submitted for release as type 19.

Type	Test antiserums	Types of pneumococci															Additional slight cross reactions shown by one or more other antiserums of the same type
		61 (Weingart) (42?)	62	63 (22A)	64 (23B)	65 (24A)	66 (35B) (Hoge)	67 (32A)	68 (9V?)	69 (39)	70 (40A) (33)	71 (26) (38)	72 (T)	73	74	75	
1	Therapeutic (concentrated)	0	0	0	0	0	0	0	T	0	0	0	0	0	0	0	None.
2	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Type 5.
3	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	None.
4	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Do.
5	do	T	T	0	0	0	T	0	0	0	0	0	0	0	0	0	Types 4, 36.
6	do	T	T	0	0	0	0	0	0	0	0	0	0	0	0	0	Types 14, 15, 20, 30, 31, 34, 35, 36, 40, 54, 56.
7	do	0	0	0	0	0	0	0	0	T	0	0	0	0	0	0	Types 5, 11, 18, 36, 43, 44, 53, 55, 56.
8	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Types 7, 18, 23, 30, 33, 44, 45, 48, 50, 51, 54, 55, 56.
9	do	0	0	0	0	0	0	0	1:8+	0	0	0	0	0	0	0	Types 16, 19, 57, 58, 59.
10	do	1:4+	1:4+	0	0	0	1:4+	0	0	P	0	0	0	0	0	0	Type 30.
11	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Types 4, 6, 17, 18, 44, 47, 49, 55, 56, 61, 62
12	do	0	0	0	0	0	0	0	0	0	0	0	0	T	0	0	Type 7.
13	do	T	T	0	0	0	<1:4	0	0	T	P	0	0	0	<1:4	0	Type 30.
14	do	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Types 2, 6, 26, 69.
15	do	P	P	0	0	0	T	0	0	T	0	0	0	0	0	0	Types 7, 17, 39, 51.
16	do	0	0	0	0	0	0	0	0	0	0	0	P	0	0	0	Types 4, 9, 21, 49.
17	do	0	0	1:8+	0	0	T	T	0	0	0	0	0	0	0	0	Types 46, 54.
18	do	P	0	0	T	0	T	0	0	0	0	0	0	0	0	0	Types 1, 9, 19, 23, 72.
19	do	0	0	0	0	0	0	0	0	T	0	0	0	0	0	0	Types 20, 29, 31, 32, 40, 47, 61, 62, 67.
20	do	1:64	1:64	0	T	0	1:4+	0	0	T	0	0	0	0	0	0	Types 11, 29, 43, 53.
21	do	0	T	0	0	0	<1:4	0	0	1:8	0	0	0	0	0	0	Type 16.
22	do	0	0	1:128	0	0	0	0	0	T	0	0	0	0	1:4	0	Types 22, 63, 66.
23	do	0	T	0	1:16+	0	0	1:4+	0	0	0	0	0	0	<1:4	0	Types 15, 27, 36.
24	do	0	0	T	0	1:32+	0	0	0	0	0	0	0	0	0	0	None.
25	do	0	0	0	0	0	0	0	0	T	0	P	0	0	0	0	Do.
26	Diagnostic [1]		0			0											None (only 2 diagnostic antiserums tested).

See footnotes at end of table.

TABLE 5.—*Capsular swelling reactions produced by antiserums of different types titrated with 75 types of pneumococci*—Continued

Type	Test antiserums	Types of pneumococci															Additional slight cross reactions shown by one or more other antiserums of the same type
		61 (Weingart) (42?)	62	63 (22A)	64 (23B)	65 (24A)	66 (35B) (Hoge)	67 (32A)	68 (9V?)	69 (39)	70 (40A) (33)	71 (26) (38)	72 (T)	73	74	75	
27	Therapeutic (concentrated)	0	0	0	0	0	0	T	0	T	0	0	0	0	0	0	None.
28	do	0	0	0	1:8+	0	T	0	0	T	0	0	0	0	0	0	Do.
29	do	T	T	<1:4	T	0	1:64+	0	0	1:8	0	0	0	0	0	0	Type 5.
31	do	1:32+	1:32+	P	0	0	0	0	0	0	0	0	0	0	0	0	Types 14, 15, 30.
32	do	T	T	0	0	0	0	1:64+	0	0	0	0	0	0	<1:4	0	Type 30.
33	do	0	0	0	0	0	0	0	1:128	T	0	0	0	0	T	0	Type 11.
34	do	0	0	0	0	0	0	0	0	1:16+	0	0	0	0	0	T	None.
41	Experimental [2]	0	0	------	------	------	T	------	0	0	0	------	------	------	------	------	No other antiserums of the same type examined.
42	Diagnostic	0	0	0	0	0	0	0	0	0	1:4+	------	0	0	0	0	Do.
43	Experimental [3]	0	0	0	0	------	------	------	0	T	------	------	0	------	------	------	Do.
44	do. [3]	0	0	------	0	------	0	------	0	------	------	------	0	------	------	------	Do.
44	do. [3]	<1:4	0	0	0	0	0	0	------	------	0	0	T	0	0	0	Do.
52	do	1:8	1:8	0	------	------	1:8	------	0	0	T	------	------	------	0	P	Types 11, 43.
53	Diagnostic [4]	0	0	------	0	------	------	------	0	T	------	------	0	------	------	------	No other antiserum of the same type examined.
57	do [5]	------	------	------	------	------	------	------	0	------	------	------	------	------	------	------	Do.
59	Experimental [3]	0	0	0	0	0	0	0	------	0	0	0	------	0	0	0	Do.
62	do. [3]	1:32	1:32+	0	0	0	1:16+	0	------	T	0	0	0	0	0	0	Do.
64	do. [3]	0	0	0	1:32	0	P	0	0	0	0	0	0	0	0	0	Do.
66	do. [3]	1:16	1:16	0	0	0	1:32+	0	------	T	P	0	0	0	0	0	Do.
70	do. [3]	0	P	0	0	0	P	0	0	0	1:16+	0	0	0	0	0	Do.
72	do. [3]	0	0	0	0	0	0	0	0	0	0	0	1:8+	0	0	0	Do.
73	do. [3]	0	0	0	0	0	0	0	0	0	T	0	0	1:8	0	0	Do.
74	do. [3]	0	0	0	0	0	0	T	0	0	0	0	0	0	1:16	0	Do.
75	do. [3]	0	0	0	0	0	0	0	0	P	0	0	0	0	0	1:32+	Do.

[1] Routinely submitted for release as type 6.
[2] Diagnostic antiserum prepared at Lederle Laboratories, Inc.
[3] Unabsorbed antiserum prepared at the New York City Laboratories.
[4] Routinely submitted for release as type 11.
[5] Routinely submitted for release as type 19.

DISCUSSION

The identification of certain types of pneumococci by means of cross reactions given by selected unabsorbed heterologous type antiserums would not be practicable for the ordinary diagnostic laboratory but it can be recommended as a quick and easy method in larger laboratories which are frequently asked to classify types of pneumococci for which no specific diagnostic antiserums can be obtained. Also, it should be of use in the producing laboratory where the specificity of certain types of diagnostic antiserums may depend upon which of two closely related types of pneumococci are employed for testing and absorbing out cross reactions.

Cross reactions have been found with great regularity between certain types. For this reason it is important that all diagnostic antiserums should be tested for cross reactions with types which may be expected to show capsular swelling. In addition, it is desirable that antiserum for each of the types reported to be the most prevalent are tested for cross reactions with the remaining prevalent types. This would exclude reactions which might occur as the result of a long period of immunization, crosses in the serum of individual rabbits, or accidental mixtures of types.

Type incidence reports to a certain extent are dependent upon the specificity of the diagnostic antiserums and upon the number of infections diagnosed as being due to the pneumococcus. Thus, Avery, Chickering, Cole, and Dochez (*9*), in 1917, reported that 80 percent of all cases of lobar pneumonia in adults in New York were due to pneumococci, types 1, 2, and 3. Following the separation of the old group IV pneumococci into types 4 to 32, inclusive (*10*, *11*), the figures on the prevalence of types 1, 2, and 3 have been much lower (*12*). By means of diagnostic antiserums for two new types, Vammen (*3*) demonstrated in a half year in Denmark one type in 31 patients and 9 normal individuals; the other in 71 patients and 10 normal individuals. Rumreich and his associates (*13*), in a 2-year study of pneumococcic type incidence in six representative States of the Nation, observed that 10 of the types accounted for 74.6 percent of all types determined pneumococcic pneumonias. The use of more specific diagnostic antiserums should make possible even more accurate information on type incidence.

SUMMARY

All strains of pneumococci of the same type reacted in a similar manner with both homologous and heterologous type antiserums. Every new type of pneumococcus with the exception of one showed capsular swelling with antiserums of different heterologous types or the degree of the cross reactions was different.

The differences of the cross reactions have been used for identifying previously undetermined types of pneumococci and for differentiating closely related types.

There was considerable regularity in the cross reactions given by different antiserums of the same type. Data were presented to show the cross reactions exhibited by a potent, unabsorbed antiserum for each of the types commercially available and some cross reactions noted in antiserums for 17 types which have not been on the market.

Certain types of pneumococci were so similar that antiserum for one type could be used for one or more other types.

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MENINGOCOCCUS MENINGITIS IN THE UNITED STATES DURING 1943

In 1943 the United States experienced the highest incidence of meningococcus meningitis during the 30 years since the Public Health Service began the collection of morbidity data for this disease in 1914. According to preliminary reports, a total of 17,974 cases was reported by the State health authorities of the 48 States and the District of Columbia, giving a case rate of 13.4 per 100,000 population. The next highest reported incidence was in 1929, in which year 10,551 cases were reported in 46 States and the District of Columbia, or an incidence rate of 8.7 per 100,000 population. Although a smaller number of States were reporting cases of meningococcus meningitis to the Public Health Service prior to 1929, the incidence rates for those years based on the figures furnished by the States reporting were below the rate for 1929.

Early in 1942 it was noted that the weekly figures for cases of meningococcus meningitis were exceeding the seasonal expectancy as based on 5-year medians. This excess incidence began during February of that year and continued and gradually increased during the remainder of 1942, reaching approximately three times the median in December. During January and February of 1943 the weekly figures were from four to nine times the median, and a total of 4,040 cases was reported by March 13, as compared with 3,774 cases for the entire year 1942. The accompanying tables show the morbidity and mortality data for meningitis for the country as a whole and the incidence rates per 100,000 population by geographic divisions from 1929 to 1943, inclusive.

TABLE 1.—*Number of cases of meningococcus meningitis and deaths from the same cause, with rates per 100,000 population, reported in the United States, 1929 to 1943, inclusive*

Year	Number of States reporting	Cases	Cases per 100,000 population	Deaths	Deaths per 100,000 population
1929	46	10,551	8.7	5,171	4.5
1930	44	8,384	7.0	4,171	3.6
1931	40	5,426	4.7	2,806	2.4
1932	41	3,102	2.8	1,651	1.4
1933	44	2,913	2.4	1,482	1.2
1934	45	2,500	2.0	1,272	1.0
1935	43	5,736	4.7	2,657	2.1
1936	44	7,320	5.9	3,020	2.4
1937	44	5,484	4.3	2,208	1.7
1938	47	2,919	2.3	1,024	.8
1939	47	1,993	1.5	863	.7
1940	48	1,665	1.3	694	.5
1941	48	2,039	1.5	713	.5
1942	48	3,826	2.9	938	.7
1943	48	17,974	13.4	[1]	[2] 2.2

[1] Total deaths not available.
[2] Average of monthly rates for a 10-percent sample of death certificates (Bureau of the Census) and subject to errors of sampling.

TABLE 2.—*Case rates for meningococcus meningitis per 100,000 population* [1]

Geographic division	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	[2] 1943
New England	4.0	3.8	2.3	1.8	1.2	1.4	2.0	4.1	3.4	1.4	1.1	1.2	1.8	5.4	**24.1**
Middle Atlantic	7.8	5.3	4.5	2.5	1.7	1.3	3.8	4.4	3.2	1.8	1.7	1.4	1.6	3.8	**16.6**
East North Central	12.6	8.9	5.3	3.7	3.5	2.5	5.3	4.4	2.8	1.4	0.9	0.8	0.9	1.1	9.6
West North Central	9.1	7.6	4.9	2.6	3.0	2.6	5.5	4.0	2.7	1.7	1.0	1.0	1.0	1.1	9.0
South Atlantic	2.9	4.0	3.5	2.3	2.1	2.2	7.3	**11.2**	8.1	3.8	1.9	1.8	2.4	4.3	**15.6**
East South Central	2.9	**11.7**	8.0	2.9	2.3	2.0	4.9	**11.4**	**9.4**	5.9	2.7	2.1	2.6	2.5	**12.1**
West South Central	4.5	3.0	1.8	1.5	1.9	1.8	2.9	5.0	4.1	1.8	1.4	1.2	1.5	2.4	**6.7**
Mountain	**40.1**	**22.8**	7.8	4.8	3.2	3.6	6.4	8.1	4.7	3.6	3.8	1.7	1.4	2.3	**12.2**
Pacific	**13.8**	6.4	4.4	2.5	2.1	1.6	4.5	4.3	3.5	1.6	1.2	1.0	1.3	4.4	**17.1**
United States	8.7	7.0	4.7	2.8	2.4	2.0	4.7	5.9	4.3	2.3	1.5	1.3	1.5	2.9	**13.4**

[1] For the years 1940–42 the enumerated population of 1940 was used. For 1943, estimated populations were used.
[2] Based on preliminary weekly telegraphic reports.

The incidence rate for the country as a whole was 50 percent higher in 1943 than in 1929. The highest rates were recorded in the New England, Middle Atlantic, and Pacific areas. As shown in table 2, the rates for all but three geographic areas were higher in 1943 than in 1929, and the rates for all areas except the Mountain were higher in 1943 than for any other year since 1929 (the highest rate and the two rates next in numerical order are printed in bold-face type.) [1]

The outstanding difference between the two epidemic years is in the case fatality ratios. In 1929 the case fatality for meningococcus meningitis was about 50 percent, on the basis of total reports and reports from several individual States in which the cases were considered to be fairly completely reported. Figures for total deaths from meningococcus meningitis during 1943 are not yet available; but on the basis of the average of the monthly rates for a 10-percent sample of death certificates, issued by Bureau of the Census, and the incidence rate the case fatality ratio was 16.4. While not strictly comparable, but probably more nearly complete, the reports for 1943 for 32 cities scattered throughout the United States give a case fatality of 18.4 percent. The ratio for California was 16.9, while that for New York City was 16.0. In a severe epidemic in Chile in 1941–42, the case fatality was also 16.0 percent.[2]

It would appear that the greater part of the recent reduction in the fatality for meningococcus meningitis is due to the introduction of chemotherapy. There is abundant evidence of the effectiveness of sulfonamide therapy. Prior to the use of the sulfonamides in the treatment of meningococcus meningitis, the case fatality had dropped to between 30 and 40 percent. Col. Henry M. Thomas, Jr., in a report of the treatment of 1,935 cases occurring in the Army in several Southeastern States during the winter of 1942–43, states

[1] For rates by geographic areas for prior years, see The Movements of Epidemic Meningitis 1915–30, by A. W. Hedrich, Pub. Health Rep., Nov. 13, 1931, pp. 2709–2726. The slight difference between some of the rates given here and those given by Dr. Hedrich for 1929 and 1930 is probably due to the use of different States.
[2] Am. J. Pub. Health, March 1944, pp. 231–233.

that the case fatality was only 3.3 percent, as compared with a fatality of 39 percent for about 6,000 cases in the First World War.[3] It should be noted that the military group was composed of individuals in the young adult ages, in excellent physical condition, and subject to immediate hospitalization on the first signs of illness. It would be expected, therefore, that the fatality would be higher in the civilian population. It is interesting to note that the Army reports also point out the prophylactic value of the administration of sulfadiazine by mouth even in small doses.[4]

INCIDENCE IN 1944

Up to the week ended March 25, 1944, a total of 6,637 cases of meningococcus meningitis had been reported as compared with 5,139 cases for the same period in 1943. A larger number of cases has been reported in 1944 than in 1943 for each week up to the week ended March 11, when the current weekly figure dropped below that for 1943. The largest number of weekly cases reported in 1943 was 614 for the week ended March 20 (corresponding to the week ended March 18, 1944), while the largest number of cases reported for any week this year up to March 25 was 645 for the week ended January 15, although a high level has been maintained for subsequent weeks. While the peak week for 1943 occurred in March, a larger number of cases was reported during the second quarter of that year than in the first quarter.

A break in the downward trend during the 2 preceding weeks was recorded for the week ended March 25, 1944, although the incidence continued below that for the corresponding week of last year. On the basis of the seasonal pattern of meningococcus meningitis, an interrupted but general decline in the number of cases may now be expected.

TABLE 3.—*Number of cases of meningococcus meningitis reported, by weeks, in 1944 as compared with 1943*

Year	January				February				March				Total
	8	15	22	29	5	12	19	26	4	11	18	25	
1944	580	645	521	527	571	562	529	552	586	517	497	550	6,637
Corresponding week, 1943	278	309	356	339	330	403	398	484	531	525	614	572	[1] 5,139

[1] Not including delayed reports not assignable by weeks.

[3] J. Am. Med. Assoc., October 2, 1943, pp. 264–272.
[4] J. Am. Med. Assoc., October 9, 1943, pp. 333–339.

INCIDENCE OF HOSPITALIZATION, NOVEMBER, DECEMBER 1943, JANUARY, FEBRUARY 1944

Through the cooperation of the Hospital Service Plan Commission of the American Hospital Association, data on hospital admissions among about 10,000,000 members of Blue Cross Hospital Service Plans are presented monthly. These plans provide prepaid hospital service. The data cover about 60 hospital service plans scattered throughout the country, mostly in large cities.

Item	November	
	1942	1943
1. Number of plans supplying data	60	68
2. Number of persons eligible for hospital care	8,308,004	11,478,284
3. Number of persons admitted for hospital care	67,905	94,495
4. Incidence per 1,000 persons, annual rate, during current month (daily rate × 365)	99.3	100.2
5. Incidence per 1,000 persons, annual rate for the 12 months ended Nov. 30	108.1	105.1
	December	
1. Number of plans supplying data	65	58
2. Number of persons eligible for hospital care	9,483,924	10,175,351
3. Number of persons admitted for hospital care	75,195	78,675
4. Incidence per 1,000 persons, annual rate, during current month (daily rate × 365)	93.3	89.4
5. Incidence per 1,000 persons, annual rate for the 12 months ended Dec. 31	107.9	104.8
	January	
	1943	1944
1. Number of plans supplying data	58	46
2. Number of persons eligible for hospital care	8,545,423	8,900,268
3. Number of persons admitted for hospital care	71,777	72,305
4. Incidence per 1,000 persons, annual rate, during current month (daily rate × 365)	98.8	94.9
5. Incidence per 1,000 persons, annual rate for the 12 months ended Jan. 31	107.6	104.5
	February	
1. Number of plans supplying data	65	54
2. Number of persons eligible for hospital care	9,739,448	10,231,853
3. Number of persons admitted for hospital care	76,661	80,500
4. Incidence per 1,000 persons, annual rate, during current month (daily rate × 365)	102.6	105.6
5. Incidence per 1,000 persons, annual rate for the 12 months ended Feb. 29	108.3	104.8

DEATHS DURING WEEK ENDED MARCH 25, 1944

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 25, 1944	Corresponding week, 1943
Data for 93 large cities of the United States:		
Total deaths	9,605	9,979
Average for 3 prior years	9,342	
Total deaths, first 12 weeks of year	122,809	122,503
Deaths under 1 year of age	603	708
Average for 3 prior years	637	
Deaths under 1 year of age, first 12 weeks of year	7,588	8,742
Data from industrial insurance companies:		
Policies in force	66,368,639	65,462,918
Number of death claims	12,665	13,135
Deaths claims per 1,000 policies in force, annual rate	10.0	10.5
Death claims per 1,000 policies, first 12 weeks of year, annual rate	11.4	10.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED APRIL 1, 1944

Summary

The incidence of meningococcus meningitis continues high, but for the fourth successive week is below that for last year. A total of 549 cases was reported for the week, as compared with 550 last week, 595 for the corresponding week last year, and a 5-year (1939–43) median of 57. Of the total, 260 cases, or 47 percent, were reported in the Middle Atlantic and East North Central areas. Nine States reporting 19 or more cases currently are as follows (last week's figure in parentheses): *Increases*—New York 63 (56), New Jersey 24 (20), Pennsylvania 37 (27), Ohio 56 (37); *decreases*—Illinois 28 (44), Michigan 28 (35), Tennessee 19 (33), California 44 (47); *no change*—Missouri 27 (27).

The cumulative total for the first 13 weeks of the year is 7,186, as compared with 5,918 and 3,437 for the comparable period in 1943 and 1930, respectively, the largest numbers reported for the same period in any prior years.

The incidence of measles and scarlet fever increased during the week to 34,092 and 7,727 cases, respectively, or 5 per cent increase in each instance, as compared with the slight decreases in the preceding week. The cumulative totals for the first quarter of the year are 306,317 and 76,814, as compared with 210,408 and 51,038 for the same period last year and 5-year medians of 204,951 and 52,173, respectively.

Current figures for diphtheria, influenza, poliomyelitis, smallpox, typhoid fever, and whooping cough are below the respective 5-year medians. The cumulative figure for poliomyelitis for the first quarter of the year is lower than for the same period of any of the past 4 years, while the figures for diphtheria, smallpox, and whooping cough are lower than the comparable figures for any prior year of record. The cumulative figure for typhoid fever is lower than for the same period of any prior year of record except 1943.

Deaths registered for the week in 93 large cities of the United States totaled 9,476, as compared with 9,605 last week and a 3-year (1941–43) average of 9,139. The cumulative figure for the year to date is 132,285, as compared with 132,498 for the same period last year.

Telegraphic morbidity reports from State health officers for the week ended April 1, 1944, and comparison with corresponding week of 1943 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1939–43	Week ended		Median 1939–43	Week ended		Median 1939–43	Week ended		Median 1939–43
	Apr. 1, 1944	Apr. 3, 1943		Apr. 1, 1944	Apr. 3, 1943		Apr. 1, 1944	Apr. 3, 1943		Apr. 1, 1944	Apr. 3, 1943	
NEW ENGLAND												
Maine	0	0	1			1	294	8	41	0	8	1
New Hampshire	0	0	0		5		0	60	60	0	1	0
Vermont	1	0	0				171	470	43	1	1	0
Massachusetts	2	3	3				1,196	1,665	1,008	16	23	3
Rhode Island	1	1	0		1		269	11	11	5	17	0
Connecticut	2	1	1		5	6	471	455	365	12	9	1
MIDDLE ATLANTIC												
New York	12	17	17	[1] 6	19	19	2,799	2,826	1,467	63	68	4
New Jersey	2	6	6	21	9	9	1,684	1,653	461	24	39	1
Pennsylvania	14	7	11	5	5		1,424	2,394	1,081	37	38	7
EAST NORTH CENTRAL												
Ohio	3	13	9	9	7	16	2,135	1,227	354	56	7	2
Indiana	5	3	6	15	44	33	294	761	125	13	9	1
Illinois	15	22	22	14	11	33	1,271	1,378	227	28	21	1
Michigan [2]	8	5	5	7	4	4	1,295	1,301	393	28	18	2
Wisconsin	1	1	0	55	36	202	2,737	1,563	870	11	12	1
WEST NORTH CENTRAL												
Minnesota	5	3	1			3	1,354	126	214	5	4	0
Iowa	2	5	5	31		9	165	341	270	6	2	0
Missouri	0	4	4	3	8	8	415	369	146	27	12	0
North Dakota	0	0	1	8	3	3	148	56	44	0	0	0
South Dakota	3	10	1			1	37	178	13	0	0	0
Nebraska	2	0	4	9	29	2	125	196	190	1	0	0
Kansas	3	7	4	3	3	12	814	629	629	8	4	1
SOUTH ATLANTIC												
Delaware	1	0	0				22	95	3	5	2	0
Maryland [2]	1	16	3	25	8	41	1,139	140	393	5	22	1
District of Columbia	0	0	1	1	1	2	125	75	91	5	5	1
Virginia	5	3	6	259	556	484	695	621	421	5	31	3
West Virginia	5	1	6	4	119	119	666	90	90	9	4	3
North Carolina	4	8	11	26	71	57	2,028	93	808	3	18	2
South Carolina	0	3	5	346	473	605	604	175	175	12	15	2
Georgia	7	4	5	35	48	90	330	264	263	4	7	2
Florida	3	2	4	6	5	13	416	69	193	1	2	2
EAST SOUTH CENTRAL												
Kentucky	2	3	6	13	7	26	105	543	111	13	20	4
Tennessee	4	3	3	57	74	153	378	540	129	19	18	2
Alabama	7	7	7	76	324	328	531	320	257	5	9	3
Mississippi [2]	1	2	3							10	43	2
WEST SOUTH CENTRAL												
Arkansas	2	4	4	87	62	201	264	157	157	4	1	1
Louisiana	0	3	3	5	8	8	121	240	189	5	7	1
Oklahoma	2	1	4	214	78	197	95	107	107	3	1	1
Texas	34	29	29	1,143	1,129	1,154	3,039	1,297	1,297	18	20	2
MOUNTAIN												
Montana	0	2	1	13	52	43	262	374	150	1	0	0
Idaho	0	0	0				29	27	39	2	0	0
Wyoming	2	1	1	12	26	1	104	213	126	0	1	0
Colorado	3	14	8	40	31	31	354	720	272	12	4	0
New Mexico	0	0	0	7		1	150	12	53	7	0	0
Arizona	2	1	2	59	98	137	308	31	104	2	0	0
Utah [2]	0	0	0	15	9	13	28	252	235	0	1	0
Nevada	0	0	0		3		0	21	9	0	0	0
PACIFIC												
Washington	6	7	1	6	2	1	261	775	703	8	6	1
Oregon	5	1	2	26	22	24	135	453	351	6	7	1
California	33	19	17	109	70	220	2,705	812	812	44	58	2
Total	210	242	274	2,770	3,465	4,087	34,092	26,183	21,924	549	595	57
13 weeks	3,212	3,679	4,037	320,567	57,434	113,646	306,417	210,408	204,951	7,186	5,826	682

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended April 1, 1944, and comparison with corresponding week of 1943 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [4]		
	Week ended		Median 1939–43	Week ended		Median 1939–43	Week ended		Median 1939–43	Week ended		Median 1939–43
	Apr. 1, 1944	Apr. 3, 1943		Apr. 1, 1944	Apr. 3, 1943		Apr. 1, 1944	Apr. 3, 1943		Apr. 1, 1944	Apr. 3, 1943	
NEW ENGLAND												
Maine	0	0	0	46	13	13	0	0	0	0	1	0
New Hampshire	0	0	0	21	10	7	0	0	0	1	0	0
Vermont	0	0	0	11	10	11	0	0	0	0	0	0
Massachusetts	0	0	0	431	568	171	0	0	0	0	2	2
Rhode Island	0	0	0	14	17	17	0	0	0	0	0	0
Connecticut	0	0	0	93	93	86	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	1	0	0	749	559	640	0	0	0	3	4	6
New Jersey	0	0	0	283	204	204	0	0	0	1	1	1
Pennsylvania	1	2	0	750	350	400	0	0	0	2	0	7
EAST NORTH CENTRAL												
Ohio	0	0	0	489	314	414	0	1	2	4	2	2
Indiana	0	2	0	230	154	190	0	2	2	1	0	0
Illinois	0	0	1	582	271	483	0	1	3	0	6	3
Michigan [3]	0	0	0	388	119	310	0	0	0	2	3	2
Wisconsin	1	0	0	433	339	175	0	0	3	0	0	0
WEST NORTH CENTRAL												
Minnesota	0	0	0	219	33	80	0	0	2	0	1	0
Iowa	0	0	0	200	59	64	1	1	4	2	0	0
Missouri	0	0	0	160	80	40	0	0	3	0	1	1
North Dakota	0	0	0	56	5	9	0	0	0	0	0	0
South Dakota	1	0	0	21	11	13	0	0	0	0	0	0
Nebraska	0	0	0	43	29	44	0	0	0	0	0	0
Kansas	0	0	0	126	74	74	0	1	1	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	22	9	10	0	0	0	0	0	0
Maryland [3]	0	0	0	230	146	49	0	0	0	0	5	2
District of Columbia	0	1	0	159	20	16	0	0	0	0	0	0
Virginia	0	0	0	112	43	32	0	0	0	2	2	2
West Virginia	0	0	0	108	21	41	0	0	0	1	0	2
North Carolina	0	0	0	29	32	32	0	0	0	0	0	1
South Carolina	0	0	0	5	5	5	1	1	0	2	1	1
Georgia	1	0	0	30	15	15	0	9	1	4	1	2
Florida	1	0	1	13	7	8	0	0	0	3	1	2
EAST SOUTH CENTRAL												
Kentucky	1	3	0	83	51	71	0	0	0	1	0	1
Tennessee	0	0	0	60	45	67	0	0	0	1	3	2
Alabama	0	0	0	15	43	18	0	0	1	1	2	3
Mississippi [3]	0	1	1	6	10	7	1	1	0	2	1	2
WEST SOUTH CENTRAL												
Arkansas	1	0	0	20	5	5	0	1	1	1	1	1
Louisiana	1	0	0	7	13	7	0	0	1	1	2	5
Oklahoma	0	0	0	13	17	17	1	0	1	0	1	1
Texas	4	0	0	140	162	60	1	13	13	7	3	5
MOUNTAIN												
Montana	0	0	1	90	16	29	4	0	0	0	0	0
Idaho	0	0	0	43	7	7	0	0	0	0	0	0
Wyoming	0	0	0	10	58	19	0	0	0	0	0	0
Colorado	1	0	0	71	39	37	0	0	0	0	0	0
New Mexico	0	0	0	29	3	4	0	0	0	0	4	2
Arizona	0	[3] 3	0	28	19	9	0	0	0	0	0	0
Utah [3]	0	1	0	125	49	23	0	0	0	0	0	0
Nevada	0	0	0	5	1	0	0	0	0	0	0	0
PACIFIC												
Washington	1	1	0	372	40	24	1	0	0	3	4	0
Oregon	0	0	0	166	12	12	0	0	1	0	1	0
California	3	5	1	391	136	136	0	0	0	17	1	3
Total	18	[3] 19	19	7, 727	4, 336	4, 465	10	31	48	62	54	77
13 weeks	295	340	330	76, 814	51, 038	52, 173	162	350	605	954	692	993

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended April 1, 1944, and comparison with corresponding week of 1943 and 5-year median—Con.

Division and State	Whooping cough			Week ended Apr. 1, 1944								
	Week ended		Median 1939–43	Anthrax	Dysentery			Encephalitis, infectious	Leprosy	Rocky Mt. spotted fever	Tularemia	Typhus fever
	Apr. 1, 1944	Apr. 3, 1943			Amebic	Bacillary	Unspecified					
NEW ENGLAND												
Maine	0	60	54	0	0	0	0	0	0	0	0	0
New Hampshire	0	23	10	0	0	0	0	0	0	0	0	0
Vermont	37	27	34	0	0	0	0	0	0	0	0	0
Massachusetts	79	179	196	0	0	17	0	1	0	0	0	0
Rhode Island	6	43	43	0	0	0	0	0	0	0	0	0
Connecticut	28	51	67	0	1	0	0	1	0	0	0	0
MIDDLE ATLANTIC												
New York	101	405	405	0	2	8	0	0	0	0	0	0
New Jersey	54	205	180	0	0	0	0	1	0	1	0	0
Pennsylvania	96	311	349	1	2	0	0	0	0	0	0	0
EAST NORTH CENTRAL												
Ohio	50	181	209	0	0	1	0	0	0	0	0	0
Indiana	14	83	33	0	0	0	0	0	0	0	0	0
Illinois	37	111	118	0	1	0	0	0	1	1	0	0
Michigan [2]	98	253	174	0	1	0	0	0	0	0	0	0
Wisconsin	53	190	146	0	0	0	0	0	0	0	1	0
WEST NORTH CENTRAL												
Minnesota	29	78	49	0	4	0	0	0	0	0	0	0
Iowa	11	18	18	0	0	0	0	0	0	0	0	0
Missouri	10	8	8	0	0	0	0	0	0	0	0	0
North Dakota	2	16	16	0	0	0	0	0	0	0	0	0
South Dakota	0	5	2	0	0	0	0	0	0	0	0	0
Nebraska	7	8	9	0	0	0	0	0	0	0	0	0
Kansas	37	109	49	0	0	0	0	0	0	0	0	0
SOUTH ATLANTIC												
Delaware	0	6	7	0	0	0	0	0	0	0	0	0
Maryland [2]	28	109	80	0	0	0	0	1	0	0	0	0
District of Columbia	2	42	15	0	0	0	0	0	0	0	0	0
Virginia	54	85	53	0	0	0	98	0	0	0	0	0
West Virginia	53	106	69	0	0	0	0	0	0	0	0	0
North Carolina	112	179	179	0	0	0	0	0	0	0	0	1
South Carolina	72	32	96	0	0	3	0	0	0	0	1	1
Georgia	20	42	29	0	0	3	0	0	0	0	2	5
Florida	18	30	23	0	0	0	0	1	0	0	0	1
EAST SOUTH CENTRAL												
Kentucky	27	49	50	0	1	0	0	0	0	0	0	0
Tennessee	11	111	46	0	0	0	0	0	0	0	0	0
Alabama	31	52	52	0	0	0	0	0	0	0	3	5
Mississippi [2]				0	0	0	0	0	0	0	0	0
WEST SOUTH CENTRAL												
Arkansas	13	26	18	0	0	0	0	0	0	0	1	0
Louisiana	0	10	12	0	1	1	0	0	0	0	0	0
Oklahoma	5	33	9	0	0	0	0	0	0	0	0	0
Texas	260	545	243	0	24	199	0	1	0	0	0	15
MOUNTAIN												
Montana	10	16	9	0	0	0	0	0	0	0	1	0
Idaho	11	5	5	0	0	0	0	0	0	0	0	0
Wyoming	5	2	2	0	1	0	0	0	0	0	0	0
Colorado	22	11	55	0	0	0	0	0	0	0	0	0
New Mexico	10	13	31	0	0	0	2	0	0	0	0	0
Arizona	52	29	29	0	1	0	11	0	0	0	0	0
Utah [2]	32	51	51	0	0	0	0	0	0	0	0	0
Nevada	6	0	0	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	34	30	38	0	0	0	0	0	0	0	0	0
Oregon	35	27	24	0	0	0	0	0	0	0	0	0
California	92	394	283	0	1	5	0	1	0	0	0	1
Total	1,764	4,399	4,110	1	40	237	111	7	1	2	9	29
13 weeks	23,873	51,424	51,424	12	357	2,589	856	133	9	4	134	504

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Exclusive of delayed report of one case in Arizona.
[4] Including paratyphoid fever cases reported separately as follows: New York, 1; Michigan, 1; Florida, 1; Tennessee, 1; Washington, 1; California, 15.

WEEKLY REPORTS FROM CITIES

City reports for week ended March 18, 1944

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	25	3	5	0	5	0	1	0
New Hampshire:												
Concord	0	0	------	1	2	0	1	0	0	0	0	1
Vermont:												
Barre	0	0	------	0	0	0	0	0	0	0	0	0
Massachusetts:												
Boston	1	0	------	1	96	8	19	0	93	0	0	18
Fall River	0	0	------	0	25	1	5	0	2	0	1	2
Springfield	0	0	------	0	47	0	0	0	44	0	0	6
Worcester	0	0	------	0	0	0	8	0	79	0	0	5
Rhode Island:												
Providence	0	0	------	0	228	2	6	0	5	0	0	1
Connecticut:												
Bridgeport	0	0	2	2	27	0	2	0	3	0	0	0
Hartford	1	0	------	0	2	0	1	0	13	0	0	0
New Haven	0	0	2	0	148	1	0	0	4	0	0	8
MIDDLE ATLANTIC												
New York:												
Buffalo	1	0	------	0	3	0	5	0	15	0	0	2
New York	6	1	6	4	1,840	26	79	0	342	0	4	40
Rochester	0	0	------	0	2	4	4	0	10	0	0	0
Syracuse	0	0	------	0	1	1	7	0	3	0	0	8
New Jersey:												
Camden	1	0	1	1	6	1	2	0	49	0	0	0
Newark	0	0	2	1	114	3	11	0	30	0	0	6
Trenton	0	0	6	0	14	0	5	0	8	0	0	0
Pennsylvania:												
Philadelphia	2	0	9	6	29	14	31	0	111	0	0	14
Pittsburgh	0	0	5	3	103	5	14	0	21	0	0	7
Reading	0	0	------	0	3	0	4	0	7	0	0	0
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	4	0	------	0	52	7	7	0	47	0	0	0
Cleveland	0	0	4	2	696	4	19	0	105	0	1	12
Columbus	0	0	1	1	151	0	2	0	8	0	0	3
Indiana:												
Fort Wayne	0	0	------	0	0	0	2	0	6	0	0	0
Indianapolis	8	0	------	0	22	4	8	0	80	0	0	2
South Bend	0	0	------	0	7	0	0	0	9	0	0	0
Terre Haute	0	0	------	0	0	0	0	0	0	0	0	0
Illinois:												
Chicago	1	0	1	1	73	16	30	1	196	0	0	10
Springfield	0	0	4	0	63	1	2	0	2	0	0	1
Michigan:												
Detroit	3	0	1	1	101	16	14	0	126	0	0	20
Flint	1	0	------	0	7	1	3	0	4	0	0	1
Grand Rapids	0	0	------	0	179	0	3	0	14	0	0	0
Wisconsin:												
Kenosha	0	0	------	0	11	0	0	0	7	0	0	0
Milwaukee	0	0	------	0	80	0	6	0	77	0	0	12
Racine	0	0	------	0	17	0	3	0	2	0	0	4
Superior	0	0	------	0	7	0	0	0	22	0	0	0
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	15	0	1	0	32	0	0	7
Minneapolis	2	0	------	1	485	3	10	0	49	0	0	5
St. Paul	1	0	------	1	775	1	5	0	27	0	0	10

City reports for week ended March 18, 1944—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Missouri:												
Kansas City	0	0	------	0	44	3	7	0	32	0	0	1
St. Joseph	0	0	------	0	6	0	0	0	5	0	0	0
St. Louis	0	0	2	1	209	11	13	0	43	0	1	7
Nebraska:												
Omaha	2	0	------	0	17	0	7	0	55	0	0	0
Kansas:												
Topeka	1	0	------	0	17	0	0	0	3	0	0	3
Wichita	0	0	------	0	215	0	6	0	6	0	0	2
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	1	3	0	8	0	2	0	0	0
Maryland:												
Baltimore	5	0	6	4	974	6	13	0	111	0	1	31
Cumberland	0	0	------	0	0	0	0	0	0	0	0	1
Frederick	0	0	------	0	0	0	0	0	0	0	0	0
District of Columbia:												
Washington	0	0	1	1	129	1	11	0	222	0	0	3
Virginia:												
Lynchburg	0	0	3	0	9	0	1	0	2	0	1	5
Richmond	0	0	------	0	261	3	3	0	3	0	0	0
Roanoke	0	0	------	0	82	0	0	0	1	0	0	9
West Virginia:												
Charleston	0	0	------	0	2	1	0	0	7	0	0	0
Wheeling	0	1	------	0	17	1	1	0	23	0	0	0
North Carolina:												
Winston-Salem	0	0	------	0	44	0	1	0	1	0	0	0
South Carolina:												
Charleston	0	0	16	0	34	2	2	0	1	0	0	0
Georgia:												
Atlanta	0	0	20	1	43	1	0	0	5	0	1	0
Brunswick	0	0	------	0	4	0	1	0	0	0	0	0
Savannah	0	0	------	0	8	2	1	0	2	0	0	0
Florida:												
Tampa	0	0	------	0	7	1	4	0	1	0	1	0
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	1	0	6	1	24	4	3	0	26	0	0	10
Nashville	0	0	------	0	6	0	0	0	8	0	0	1
Alabama:												
Birmingham	0	0	6	0	23	1	7	0	0	0	0	2
Mobile	1	0	------	1	0	0	2	0	0	0	0	0
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	1	0	3	0	57		1	0	1	0	0	0
Louisiana:												
New Orleans	1	0	17	3	37	3	6	0	10	0	0	0
Shreveport	1	0	------	0	0	0	5	0	2	0	0	0
Texas:												
Dallas	3	0	1	1	169	0	1	0	6	0	1	0
Galveston	0	0	------	0	2	0	2	0	0	0	0	0
Houston	3	0	------	0	37	0	5	0	1	0	0	0
San Antonio	2	0	1	1	37	4	9	1	1	0	0	1
MOUNTAIN												
Montana:												
Billings	0	0	------	0	3	0	0	0	0	0	0	0
Great Falls	0	0	------	0	10	0	0	0	7	0	0	0
Helena	0	0	------	0	0	0	0	0	0	0	0	0
Missoula	0	0	------	0	0	0	1	0	1	0	0	0
Idaho:												
Boise	0	0	------	0	1	0	0	0	2	0	0	0
Colorado:												
Denver	0	0	10	0	172	0	7	0	31	0	0	17
Pueblo	0	0	------	0	40	0	1	0	2	0	0	0

City reports for week ended March 18, 1944—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
MOUNTAIN—continued												
Utah:												
Salt Lake City	0	0	------	0	9	0	2	0	26	0	0	0
PACIFIC												
Washington:												
Seattle	0	0	------	0	0	0	5	0	0	0	0	0
Spokane	0	0	------	0	73	1	3	0	20	0	0	0
Tacoma	1	0	------	0	7	1	0	0	68	0	0	0
California:												
Los Angeles	7	0	16	4	308	4	8	1	42	0	1	10
Sacramento	0	0	------	0	22	2	1	0	4	0	0	7
San Francisco	0	0	10	1	82	0	12	2	38	0	1	10
Total	61	2	162	46	8,700	174	484	5	2,478	0	15	325
Corresponding week, 1943	66	2	254	84	6,460	168	527	4	1,746	0	9	1,156
Average, 1939–43	76	------	470	[1] 44	[2] 4,743	------	[1] 517	------	1,537	8	18	1,091

[1] 3-year average.
[2] 5-year median.

Dysentery, amebic.—Cases: New York, 2; Philadelphia, 4; Chicago, 1; St. Louis, 1; Charleston, S. C., 2; Memphis, 1; Dallas, 1.
Dysentery, bacillary.—Cases: Providence, 1; Richmond, 1; Charleston, S. C., 6; Los Angeles, 5.
Dysentery, unspecified.—Cases: San Antonio, 1.
Leprosy.—Cases: Tampa, 1.
Typhus fever.—Cases: Atlanta, 1; New Orleans, 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1942, 34,648,700)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	5.0	0.0	10.0	10.0	1,495	37.4	117.1	0.0	618	0.0	5.0	102
Middle Atlantic	4.5	0.4	13.0	6.7	946	24.1	72.4	0.0	267	0.0	1.8	34
East North Central	10.0	0.0	6.4	2.9	858	28.7	58.0	0.6	413	0.0	0.6	38
West North Central	11.9	0.0	4.0	5.9	3,536	35.7	97.2	0.0	500	0.0	2.0	69
South Atlantic	8.7	1.7	80.0	12.2	2,814	31.3	80.0	0.0	663	0.0	7.0	85
East South Central	11.9	0.0	71.5	11.9	316	29.8	71.5	0.0	202	0.0	0.0	77
West South Central	32.4	0.0	64.7	14.7	997	20.6	85.3	2.9	62	0.0	2.9	3
Mountain	0.0	0.0	80.6	0.0	1,894	0.0	88.7	0.0	556	0.0	0.0	137
Pacific	14.0	0.0	45.6	8.8	862	14.0	50.8	5.3	301	0.0	3.5	47
Total	9.2	0.3	24.4	6.9	1,313	26.3	73.0	0.8	374	0.0	2.3	49

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended March 4, 1944.—During the week ended March 4, 1944, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		14		199	472	79	49	126	170	1,100
Diphtheria	3	8	3	30	1	2		1	1	49
Dysentery (bacillary)				1						1
Encephalitis, infectious									2	2
German measles		9	8	43	23	14	56	9	47	209
Influenza		22	3		153	1	4		55	238
Measles		114		1,077	597	111	76	245	30	2,250
Meningitis, meningococcus				2	1			1	3	7
Mumps		20	10	225	202	95	12	51	72	687
Poliomyelitis				1		1				2
Scarlet fever		7	2	79	265	75	24	84	80	616
Tuberculosis (all forms)		2	6	182	54	17	13	26	45	345
Typhoid and paratyphoid fever				13	2					15
Undulant fever				3					2	5
Whooping cough		12		102	62	10	2		18	206

CUBA

Provinces—Notifiable diseases—4 weeks ended February 26, 1944.—During the 4 weeks ended February 26, 1944, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana[1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1		5	3		5	14
Chickenpox	1		2			3	6
Diphtheria		39	1			4	44
Hookworm disease		17					17
Leprosy				1		1	2
Malaria	30	8	6	10	4	386	444
Measles	5	46	11			1	63
Poliomyelitis				1		1	2
Scarlet fever		2					2
Trachoma						20	20
Tuberculosis	12	18	19	13	3	42	107
Typhoid fever	15	62	1	27	7	14	126
Whooping cough		41					41
Yaws				6		1	7

[1] Includes the city of Habana.

GERMANY

Infectious diseases—Week ended January 1, 1944, and period January 1 to December 25, 1943—Comparative.—The following numbers of cases of certain infectious diseases were reported in Germany [1] for the week ended January 1, 1944, and for the period January 1 to December 25, 1943, compared with the same period of 1942:

Disease	Week ended Jan. 1, 1944	January 1–December 25, 1943	Corresponding period, 1942
Anthrax	1	31	33
Cerebrospinal meningitis	36	2,514	2,732
Diphtheria	6,991	286,137	274,479
Dysentery	46	7,325	15,072
Inflammation of the brain	12	557	419
Malaria	1	682	709
Poliomyelitis	23	2,925	3,911
Psittacosis	----	16	4
Ptomaine poisoning	27	1,575	1,930
Scarlet fever	6,892	380,542	396,554
Trachoma	42	6,130	8,514
Tuberculosis (all forms)	1,867	141,304	144,495
Typhoid fever	226	18,355	16,021
Typhus fever	42	5,016	5,913
Undulant fever	9	165	199
Weil's disease	3	218	100
Whooping cough	980	128,415	85,996

[1] Although not stated in the report, it is assumed that the figures are for the old German Reich.

JAMAICA

Notifiable diseases—4 weeks ended March 11, 1944.—During the 4 weeks ended March 11, 1944, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis	----	1	Leprosy	----	5
Chickenpox	17	28	Tuberculosis	33	67
Diphtheria	3	3	Typhoid fever	7	93
Erysipelas	1	1			

NEW ZEALAND

Notifiable diseases—4 weeks ended February 28, 1944.—During the 4 weeks ended February 28, 1944, certain notifiable diseases were reported in New Zealand as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	21	4	Poliomyelitis	8	----
Diphtheria	66	----	Puerperal fever	5	----
Dysentery (bacillary)	35	1	Scarlet fever	246	1
Erysipelas	24	----	Trachoma	3	----
Food poisoning	5	----	Tuberculosis (all forms)	221	50
Influenza	1	----	Typhoid fever	11	2
Lead poisoning	1	----	Undulant fever	5	----

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

(Few reports are available from the invaded countries of Europe and other nations in war zones.)

Smallpox

British East Africa.—Smallpox has been reported in British East Africa as follows: Tanganyika Territory—weeks ended January 29, 1944, 45 cases; February 5, 60 cases; February 12, 35 cases. Uganda—weeks ended February 12, 129 cases; February 19, 83 cases; February 26, 101 cases.

Egypt.—Smallpox has been reported in Egypt as follows: Alexandria—weeks ended February 19, 1944, 65 cases, 9 deaths; February 26, 70 cases, 6 deaths. Port Said—weeks ended March 4, 140 cases, 9 deaths; March 11, 76 cases, 5 deaths.

French Guinea.—For the period January 11 to February 10, 1944, 130 cases of smallpox were reported in French Guinea.

India.—For the week ended February 26, 1944, 282 cases of smallpox with 81 deaths were reported in Bombay, and for the week ended March 4, 1944, 278 cases of smallpox with 224 deaths were reported in Calcutta, India.

Indochina.—For the period February 1–10, 1944, 95 cases of smallpox were reported in Indochina.

Nigeria.—Smallpox has been reported in Nigeria as follows: Weeks ended February 19, 1944, 148 cases with 36 deaths; February 26, 1944, 236 cases with 36 deaths.

Typhus Fever

Guatemala.—For the month of February 1944, 162 cases of typhus fever with 41 deaths were reported in Guatemala.

Rumania.—For the period March 1–15, 1944, 1,068 cases of typhus fever were reported in Rumania.

Slovakia.—For the period February 1–12, 1944, 33 cases of typhus fever were reported in Slovakia.

COURT DECISION ON PUBLIC HEALTH

Town water supply—order of State department of public health regarding chlorinating equipment upheld.—(Massachusetts Supreme Judicial Court; *Commonwealth* v. *Town of Hudson et al.*, 52 N.E.2d 566; decided December 29, 1943.) A Massachusetts law enacted in January 1942 provided as follows: "If the department of public health determines that, during the existence of the present state of war, it is necessary for a city, town, district, or water company maintaining a water supply to provide equipment for such supply, including treatment equipment, or additions to existing equipment, for the protection of the public health, said department may order such city, town, district, or company to provide such equipment or to make such additions to any existing equipment. The supreme judicial or the superior court shall have jurisdiction in equity to enforce any such order." The State department of public health sent a notice dated April 10, 1942, to the defendant town signed "By order of the department of public health. Paul J. Jakmauh, M. D., Commissioner of Public Health." This notice stated that "the department hereby determines that it is necessary for the town of Hudson to provide treatment equipment for chlorinating all water supplied to the town during the existence of the present state of war," and under the authority of the above-quoted statute ordered the town "to provide such chlorinating equipment forthwith." At a special town meeting held on April 29, 1942, it was voted "not to authorize the commissioners of public works to install chlorinating equipment for the town's water supply as ordered by the State department of public health." In October 1942 the Commonwealth, by the Attorney General, brought a bill in equity against the town, its commissioners of public works, and its selectmen, praying that they "be ordered forthwith to provide treatment equipment for chlorinating the water supplied to the town of Hudson, as ordered by the department of public health."

The water supply of the defendant town came from a well-isolated pond situated in a wooded section of another town. The water had never been treated, it satisfied State and Federal standards for drinking water, and was rated as very good. Several industrial plants in the town were engaged in producing goods needed for the war and a large number of their employees lived in the town. The pond was guarded constantly by one armed guard and two dogs. The State department's determination was based wholly upon the danger of pollution by "sabotage." The trial court reserved the case for the State supreme court without decision.

The latter court held the order to be within the authority given the department by the statute. According to the court it was unnecessary to give the town an option to purify the water in some other way.

The department had authority to specify even more particularly than it did the kind and amount of equipment to be provided. The fact that the evil to be avoided was one feared rather than one presently existing was no reason for denying legislative authority to guard against it. Also the fact that chlorination would cost the town money was not a constitutional objection to a legislative act requiring that precaution.

Concerning the question of delegation of legislative power the supreme court stated that the fact that the legislature, instead of requiring chlorination by its own act, left the selection of the water systems requiring such treatment to the department did not give rise to any constitutional objection. It was pointed out that one of the exceptions to or qualifications of the doctrine that the general power to legislate cannot be delegated was that the legislature could delegate to a board or an individual officer the working out of the details of a policy adopted by the legislature. The order in the instant case was stated by the court to be plainly a valid exercise of the State's police power. Even though made by the department it was made under a valid delegation of power by the legislature and had the same force as though made by the legislature itself.

With respect to giving the town a hearing the court held that there was no constitutional need therefor. The legislature was dealing with an emergency affecting many water systems throughout the State and a hearing by the department in each case would delay needed action and tend to defeat the statute's purpose.

That the town's water was naturally pure was said by the court to be beside the point. The department reasonably could find that the guard placed over the water supply could not insure against pollution by disease-producing organisms introduced by enemy agents or sympathizers and that chlorination would reduce the danger to public health if such pollution took place. The department's action was of the very kind contemplated by the statute and the problem was the State's business and not that of the defendant town alone. "An epidemic originating in Hudson might sweep the Commonwealth. The town cannot ask the courts to try the legislative question whether chlorination is needed. [Case cited.] Still less has it the right to nullify the order because not convinced of its necessity. There was never any sufficient reason for the town to doubt the validity of the order or to refuse to obey it."

A decree in accordance with the opinion was ordered entered by the supreme court.

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