

namely, streptococcus, Type IV pneumococcus, *M. catarrhalis*, Pfeiffer's bacillus, etc. A confluent lobular pneumonia ensues, caused by one or more of these organisms. In other words, we consider this a type of aspiration pneumonia.

However, it is by no means certain that *Bacillus influenzae* of Pfeiffer is the original infecting organism. We have not found it in pure culture in any of our cases examined postmortem. The disease may eventually be shown to be caused by some filterable virus or ultramicroscopic organism.

LOBAR PNEUMONIA AT A BASE HOSPITAL

LABORATORY AND CLINICAL STUDY OF FIFTY CASES *

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Early in March, 1918, it was suggested by one of us (L. S. M.) that a more careful study be made on the lobar pneumonia cases that appeared at this camp. The chief of the medical service was therefore requested to continue Lieutenant Schiff on duty as ward surgeon in charge of the pneumonia wards. It was felt that a comparative study of the cases clinically could best be made if the same man were continued on duty.

This article is a report on two series of cases. In the first, thirty cases were followed up in a routine way. Polyvalent antipneumococcus serum was administered in each case without regard to the outcome of the type determination. The second series is a study of twenty cases in which more complete laboratory methods were done, such as blood cultures, daily leukocyte counts, type determination, and the use therapeutically of Type I serum only in those cases that were found to be due to the Type I pneumococcus.

TABLE 1.—FREQUENCY OF POSITIVE BLOOD CULTURES IN
PNEUMONIA AND ITS PROGNOSTIC SIGNIFICANCE
(SECOND SERIES)

Type	No.	Blood Cultures				Mortality in Cases with			
		Positive		Negative		Positive		Negative	
		No.	Per Cent.	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.
I	3	15	33	2	66	—	—	—	—
II	9	45	44	5	56	1	25	—	—
III	—	—	—	—	—	—	—	—	—
IV	8	40	38	5	63	1	33	—	—

PNEUMOCOCCUS SEPTICEMIA AND ITS PROGNOSTIC SIGNIFICANCE

The incidence of positive blood cultures in lobar pneumonia has been variously stated as ranging from 20 to 50 per cent. The findings at the Rockefeller Institute¹ were 30 per cent. Our findings, as will be seen in Table 1, are 40 per cent., thus distributed: Type I, 33 per cent.; Type II, 44 per cent., and Type IV, 38 per cent. The two deaths that occurred were both among those with the positive blood findings, one in Type II and the other in Type IV. The mortality

of those with positive blood findings according to this table is 20 per cent., as compared with no mortality in the negative cases.

The technic followed was to obtain about 20 c.c. of blood from a vein at the elbow under aseptic precautions; plant 10 c.c. of the blood in a bottle containing 80 c.c. of meat infusion broth, and from 2 to 3 c.c. in each of a tube containing plain agar melted and brought down to 45 C., and plated. The cultures were kept under observation for from five to seven days and examined daily before a definite negative report was made. The typing was done mostly by Avery's cultural method. Both the agglutination and precipitin

TABLE 2.—COMPLICATIONS AND MORTALITY *

Type	No. Cases		Empyema		Otitis		Died		Recovered	
	1st	2d	1st	2d	1st	2d	1st	2d	1st	2d
I.....	3	3	0	1	0	0	0	0	3	3
II.....	4	9	0	2	0	3	0	1	4	8
III.....	0	0	0	0	0	0	0	0	0	0
IV.....	11	8	0	1	1	0	0	1	11	7
Undeter- mined...	12	0	0	0	0	0	0	0	12	0

* Comparison between Series 1, cases treated at random with polyvalent serum, and Series 2, those treated with Type I serum only when found due to Type I pneumococcus infection.

tests (the routine method was the agglutination test) were done in a number of cases. The mouse method was not used, owing to the impossibility of obtaining white mice.

The pneumococcus obtained from the blood was in all cases found to correspond to the type obtained in the sputum.

The blood cultures were taken from two to nine days following the first initial symptoms, and in most cases from two to five days prior to the occurrence of the crisis.

It is significant that in the fifty cases here reported there was not a single case of Type III. It would be of interest to know whether the infection with this type of pneumococcus was as rare in other camps. In the thirty-one cases of lobar pneumonia reported by Cole and MacCallum² at Fort Sam Houston, Texas, they found only one case with Type III, or 3 per cent., as against 13 per cent. at the Rockefeller Institute.¹

In a recent article by A. A. Small³ in a report on the pneumonia cases at Camp Pike, the type determination findings were: Type I, 21 per cent.; Type II, 34 per cent.; Type IV, 45 per cent.—no Type III in the whole series. Our findings of those fifty cases that were typed were: Type I, 16 per cent.; Type II, 34 per cent.; Type IV, 50 per cent.—none of Type III in this series.

COMPARISON OF COMPLICATIONS AND MORTALITY BETWEEN THE TWO SERIES

In comparing the complications and mortality between the two series in Table 2, one cannot help but recognize the marked difference between them. One would expect the course of the disease to be much more severe and the mortality much higher in the first series of the thirty cases, which extended through the months of January, February and March, the coldest months of the year, as compared with the second series of cases, which extended through the last week of March, April and May, the wards and general treatment being the same and carried out by the same ward surgeon.

*From the Clinical and Pathological Laboratory, Base Hospital, Camp MacArthur, Waco, Texas.

1. Avery, Chickering, Cole and Dochez; Monographs of the Rockefeller Institute for Medical Research, No. 7, Oct. 16, 1917.

2. Cole, Rufus, and MacCallum, W. G.: Pneumonia at a Base Hospital, THE JOURNAL A. M. A., April 20, 1918, pp. 1146-1156.

3. Small, A. A.: Pneumonia at a Base Hospital, THE JOURNAL A. M. A., Aug. 31, 1918, pp. 700-702.

As a matter of fact, the course of the disease was much worse in the second series of twenty cases, which had in its favor the better weather conditions, having four empyema cases, three cases with otitis media, and two deaths; while in the first series of thirty cases there were no empyema cases, only one with otitis media, and not a single death. The only difference in the treatment between the two series was the use of the polyvalent antipneumococcus serum as a routine measure in the first series, while only in those that were of Type I infection, three cases out of the twenty, in the second series was serum given. The general impression as expressed by Major O. H. Campbell, chief of the medical service, was to the effect that the cases in which the polyvalent serum was administered ran a much milder course, the patients feeling better, breathing easier, and in every respect being much better off than those patients in the second series who did not receive serum, not having Type I infection.

The same impression was expressed by the various ward surgeons who observed the other cases that occurred in camp on whom polyvalent serum was used as a routine measure. Credit for the use of the polyvalent serum is due to Major Campbell, who instituted its use as a routine measure in all cases of pneumonia in the beginning, before we had any facilities in the hospital to do type determination. Because of the apparent good the polyvalent serum did and the easier course these cases ran and the low mortality obtained, the routine use of polyvalent serum was continued for a long time after the type determination was instituted in this laboratory.

SPECIFIC THERAPY: POLYVALENT VERSUS TYPE I SERUM

A critical analysis of Table 2, with special reference to the difference in complications and mortality between the first series, which received the polyvalent serum as a routine measure, and the second, which did not, is the strongest evidence, at least for the present, that we have in favor of using the polyvalent serum as a routine measure. We have no means of determining thus far the amount of antibodies Type IV organisms are capable of producing against their own respective types, while against Type II, according to the Rockefeller Institute,⁴ an antiserum can be produced, though much less potent than against Type I. These facts, and the fact that Type II plus Type IV infections make up from 70 to 80 per cent. of the cases of lobar pneumonia that occurred in the camps, strongly suggest the advisability of using the polyvalent serum as a routine measure, until such time at least as monovalent serums can be produced against the respective individual types of infections. The potency against Type I infection of the polyvalent antiserum, as pointed out by Wayson and McCoy⁴ of the U. S. Public Health Service, must in all respects compare favorably with that of Type I monovalent antiserum.

The important thing in the use of an antiserum as a routine measure is the avoidance of anaphylaxis. This may be accomplished by the intradermal and subcutaneous test. The technic as followed in this hospital is the administration intradermally, on the flexor surface of the upper arm, of 0.5 c.c. of a 1 per cent. antipneumococcus serum in sterile saline, controlled by

0.5 c.c. of saline solution introduced at points from 3 to 4 cm. apart on the same level of the skin, followed, if negative, in fifteen minutes by 1 c.c. of straight serum subcutaneously. If the subcutaneous test is found negative, it is followed one hour later by 50 c.c. of polyvalent serum intravenously. This dose is repeated from every twelve to twenty-four hours until the temperature, respiration and pulse warrant its discontinuation.

If properly carried out, this intradermal and subcutaneous skin test should do away with the objection raised against the routine use of the polyvalent antipneumococcus serum of unquestionable potency (as tested by the U. S. Public Health Service) in pneumonia due to pneumococcus infections of whatever type.

TOXIC GASES IN MODERN WARFARE

WITH SPECIAL REFERENCE TO DIAGNOSIS AND
TREATMENT

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The idea of employing gases in warfare is, of course, not new. In 360 B. C., the time of the Trojans, resinous woods, sulphur and pitch were employed. Long ago the Chinese availed themselves of the so-called "stink-pots" to choke and nauseate their adversaries. The Turks used "Greek fire" against the crusaders. In more modern times we find General Joubert protesting to General White, during the Anglo-Boer War, because the bursting lyddite shells caused suffocation. In the latter instance the carbon monoxid poisoning was, of course, entirely incidental to combustion and not primarily a method of destruction.

Under the guise of studying industrial intoxications, the Hun had experimented extensively with chlorin, bromin, formaldehyd, nitrous vapor, sulphurous anhydrid, etc., long before the beginning of the present war. The knowledge and experience thus gained was first employed in warfare in April, 1915, when large quantities of cylinder gas were discharged against the Canadians and Turcos at Ypres with such ghastly effect.

Since that time various gases, either simply or in combination, have been employed, nearly all of them being based, so far as their production is concerned, on chlorin or methyl alcohol. Lately, arsenical compounds have also been used.

METHODS OF EMPLOYMENT

1. Cylinder, drift or cloud gas (generally chlorin or phosgen). The gas is discharged from large numbers of big cylinders, generally at night or in the early morning when a steady, properly directed wind, of from 4 to 12 miles an hour, is blowing. The gas is heavier than air, sinks into trenches, dugouts and shell holes, and is unaffected by mist, rain or water courses. Such attacks have been made on a 5-mile front and have produced intoxication at points 6 miles behind the line.

2. Artillery shells. Shells containing gas in a liquid state, and lately also explosive charges to insure dissemination are used for distant ranges. With fifty or more guns firing ten shots a minute, often in salvos,

4. Wayson, N. E., and McCoy, G. W.: The Potency of Antipneumococcus Serum, THE JOURNAL A. M. A., June 8, 1918, pp. 1747-1749.