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**Types of pneumococci found in the mouths of surgical cases before operation.**By **MIRIAM OLMSTEAD.***[From the Bacteriological Laboratory, The Presbyterian Hospital.]*

An investigation of post-operative pneumonia during 1916 and 1917, a report of which has been made by Dr. Whipple,<sup>1</sup> involved a routine search for pneumococci in the mouths of cases admitted to the surgical service of The Presbyterian Hospital.

The method of procedure was as follows: A specimen of sputum or saliva, whatever the patient could expectorate, was received in a sterile jar and sent to the laboratory. The specimen was injected into a mouse and the type of pneumococcus recovered from the mouse was determined by agglutination reactions, testing a pure culture against pneumococcus serum furnished by courtesy of The Rockefeller Institute. When a patient could not expectorate, the throat was swabbed, a culture made from the swab and pneumococci isolated from the culture. After a few months, only expectorated specimens were used, owing to the small percentage of cultures yielding pneumococci. From February to June, 1916, two hundred and forty-nine swab cultures were examined, from forty-three of which pneumococcus was recovered, a percentage of only 17.2. The incidence of pneumococcus in four hundred and twenty-nine expectorated specimens during the same period was one hundred and seventy-five, a percentage of 40.7. If it had been feasible to inoculate a mouse with the washings from a swab immediately after its leaving the mouth, this method of detecting the presence of pneumococcus in the mouth would have been satisfactory; but in consideration of the technique employed it is highly probable that 17.2 per cent. underestimates the number of individuals in that group harboring pneumococci. However, in tabulating the results according to type, these individuals have been included.

Two thousand four hundred and seventy-seven specimens have been examined, two thousand two hundred and twenty-eight

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<sup>1</sup> Whipple, A. O., *Surg. Gyn. and Obstet.*, 1918, XXVI, 29.

of them expectorated specimens, two hundred and forty-nine swabs. Pneumococcus was recovered from seven hundred and ninety-eight specimens, 32.2 per cent. If the unsatisfactory swab group is subtracted, the percentage of positive results for two years is 33.8. In 1916 the annual percentage was 36.4, in 1917, 32.5. The lowest percentage at any time was 20, in November, 1917; the highest was 49, in March, 1916. During both years the percentage was comparatively high from February through June. Eighty-seven out of the two thousand four hundred and seventy-seven cases studied developed post-operative pneumonia. Pneumococcus was recovered from the pre-operative sputum of forty-seven of these eighty-seven cases, a percentage of 54.

The table summarizes the findings according to type.

	Incidence.	Per Cent.
Type I.....	5	.6
Type II.....	10	1.2
Atypical II.....	90	11.2
Type III.....	104	13
Type IV.....	<u>589</u>	73.8
Pneumococcus present.....	798	32.2
Pneumococcus absent.....	<u>1,679</u>	
Total cases.....	2,477	

Some of the Type IV. pneumococci have been classified and all of our twelve groups are represented among them.<sup>2</sup>

A history of contact with a pneumonia case was obtained in only one instance, that of an individual with Type I in the sputum. This was the only member of the Type I group that developed post-operative pneumonia, forming 20 per cent. One with Type II developed post-operative pneumonia, 10 per cent., seven with an Atypical II, 7.7 per cent., nine with Type III, 8.6 per cent., twenty-nine with Type IV, 4.9 per cent. There seems to be no predominance of the virulent types at any one period of the year. Among the Type IV strains, there was great variation in virulence, mice succumbing in from eighteen hours to eight days after inoculation of sputum, the majority within three days.

Dochez and Avery<sup>3</sup> reported finding the pneumococcus in 58.4 per cent. of the mouths of one hundred and thirteen "normal

<sup>2</sup> Olmstead, M. P., *Jour. Immunol.*, 1917, II, 425.

<sup>3</sup> Dochez and Avery, *Jour. Exp. Med.*, 1915, XXII, 105.

individuals." The high percentage may be partly accounted for by the fact that eleven of these had been or were in contact with pneumonia cases of Types I and II. Stillman<sup>1</sup> reported a series of three hundred and ninety-eight "normal individuals," finding pneumococcus in one hundred and seventy-two (43.2 per cent.). The specimens examined by us were not, strictly speaking, from normal mouths; but inasmuch as these cases were in the hospital because of conditions unassociated with respiratory affections, it seems quite fair to compare the results with those reported by Dochez, Avery and Stillman. Stillman's figures contain a greater proportion of Types I, II and III than do ours, but most of the individuals harboring Types I and II were "contacts." In our series, only one of whom was known to be a "contact," the virulent types were relatively uncommon, 73.8 per cent. of the cases harboring Type IV pneumococci. There is apparently a considerable variation in the incidence of pneumococci in the mouths of normal individuals at different seasons, in different years and in different groups, and among the individuals harboring pneumococci considerable variation in the proportion of the four types.

*Summary.*—During 1916 and 1917 pneumococci were recovered from the mouths of 32.2 per cent. of surgical cases before operation. Type I was found in .6 per cent. of the cases harboring pneumococci, Type II in 1.2 per cent., an Atypical II in 11.2 per cent., Type III, in 13 per cent. and Type IV in 73.8 per cent.

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### Renal action in acute nephritis.

By DANA W. ATCHLEY (by invitation).

[From the Coolidge Fellowship and the Medical Clinic, Presbyterian Hospital, Columbia University, New York.]

The clinical discussion of these cases will appear with the functional results in a later paper. In the series are six acute cases and two cases entering the hospital in an acute attack but giving a history of previous renal disease. The phenolsulphonphthalein excretion, the renal test day, the blood urea, the urea index and the chloride index were employed for the functional studies. The

<sup>1</sup> Stillman, E. G., *Jour. Exp. Med.*, 1916, XXIV, 651.