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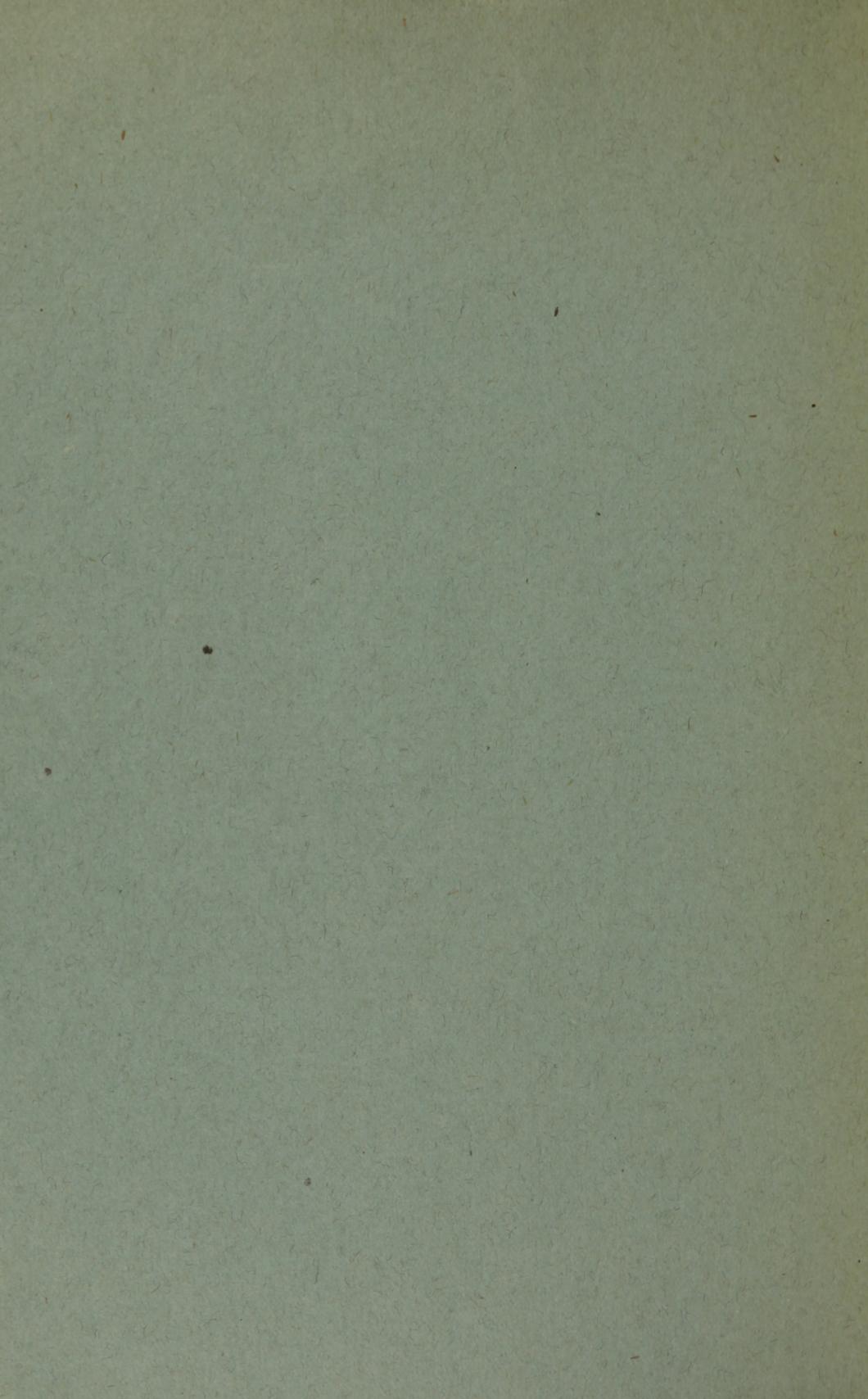
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THE INFLUENZA BACILLUS IN PARANASAL  
SINUS INFECTIONS

By S. J. CROWE AND W. S. THACKER-NEVILLE, Baltimore

*(From the Departments of Surgery and Pathology of The Johns  
Hopkins Medical School.)*



## THE INFLUENZA BACILLUS IN PARANASAL SINUS INFECTIONS

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There is some difference of opinion as to the nature of the [322]  
organism primarily responsible for the influenzal epidemic  
of 1918-1919. Pfeiffer's bacillus was found in a sufficient  
number of cases to raise the question as to whether it was  
the primary agent, or, like the streptococcus and pneumococ-  
cus, a secondary invader.

We were interested to determine whether or not this bacil-  
lus occurred more frequently in a series of infected nasal  
sinuses observed immediately following the epidemic, than  
in a series of such cases observed during a period when there  
was no epidemic. During the height of the epidemic in Balti-  
more, it was impossible, owing to the press of work, and the  
scarcity of skilled help, to make bacteriological examinations  
of the infected sinuses. Within six weeks after the epidemic  
had subsided, however, one of us (Neville) undertook a care-  
ful bacteriological study of every case of maxillary sinus  
infection treated at The Johns Hopkins Hospital. We limited  
our study to the maxillary sinus, because this cavity is the  
one most frequently affected, and because the material for [323]  
culture can be obtained from this situation with less risk of  
contamination than from the ethmoidal, frontal or sphenoidal  
cells.

We present for comparison two series of cases. The first  
series of seventy includes every case of accessory nasal sinus  
infection treated at The Johns Hopkins Hospital during the  
years 1912-1918, in which we have a report on the cultures

[323] made from the antrum.\* Of these 70 observations, made during a period when there was no epidemic of influenza, we have 15 cases in which the influenza bacillus was found in the antrum. The 30 cases of the second series were all observed during February, March and April of 1919. In eight of these cases we found *B. influenzae* in the antrum. It is of interest that the percentage of cases in which the influenza bacillus was found in the antrum is about the same in each group.

The material for culture is obtained by a very simple method. A small piece of cotton on the end of a steel applicator is moistened with a 20 per cent solution of cocaine and 1:1000 adrenalin. The excess of cocaine is removed by pressing the cotton between two layers of gauze; this will insure against symptoms of cocaine poisoning. A small piece of cotton moistened with cocaine and adrenalin is also placed between the anterior end of the inferior turbinate and the septum, and both are left in place for ten or fifteen minutes. A curved trochar, a small rubber ear syringe, a nasal speculum and a finger bowl are then boiled for at least five minutes. The patient's nose is cleansed of all visible discharge. The trochar is passed under the anterior end of the inferior turbinate into the antrum, and the stilette removed. The patient bends 90° forward, and often the pus will drop from the cannula. If not, air or a few drops of sterile salt solution are blown into the antrum with the rubber syringe, and the material returning through the cannula is caught in a sterile test-tube. It is important that enough adrenalin be used to make the procedure absolutely bloodless, for we have found, in agreement with Rivers, that a few drops of blood mixed with the material obtained for culture will inhibit the growth of the influenza bacillus.<sup>1</sup>

The bacteriological technique employed is as follows: The material is plated immediately on agar containing defibri-

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\* It was formerly our custom to take cultures from infected sinuses (chiefly at operation) on cotton swabs. These swabs were sent to the regular bacteriological laboratory of the hospital but had often completely dried up before reaching the laboratory. This accounts for the comparatively small number in which we have a bacteriological report.

nated rabbit's blood, and the plates are incubated at 37° C. [323] for twenty-four hours. The various colonies are then examined in stained smears and transferred to blood-agar slants. After twenty-four hours the colonies showing the cultural characteristics of the streptococcus and pneumococcus are differentiated by Neufeld's bile soluble test. The pneumococci are grouped according to the method of Avery, Chickering, Cole and Dochez.<sup>2</sup> The serum used was obtained from the Rockefeller Institute. The influenza bacillus grows freely on blood-agar but not at all on plain agar. This differentiates it from the micrococcus catarrhalis. This latter organism may be differentiated from other gram-negative cocci by the use of Hiss's serum sugar media, and the Elser and Huntoon classification.

In the first series of 70 cases observed during the period from 1912 to 1918, the influenza bacillus was found in the antrum in 15 cases (21 per cent). The streptococcus was found in 33 cases (47 per cent); in 10 of these the organism was hæmolytic. The pneumococcus occurred 12 times (17 per cent). The staphylococcus was found in 16 cases (22 per cent), in one of which it was hæmolytic; the proteus was found once; and the diphtheria bacillus twice.

In the second series of 30 cases observed during the three months immediately following the subsidence of the influenzal epidemic, the influenza bacillus was found in the antrum in eight cases (26 per cent). The streptococcus was again the predominating organism (14 cases, or 46 per cent); of these 14 cases, in four it was hæmolytic. The following organisms were occasionally found: the hæmolytic staphylococcus in four cases, the pneumococcus in three cases, the micrococcus catarrhalis in two cases, and a gram-negative diphtheroid bacillus in three cases. The diphtheria bacillus was found in one case, the bacillus lactis aërogenes once, and the proteus vulgaris in two cases.

The influenza bacillus was recovered from the antrum in pure culture in four cases. In four other cases it was found associated with other organisms: streptococcus hæmolyticus, streptococcus mucosus, micrococcus catarrhalis, micrococcus tetragenus, and the staphylococcus albus. The hæmolytic

[323] staphylococcus occurred four times, once in pure culture. The staphylococcus albus was found in eight cases, but was probably in each case a contamination from the nasal cavity.† The pneumococcus was recovered in three cases (in two Type III and in one Type IV), twice in pure culture, once mixed with a staphylococcus albus.

[324]

#### CONCLUSIONS

1. The influenza bacillus was found in infected maxillary sinuses in practically the same percentage (21 per cent) in a series of cases observed during a period of six years when there was no epidemic, as in a second series observed immediately following the epidemic in Baltimore during the winter of 1918-1919 (26 per cent).

2. The influenza bacillus is not infrequently found in pure culture in the antrum.

3. Clinically *B. influenzae* is a pyogenic organism.

4. The predominating organism in all antrum infections is the streptococcus.

5. We infer from these observations that the influenza bacillus, like the streptococcus and pneumococcus, is a secondary

[323] † The healthy nasal cavity is apparently a normal habitat for the staphylococcus albus. We took cultures from the middle turbinate in seven individuals with clinically normal nasal cavities. A little mucus was obtained from the middle turbinate with a platinum loop and implanted on plates of rabbit blood-agar. We found: staphylococcus albus 91 per cent; diphtheroids, 41 per cent; pneumococcus, Type IV, 16 per cent; micrococcus catarrhalis, 8.9 per cent.

Park and Wright, in 1898, took cultures with a platinum loop from far back in the nose and showed that the nasal secretion has no bactericidal action. Of 36 examinations only six were sterile. The predominating organism was the staphylococcus.

Hasslauer<sup>3</sup> in 1902, made bacteriological examinations from the normal nasal cavities of 111 individuals. He found: staphylococcus in 25 per cent; pneumococcus in 20 per cent; streptococcus in 17 per cent; diphtheroid in 13 per cent.

He also investigated the bacteriological content of the nasal discharge in 78 cases with a coryza and found much the same varieties of organisms in both healthy and pathological nasal cavities. The only difference was that they were far more numerous in infected nasal cavities.

invader, and not the primary cause of the disease known as [324] influenza.

#### LITERATURE

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