

# BACTERIOLOGIC STUDIES OF THE UPPER RESPIRATORY PASSAGES

## III. THE INFLUENZA BACILLI (PFEIFFER) OF THE ADENOIDS AND TONSILS

I. PILOT AND S. J. PEARLMAN

*From the Department of Pathology and Bacteriology, University of Illinois, College of Medicine, Chicago*

Influenza bacilli have frequently been cultivated from the throat and sputum both from normal persons and from patients affected with various respiratory diseases. The incidence in normal persons varies somewhat according to different observers. Thus, in 1907 Davis<sup>1</sup> noted the organisms in 2 of 20 normal throats (10%). More recently Pritchett and Stillman<sup>2</sup> found the bacilli in 42% of 177 normal persons, and in school girls and boys of an orphan asylum, Winchell and Stillman<sup>3</sup> noted them in 25% to 39%. Opie and associates<sup>4</sup> give the incidence of Pfeiffer bacilli in from 24% to 35.1% of healthy soldiers. Lord<sup>5</sup> obtained the organism in as high as 76% of the swab cultures of 34 normal young men, while Jordon<sup>6</sup> recovered them in 40% of normal throats. From well children most of whom were under 2 years of age Wollstein and Spence<sup>7</sup> state that the bacilli occurred in 10% of 266. All of these figures were based on studies of the saliva or swab cultures of the pharynx and occasionally of the nasopharynx.

In previous studies of the extirpated tonsils and adenoids it was indicated that occasionally direct cultures of these structures would reveal hemolytic streptococci which were apparently too few on the surface to be recovered in the swab cultures of the same persons. To determine more accurately the frequency of the influenza bacillus in the oro- and naso-pharynx the excised tonsils and adenoids were cultivated with special reference to this organism. The material consisted of adenoids and tonsils consisting of lymphoid tissue revealing varying

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<sup>1</sup> Jour. Am. Med. Assn., 1907, 48, p. 1563.

<sup>2</sup> Jour. Exper. Med., 1919, 29, p. 259.

<sup>3</sup> Ibid., 1919, 30, p. 497.

<sup>4</sup> Jour. Am. Med. Assn., 1919, 72, p. 108.

<sup>5</sup> Ibid., p. 188.

<sup>6</sup> Ibid., p. 1542.

<sup>7</sup> Am. Jour. Dis. Child., 1920, 19, p. 459.

degrees of hyperplasia but no other marked pathologic change. The patients were children who presented no acute evidences of sore throat or any elevation of normal temperature. The age varied from 5 to 16 years, and the patients had had their tonsils and adenoids removed during the months of April, May, June and July, 1920. In 25 instances naso-pharyngeal swabs were made by means of the West tube immediately before the operation. Altogether cultures were made from the adenoids and tonsils from each of 115 persons.

The material was collected in sterile gauze and cultures were made within 4 hours after removal. Cultures were made from the surface of the adenoids and from depths between the folds and cryptlike slits which frequently occur in their structure. The tonsils were incised with a sterile knife transversely to the long axis of the crypts and cultures made from the bottom of the crypts. Ten per cent. blood agar for pouring into Petri dishes were inoculated, as well as the surface of blood-agar plates. Additional cultures were made on the so-called chocolate medium consisting of infusion agar to which defibrinated human blood was added in 5% proportion and the whole heated at 90 C. for 5 minutes.

On the chocolate plates the influenza bacilli occurred in the cultures of the adenoids in 47 instances or 40.9% and of the tonsils in 62 or 53.9%. In the nasopharyngeal swabs they were found in 10 or 40%. In each instance in which the bacilli appeared in the adenoids they were also recovered from the tonsils. From the depths of the adenoid folds the organism was isolated in one instance but did not grow out on the cultures of the surface or the nasopharyngeal swab. The brown plates frequently revealed these organisms in large numbers growing as gray, often flat, colonies of variable size, not infrequently being the predominating bacterium on this special medium. On the streaked and poured blood-agar plates the bacilli grew as small translucent dewdrop-like colonies occasionally showing strikingly the tendency to grow in clusters immediately around other colonies observed most readily in the zones of hemolysis of the *Streptococcus hemolyticus*. This symbiotic tendency was seen only when the influenza bacilli occurred in relatively large numbers, for in many instances a few transparent colonies revealing gram-negative pleomorphic bacilli were observed without this tendency. In several instances the bacilli were apparently absent on the fresh blood agar, while they were present in few or even moderate numbers on the heated blood medium.

The bacilli appeared as gram-negative small rods, some strains showing a uniform size, and a few exhibited an extreme tendency toward larger and thread-like forms, while several displayed coccoid forms. Pure cultures, isolated on chocolate-agar slants, revealed apparently more marked pleomorphism. Each strain was inoculated on a plain infusion-agar slant, and in no instance did growth occur. They were further studied by inoculating the entire surface of a fresh unheated blood-agar slant on which another organism like the staphylococcus albus was subsequently streaked linearly. In each instance the influenza bacilli grew as small dew-drop colonies which were largest and most numerous immediately adjacent to the linear streak of the foreign organism demonstrating the property of symbiosis so characteristic of the Pfeiffer bacillus.

THE INCIDENCE OF INFLUENZA BACILLUS (PFEIFFER) IN THE CULTURES OF NASOPHARYNGEAL SWABS, ADENOIDS AND TONSILS

	Number of Persons	Percentage Positive
Series I. Swabs.....	25	40.0
Adenoids.....	25	44.4
Tonsils.....	25	48.0
Series II. Adenoids.....	90	38.8
Tonsils.....	90	55.5
Total number of adenoids from which cultures were made.....	115	40.9
Total number of tonsils from which cultures were made.....	115	53.9

It is interesting to observe that the influenza bacilli occurred more often in the crypts of the tonsils and the crypt-like structures of the adenoids than in the nasopharyngeal swabs or cultures from the surface or folds of the adenoids. The organisms were also inclined to be decidedly more numerous in the depths of these structures than on the surface. In these respects the Pfeiffer bacillus resembles the streptococcus hemolyticus, illustrating the rôle played by the lymphoid structures of the oro- and naso-pharynx in furnishing foci in which dangerous bacteria flourish.

#### SUMMARY

Gram-negative, pleomorphic, hemoglobinophilic bacilli, showing a preference for heated blood agar and revealing the characteristic prop-

erty of symbiosis, were isolated and identified in 40.9% of extirpated adenoids and in 53.9% of the excised tonsils from 115 persons. In the nasopharynx they were present in 40% of 25 persons and in fewer numbers.

The tonsils and adenoids therefore are foci in which influenza bacilli (Pfeiffer) commonly flourish.