

## IV. CASES NOT YIELDING TRYPTOPHAN REACTION

None of the cases in this group gave the tryptophan reaction. The tryptophan test was repeated several times in many cases. The gastric contents from all these cases had free hydrochloric acid.

Six cases of hyperacidity.

Three cases of chronic gastric ulcer.

Five cases of neurasthenia.

One case of contraction of gastro-enterostomic orifice four years after operation. Marked stasis of food. Dilated stomach.

One case of arteriosclerosis.

One case of hypernephroma. Patient died.

Three cases of gastric atony, with marked stasis of food.

Two cases of gastroparesis.

One case of enlarged gall-bladder, probably due to calculi.

One case of chronic constipation.

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A STUDY OF THE BACTERIAL FLORA OF  
THE NASAL MUCOSA IN THE  
PRESENCE OF RHINITIS\*

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This study represents an effort, extending over about two years, to learn something of the bacterial flora of the upper respiratory tract in the presence of disease. The purpose was to ascertain, first, whether the flora in our territory are comparable to regions where such investigations have been made, namely, in various parts of England and in Germany; secondly, to uncover, if possible, the etiologic factors in infections of the mucosa of this tract. Most of these infections are more serious in their final results than they are usually considered. They may not only be the precursors of diseased adnexa, of cervical adenitis,\* often of meningitis, but, by the absorption of formed toxins, they are worthy of consideration for the part played in hemic and vascular disorders leading to arterial hypertension and its sequelae.

These are, fundamentally, infections which are peculiar to the mucous surfaces and, of course, must vary according to the environment, habits and social status of the infected subjects.

Only infections of the nasal mucosa are reported here. Detailed reports on specific bacteria will cover the other regions.

## CHARACTER OF THE RESEARCH

In this study endogenous diseases are not considered, only ectogenous bacterial invasion. The whole study includes examinations of about 250 cases of diseases of the upper respiratory tract, including a number of ear infections which presuppose postnasal infection, a considerable number of tracheal infections and a limited number from the polybacterial pharynx. Out of this research are taken 100 cases of nasal infection, listed in order of record, and these include a few cases of pernasal secretion from sinusitis.<sup>1</sup>

\* Read in the Section on Laryngology and Otology of the American Medical Association, at the Sixty-first Annual Session, held at St. Louis, June, 1910.

1. I must acknowledge my great obligation to the following individuals: Aaron Arkin, who carried through the cultures of the first series of sixty-four cases in the bacterial laboratory of the University of Chicago through the courtesy of Professor Jordan; Dr. Mary C. Lincoln, who carried through the second series of fifty cases and has critically examined the whole list; and my assistant, Miss Copeland, who with me has worked out the third series of 130 cases. I am also indebted to men in the laboratory of Wright and Douglas at St. Mary's, London, and to Dr. Allen of London, for confirmation of my findings in the probably most frequent causal factor—the *Bacillus segmentatus* of Cautley—and for courtesies extended by them. Without the cooperation of all these people it would not have been possible to carry out so thoroughly such a number of examinations in the time of the research.

The whole series represents a greater number of diseases than of individuals, and this discrepancy between diseases and persons infected is due to a fact to which I shall later call attention more specifically, namely, the fact that it is not unusual to find coincident infection on different areas of the upper respiratory tract caused by distinct bacteria on the respective areas involved. The fact that bacteria grow with varying degrees of rapidity and virulence is, of course, well known, but it becomes a matter of importance, (from the therapeutic side), to appreciate the possibility of this contemporaneous infection of different regions.

This locally variable susceptibility is probably due to three conditions: (1) the variation in culture media offered by the locality; (2) the variation in virulence in the respective regions, depending, doubtless, on specific local resistance to invasion; (3) the lowering of bacteriostatic pressure in reflexly related regions through stasis, the evolution of disease in one locality producing the lowered resistance in a region closely associated with it. As to regional variation, we know the proclivity for multiplication of the gonococcus on the mucosa of the urethra and of the conjunctiva, but it is rarely found growing on the upper respiratory tract. On the other hand, the pneumococcus has an adaptive habit which enables it to grow fairly well on the conjunctiva, well in the nose, ear and pharynx, and luxuriantly on the pulmonary mucosa, and even on the bloodstream itself; but it is not equally virulent in all sites *in vivo*, and is most selective as to its growth *in vitro*. So, as will be seen from the findings, the bacteria vary greatly in their selection of surface on which to grow.

## METHODS OF THE RESEARCH

Film preparations were made from the secretions taken by platinum loop, if plentiful, or by sterile swabs, if scant, and fixed in flame. For cultures a platinum loop sterilized in flame was introduced directly on the area involved in the inflammatory reaction. This method was used for all inoculations and, acting on the advice of the English workers in this field, they were made on Loeffler's blood-serum mixture which, as will be seen later, is probably not altogether reliable in fulfilling the possibilities of development for many of the organisms. They were all stained by Gram's method. In the presence of diverse colonies, subcultures were made and, from pure cultures obtained, cultural tests were carried out.

The method of obtaining materials differs from that employed by some of the English and German investigators and is more reliable, since some of them have depended on secretion blown from the nostrils, which is almost certain to be contaminated by the ever-present cocci in the skin and hairs of the interior nares, and unless special care is taken, mixes the secretions from the two nares. If the secretion is abundant, it is, of course, possible to wash the larger masses thoroughly and to obtain from them uncontaminated material, but in the beginning of acute infections, when there is only watery secretion, it is difficult to get such masses.

The method of blowing the material from both nostrils would be inaccurate in many cases, for there is abundant evidence that the two sides of the noses may vary as to their bacterial content, particularly in early stages of infection. It is even possible to have acute rhinitis on both sides caused by distinct organisms. In one case there was an acute febrile attack starting on the left side of the throat, passing to the left nostril and

Rhinitis———  
Sinusitis——Pyogenic Cocci——  
——Diphtheroids——

Chronologic No. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

into the left frontal and, possibly, anterior ethmoidal cells, with the coincident development of frontal sinusitis on the right side, but with a different organism present. In this instance, it seemed that the bacterial infection on the left side did not pass to the right side at all, but so lowered the resistance through reflex vascular stasis that a latent infection became manifest on the right side. I judge this from the accidental fact that we had made a culture from the right frontal sinus a few weeks previously, which was also predominant in this finding. In this case our technic proved valuable and the evidence was incontrovertible, presenting the interesting feature of a patient suffering constitutional symptoms from pneumococcus infection on the left side and the local pressure symptoms from a staphylococcus on the right side. Instances might be multiplied, showing the fallibility of diagnosing the infection from specimens from areas other than those involved in inflammatory reaction, and justifying the technic employed. Coincident infection of the trachea by *Micrococcus catarrhalis* with rhinopharyngeal infection showing Cautley's bacillus, has been observed several times.

Table 1 represents the 100 cases of nasal infection. The acute on chronic and acute on subacute are considered as acute infections, but they will also show among the subacute and chronic cases of rhinitis though counted but once. The number of acute cases are therefore sixty-four. There are thirty-four subacute and eleven chronic; five cases of acute sinusitis and nine cases of chronic sinusitis.

This table presents some interesting and instructive features. The number of cases and specimens examined is greater than the combined reports of the English observers, and differs in results from some and, in percentages, from all. Many bacteria are present accidentally and not in a casual way.

In Table 2 the bacteria are arranged by groups taken in the order of percentage of finding.

The three varieties of staphylococcus, *S. albus*, *S. citreus* and *S. aureus*, are listed separately, making a total of fifty-six cases, indicating a presence of these pus cocci in 56 per cent. of all cases of infection studied; other cocci added bring the total to 73 per cent. Lewis and Turner<sup>2</sup> made a study of twenty-six specimens from normal noses, disclosing pus cocci in 50 per cent.; but the most notable extended studies are those by Hesslauer<sup>3</sup> covering 186 specimens from the normal in which staphylococci are present in 25 per cent., and by Neumann<sup>4</sup> covering 206 cases, which showed the presence of *S. albus* in 98 per cent., *S. aureus* in 30 per cent. and *S. citreus* in 12 per cent.

Our percentage of staphylococci in infected cases is probably relatively very high. In some of these cases they seem to be the only organism present. The evidence of German and English observers is, however, against the probability of primary infection by them; they are almost universally considered as secondary invaders. Workers in the field of the conjunctiva have found it very difficult to grow staphylococci on the conjunctiva, while as to the study of staphylococcus infection in otitis there seems to be a great lack of agree-

2. *Edinburgh Med. Jour.*, November, 1905, p. 393.
3. *Centralbl. f. Bakt. Orig.*, 1903, xxxiii, 47.
4. *Ztschr. f. Hyg.*, 1902, xl, 33.

ment, such men as Pes and Gradenigo<sup>6</sup> maintaining that they are always secondary invaders, while Zaufal and Roskin<sup>7</sup> feel that they may replace the primary exciting bacteria and a few assert that primary infection by staphylococci is possible.

It would seem that time must be allowed for the better differentiation of this group. While in some of these cases they seem to be the only possible causal organism, such a case as 74, pneumococcus infection, might easily have been laid at the door of staphylococcus, since staphylococci were present on the first day of the attack, no pneumococci being recovered from the secretion. At the end of a week, during which time the boy was not seen and had been very ill with typical pneumonia rhinitis, the smears and cultures showed pure culture of pneumococci. A few days later, staphylococci again appeared in the secretions and the pneumococcus disappeared.

Several cases showing pure culture of staphylococci in very red pharynges, and a few ear cases, in which the staphylococci were the only demonstrable agents in the attack, have been observed. It is only lately that we have been testing the liquefying reaction of the staphylococci and, in all cases observed in this regard, we have

the cases in which they are present alone, that is, twenty-four times. Probably in these cases they are secondary to irritation other than bacterial, and possibly many would prove like Case 74, should repeated examinations be made. We are not considering the frequently occurring furuncles in the nasal vestibule. These are indisputably due to staphylococci and usually—possibly always—the aurens.

#### *The Diphtheria Group—Bacillus Segmentosus of Cautley*

The second in percentage order of occurrence 35 per cent., the *Bacillus segmentosus*, is worthy of special consideration, but time is not available for it. A detailed description of this interesting organism will follow.

Though discovered by Cautley,<sup>8</sup> working under the local government board of London, in 1893, and investigated since by Gordon,<sup>9</sup> by Prosser-White,<sup>10</sup> by Benham<sup>11</sup> and by Allen,<sup>12</sup> and commonly known in England under the name of *Bacillus septus*, it is almost unknown in our literature. I had noted its presence for several years and had it reported by laboratories as "diphtheroids," "Gram-positive diplococci," etc., but

TABLE 2.—ETIOLOGIC SUMMARY \*

Classes of Organisms.	Variety.	Per Cent.	Acute.	Acute.	Acute.	Acute.	Chronic.
			Probably Alone Causal.	Probably Causal, But Not Alone.	Total Probably Causal.	Possibly Causal.	Probably Alone Causal.
Pyogenic cocci:—							
	Staphylococci	50					
	Giant micrococci Gram-positive	12					
	Streptococci	5					
		73	0	..	0	24	0
Diphtheroids:—							
	Segmentosus	35					
	Unclassified	5					
	Yellow bac.†	4					
	Brown bac.†	1					
	Salmon bac.†	1					
		46	22	19	41	0	0
<i>Micrococcus catarrhalis</i>		20	7	13	20	0	0
<i>B. mucosus capsulatus</i> (Friedlander)		7	0	0	0	2	5
<i>Pneumococcus</i> (Fraenkel)		7	7	0	..	0	0
No growth		4	0	0	..	0	0
Diplococci—unclassified Gram-positive and Gram-negative		6	0	0	..	3	..
<i>Pyocyanus</i>		3	0	0	..	1	2
Influenza "Beta"		2	1	1	2	0	0
Gram-positive streptobacilli		3	0	0	..	0	0
Miscellaneous organisms		10	0	0	..	0	0

\* Based on conclusions of literature and my own clinical and bacteriologic observations.

† Named from color of growth on blood-serum; classified by morphology.

found the liquefiers to be associated with the more acute inflammatory reaction. This is in accord with the final conclusions of Axenfeld<sup>7</sup> and others who have studied this group, namely, that the liquefying staphylococci are the virulent ones and that most of the others are harmless.

If staphylococci invade the mucosa in a secondary way, it would seem that they do so because the primary infectors produce local injury to the mucosa, in like manner that staphylococci invade the skin following local irritation and lowering of resistance. In that event it is pertinent to inquire why they may not cause rhinitis, if present on the mucosa when it is injured by foreign bodies, as dust, or by chemical or thermal irritation. If we conclude that they are mostly of secondary occurrence, but that they may be secondary to other irritants than bacterial, then they could not be said to occur in epidemic form, and would be atypical clinically. Such seems indeed to be the case.

In the light, however, of this great preponderance of opinion against their primary invasion, we can not consider them as probable factors in starting the inflammation, but as secondary. I call them "possibly causal" in

could not identify it positively; I failed to ascertain anything of it from bacteriologists in this country and did not appreciate what I had, until Allen described it in 1908. On a visit to London last year I submitted my slides to Allen and to men in the Wright and Douglas laboratory, who confirmed the finding. So what I here report is known through England as the *Bacillus septus* (Cautley's bacillus).

It is a diphtheroid, Gram-positive bacillus, club-shaped, with rounded ends 0.2 or 0.3 by 0.5 microns. Its chief morphologic characteristic is the segmentation or barring due to an unstained septum, which caused Cautley to give it the name of *Bacillus coryzae segmentosus*—coryza because he thought it to be the cause of the coryza of epidemic influenza.

Prosser-White found it in all of seven cases, Benham in twenty-five of twenty-seven and Allen in eleven of forty-two cases of acute rhinitis. It was not alone in these cases, but apparently predominant and was thought causal. My percentage is not so high as Cautley's, Prosser-White's or Benham's, but it is higher than Allen's, and this, as will be brought out in a later specific report

8. London Local Govt. Rep., 1894-95.

9. London Local Govt. Rep., 1901-02.

10. London Local Soc. Rep.

11. Brit. Med. Jour., May 6, 1906, p. 1023.

12. Lancet, London, November, 1908, p. 1591.

5. Arch. f. Ohrenh., xxxviii.

6. Politzer: Diseases of the Ear, p. 373.

7. Axenfeld-MacNab: Bacteriology of the Eye, p. 231.

on the organism, may be accounted for by the fact that all but Allen's studies were taken from epidemic periods. Allen's was part of a research covering four years, and mine, a greater number of cases than all of the others combined, also covered a longer period and may thus be inclusive of epidemics. Attention is also called to the fact that Benham's 90 per cent. occurred in the months of November and December and in mine, if the occurrence in autumn months were taken out, a high percentage would be obtained, that is, in epidemic form. It is also interesting to note that, during the past two months (spring), we have not obtained from any of the many cultures in acute rhinitis a single specimen of *B. segmentosus*, though we have tried every case for it in hopes of showing a fresh culture for inspection. It seems from these facts that possibly this bacillus is epidemic in the autumn months.

The addition to this list of twenty-five or thirty new cases, worked out since this report was closed, would alter the percentages, adding materially to the next-mentioned organism, *Micrococcus catarrhalis*, fifteen or twenty, and to a new tiny diplococcus, Gram-negative and so far unclassified, eight or ten cases, thus reducing the preponderance of *B. segmentosus*.

The evidence is much in favor of the *Bacillus segmentosus* as a primarily etiologic organism in rhinitis. As to its being a distinct bacteriologic organism, however, there is some doubt, since its margin of differentiation<sup>13</sup> from the *Bacillus xerosis* and the *Bacillus septatus* of Gelpke,<sup>14</sup> both of which are innocuous to the conjunctiva, is small and both may be identical therewith. From secretions it is a slow grower, sometimes appearing only after three days; it does not liquefy gelatin and it grows in discrete colonies with serrated edges. In subcultures it grows more rapidly and coalesces.

Clinically it is quite characteristic, starting nearly always in the throat after a few hours' incubation, and passing to the nose. It has been recovered five times from the ear in twenty-six cases of acute otitis; it was found in one case of sinusitis and has persisted for over a year with *Mucosus capsulatus*—seventeen cases examined—and was obtained three times from cough cultures; so that it may be said to have a strong predilection for the nasal mucosa, where it develops an acute reaction, typical rhinitis, with little or no tendency to chronicity. Counting out the cocci and other organisms known not to be causal in coryza, it may be said to be the only causal organism present in 19 per cent. of cases examined, occurring also eleven times with *Micrococcus catarrhalis* and five times with other possible causal bacteria.

The other diphtheroids are few numerically, but some of them are severe in their manifestations; one, Case 78, not reported in this list, in which was found the yellow bacillus like that in Cases 79, 92, 100 and 104, all severe, produced the most nearly fatal rhinitis and otitis I have seen, with temperature range from 106 to 96. This case I intend to report specifically.

#### *Micrococcus Catarrhalis*

This Gram-negative coccus is misnamed, because it is wrong to convey such an impression of mild and benign character as is given by such a name. In some ways it seems the most dangerously infectious of all the bacteria, because of its prevalence, its capacity for wide-spread growth on the mucosa, its recently proved ability to cause

meningitis, its clearly infectious character and the frequently caused painless otitis media caused by it.

It is noted in 20 per cent. of rhinitis and may be considered as alone causal in 8 per cent. Noted epidemiologically since the closing of this report, that is, in the months of April and May just passed, this percentage would be about 60 and the addition of these last cases to our list of 100 would increase its presence alone from 8 per cent. to 18 per cent. In the whole research its presence is noted in thirteen cases of throat and trachea and seven cases of suppurative otitis. In symbiosis with the *Bacillus segmentosus* there seems to be an exaltation of virulence.

When found in otitis media suppurativa in pure culture it has produced less pain and has undergone resolution following paracentesis more quickly than any other infection that has come to my notice. In the ear it is quite likely to abort.

There is not much in the literature on the subject of this organism. We have been able to differentiate several strains of quite characteristic action and reaction, but into that I am not prepared to enter at this time. Attention may be called in passing to its morphologic and, in some strains, culture similarity to the meningococcus on one side and the gonococcus on the other.

I believe that there has been an epidemic of *Micrococcus catarrhalis* infection in Chicago this winter and spring. In the winter epidemic and in tracheal infection generally it seems most persistent, but in this spring's epidemic (not reported here) it has been mild and self-limited. Some of the series we have encountered since this report culture differently and may prove to be another organism of the same group.

Lastly, attention is again called to its recovery post mortem from an increasing number of cases of meningitis and to the fact that its proneness to cause slight subjective disturbance may account for many an obscure case of meningitis of nasal or aural genesis.

#### *Bacillus Mucosus Capsulatus* (Friedlander's *Pneumobacillus*)

It has been a matter of surprise to note almost complete absence of this organism in acute infections, because I was prejudiced in favor of its finding in the beginning of the study. None of the observers whom I have quoted, however, with the exception of Allen, have found it in the epidemic investigated. If I had not spent some time in Allen's laboratory and become familiar with his method of working, and if I did not know his thoroughness as a bacteriologist, I would doubt the possibility of its causing acute rhinitis, since we have found it present so rarely and then, with two possible exceptions, confined to chronic cases. Allen reports Friedlander in thirteen of his forty-two cases, but by his table it may be considered as alone causal of acute rhinitis only in six cases, or 14 per cent., as against Von Besser's<sup>15</sup> 2.5 per cent. and Lewis and Turner<sup>2</sup> 4 per cent. for normal noses.

Attention is called to the fact that authorities have come to consider the *ozena bacillus*<sup>16</sup> of Lowenberg and Abel<sup>17</sup> as identical<sup>18</sup> with the *pneumobacillus* of Friedlander, since they are alike morphologically, in staining reaction, and in nearly all of their cultural peculiarities as well as their pathogenicity for animals. In four of my cases the diagnosis of *ozena* would properly be made;

15. Beitr. z. path. Anat. u. z. allg. path., 1889, vi, 33.

16. Jordan: General Bacteriology, p. 252.

17. Wassermann-Kolle's Handbuch, 1903, III, 870.

18. Axenfeld-MacNab: Bacteriology of the Eye, p. 242.

13. Axenfeld-MacNab: Bacteriology of the Eye, p. 29.

14. Arch. f. Ophth. (Graefe's), 1896, xlii, 97.

two of them were seen by other men and were so diagnosed. I reported it as possibly causal in two acute cases.

#### *Pneumococcus—Fraenkel*

None of the articles quoted in this report mention the finding of the pneumococcus in acute rhinitis, which seems rather remarkable, particularly for Allen's research, which covered four years and would, one would imagine, report some findings. Hesslauer<sup>3</sup> gives the enormous percentage of 49.7 and R. O. Neumann<sup>4</sup> 22 per cent. for abnormal noses, but neither states what sort of cases he reports. It is certainly a very frequent cause of acute infection in this climate. Pneumococcus infection in the eye is quite common and it acts like my reported Case 137, in that as soon as the pneumococcus disappears the staphylococci become more obvious, appearing in large numbers.

Patients with this infection are severely ill. These cases constitute many of those which are diagnosed as grip. Especially is it noteworthy, though I have not seen it mentioned anywhere, that these infections frequently terminate by crisis. I believe that Axenfeld noted it in relation to pneumococcus eye infections, but the reference is mislaid.

Several instances have been observed in which typical pneumonia temperature range was exhibited without, so far as could be ascertained, any pulmonary involvement. This is an intensely interesting observation and is recommended for consideration.

Attention is also called to the fact that, in all cases in which pneumococcus is present, it is in pure culture, barring a notation I have already made, that staphylococci precede and follow its activity. These observations have raised many interesting points that may not be entered into at this time.

#### *Bacillus Pyocyaneus*

I have seen no mention of pyocyaneus in relation to nasal infection. It must be very rare, and English confrères with whom I talked are of the opinion that it probably grows in structures deeper than the mucous membrane.

#### *Morax-Axenfeld and Koch-Weeks Bacilli*

Morax-Axenfeld and Koch-Weeks bacilli have been very commonly observed by others, but I have seen them only the three times mentioned.

#### *Influenza "Beta" Bacillus*

The influenza "beta" bacillus presents many points of interest. I call it influenza "beta" because it is not the influenza bacillus, but belongs to this group. It should have more extended study.

The other organisms are probably of accidental occurrence and not worthy of note.

#### *Influenza Bacillus—Possibility of Failure*

It is especially interesting to call attention to the fact that in 250 cases examined the influenza bacillus has not been encountered once, nor was it noted by any of the English observers whose reports go back several years, except in an epidemic on the Riviera, in which the pneumococcus is reported as causal with *B. influenzae*, *M. catarrhalis* and *paratetrigenus*. This is surprising in view of the fact that diagnosis of grip colds have been made daily from clinical manifestations by physicians and specialists all over the country these years.

I report in this series four specimens in which no growth occurred and from whose smears no diagnosis could be made. This reveals the fact of the possibility of error in this research to which I previously called attention, namely, the fact that all cultures were made on Loeffler's blood-serum mixture.

It is pretty generally understood among experts on the subject that the influenza organism grows poorly on blood-serum unless some hemoglobin be present and, although there have been no cases which could clinically be adjudged influenza, it is possible that, had we used hemoglobin containing media for the influenza group (so-called hemophile pole bacteria) which grow with certainty only on them, we should be more certain as to the occurrence of influenza.

In like manner errors may have occurred with relation to the pneumococcus, although it is much more easily recovered from smears, had we used some such formula as that of Wertheim, on which organisms such as gonococcus and pneumococcus and Koch-Weeks bacillus grow best. It is also possible that better results might be obtained for the *Micrococcus catarrhalis* with the so-called nasgar mixture recommended by Wasserman.

These various media we may employ for future research.

No such objection may by any possibility obtain as to the limited finding of pneumobacillus of Friedlander, for on blood-serum it will outgrow any organism known to us, colonies growing to the size of a silver quarter while the *B. segmentosus* is grown to pin-point.

#### CONCLUSIONS FROM THE RESEARCH

The evidence seems indicative that the diphtheroids, particularly *Bacillus segmentosus* of Cautley, are concerned in the production of so-called common cold in its typical manifestation in the nose, and there is much evidence that it occurs in epidemic form.

The *Micrococcus catarrhalis* is much more general in its manifestation, and is, probably, also epidemic and productive of a rather more severe inflammation, though mild epidemics occur.

It seems likely that the symbiosis of these two organisms increases the virulence.

The pneumobacillus of Friedlander is much more concerned in chronic conditions and is probably identical with the ozena bacillus.

The pneumococcus of Fränkel flourishes in any part of the upper respiratory tract and, when virulent, has been found in pure culture.

Clinically the segmentosus infection is most likely to be in the nose, seldom in the trachea, but may cause otitis media; *Micrococcus catarrhalis* is most apt of all to invade the larynx and trachea, but may occur in the ear or nose and with variable virulence. The pneumobacillus is mostly confined to the nose and sinuses.

Influenza is conspicuous by its absence.

Pyogenic cocci are non-pathogenic locally, except as secondary invaders, and the probability is that only a limited number of strains are concerned in causation of acute infections on the mucosa, and these are not genuine coryza.

The bacterial flora of the nose in America probably does not differ materially from that of other countries, but must of necessity be governed largely by environment, occupation, social position and epidemics as to the ratios of finding.

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## ABSTRACT OF DISCUSSION

Dr. E. R. LEWIS, Dubuque, Iowa: In considering the pathologic conditions of the nasal and accessory nasal tissues, it must be remembered that a majority are due directly to infections, and of the remainder a large number are due indirectly to preexistent or coexistent infections. The subject of Dr. Walter's paper is, therefore, of practical interest to all who have to deal with these conditions. Inasmuch as there are involved two widely differing antagonists, the invading organism and the invaded tissues, analysis must proceed from two widely differing standpoints, that of the bacteriologist and that of the clinician. Observations which are to form the basis for deductions as to the bacteriologic or the clinical side of the matter must be made by experts and the bacteriologic expert should not dwell in the body of the clinician, and *vice versa*.

Among the deductions, certainties may or may not present; uncertainties are bound to. Undue emphasis should be spared the former and accorded the latter.

The fundamental reasons underlying the immunity of certain tissues and the susceptibility of other tissues apparently similar, in the same individual, to the same infection, may not be forthcoming. For instance, a gonococcus, bathing in mucous emulsion the newly born head, harms not the oral mucosa, or the nasal mucosa, but does attack the ocular mucosa. Yet that same oral mucosa, scatheless from its encounter with the gonococcus, falls easy prey to the leprothrix or saccharomycetic infections, which in turn do not attack the conjunctiva; the same nasal mucosa offers but weak resistance to pneumobacillus or streptococcus. Why? The Morax-Axenfeld bacillus conjunctivitis proceeds uninterrupted in the presence of bichlorid of mercury or silver salts but succumbs to zinc sulphate, whereas the more virulent gonococcus conjunctivitis subsides under the influence of silver salts but is not affected by zinc sulphate. Why? Questions like these must remain unanswered until careful investigations, patiently pursued and zealously guarded against error, shall have built up little by little a knowledge of the subject founded on truths proved by oft-repeated observations. I wish to express the appreciation which I am sure we all feel in regard to Dr. Walter's patience and energy.

I want to voice a suggestion concerning nomenclature which may be of some practical value. In speaking of the pharyngitis, tonsillitis, or rhinitis due to the *Bacillus diphtheriae*, we are wont to use the terms nasal diphtheria, diphtheritic tonsillitis or diphtheritic pharyngitis. In speaking of other forms of pharyngitis, tonsillitis or other inflammation specified according to site, of known etiology, should we adopt the custom of using etiologic terms, it seems to me we should have made a step in advance, albeit a small one.

Dr. W. S. ANDERSON, Detroit: Why do infections of the mucous membrane of the lower respiratory tract occur? We all have patients who very seldom have an acute cold, and we have other patients who repeatedly have acute colds. We know that the lower animals are comparatively free from these infections. Why? What is there in the normal mucous membrane of some persons that resists infection while that of others does not? As I understand it, the normal respiratory tract is sterile, or nearly so. In the nose there are always a few micro-organisms but they do not thrive on a healthy mucous membrane. Going downward we find fewer and fewer germs until the tract below the vocal cords is always sterile in a healthy subject. But, in the presence of an acute cold there will be an abundant growth of organisms along the whole respiratory tract. Why? I have done some work in animals and it is easy to show that the lower respiratory tract is sterile but in many conditions it becomes infected. The mere closing up of the nose of a dog will be followed by a copious growth in the lower respiratory tract. Now we are coming to believe that many of the infectious diseases gain entrance through the mucous membrane of the respiratory tract, meningitis, diphtheria and so forth. In many of these there are local lesions of the mucous membrane, and yet if you attempt to reproduce these lesions in the lower animals you will fail. I have tried over and over again with the Klebs-Loeffler bacillus and have always failed,

and yet if we inject the organisms into the blood of the animals, they will die immediately or in twenty-four to forty-eight hours. The same thing occurs with the organism of pneumonia. If you rub it on the mucous membrane of the respiratory tract you will get no results at all. Why is the membrane in some cases so resistant? If we could learn what the local condition of the respiratory tract is that favors infection it would explain a great many conditions.

Dr. WILL WALTER, Chicago: Infection of the normal mucosa was not investigated but I reported the investigations of others who compare the normal with the abnormal. As to resistance to infection, of course there is the local resistance and the general immunity to be considered. There is also a variation in virulence of infectors and doubtless a specific local resistance. These are the problems which the laboratories of the world are trying to solve and which may not be answered offhand. In obstructed noses we have from mechanical causes practically a stasis and hence lowered local resistance. The opsonic index may be as high as 2 or 2.50 and still you get infection because of this stasis and the consequent poor local resistance. If the nose is shut off from its function by such abnormalities or by being held closed infection naturally occurs lower in the tract. Protection against such infection is one of the reasons for the existence of the nose.

## A CLINICAL STUDY OF A CASE OF PSEUDOLEUKEMIC ANEMIA OF INFANCY (VON JAKSCH) \*

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In 1889, von Jaksch proposed the term "anemia pseudoleukemica infantum" to designate a pathologic picture characterized by oligocythemia, oligochromemia, considerable permanent leukocytosis, enlarged spleen, slightly enlarged liver, and, sometimes also, enlarged lymph-nodes. Its identity as a distinct disease has been seriously questioned by some authorities on diseases of the blood. Notwithstanding, however, we find in a certain number of infants suffering from a severe form of rachitis or hereditary syphilis, a symptom-complex which is entirely apart from the pre-existing disease.

A number of German authors, Japha, Fischl and Geissler and also some Italians include the grave infantile anemias in the secondary anemias with a toxic basis, practically as a middle condition between anemia and leukemia. Japha does not regard the spleen as the primary focus, and is of the opinion that it has nothing to do with the regeneration of the blood; this is based on the fact that the enlargement frequently becomes reduced before the blood-picture has become normal, while the extent of the enlargement does not correspond to the gravity of the anemia. Japha also believes that deficient new formation of blood constitutes the nature of the affection. At the same time, there may be an exaggerated destruction; but there are only a few cases in which the anemic (granular) degeneration of the red corpuscles is found as a positive evidence of blood poison.

A very notable work on this subject by Banti appeared in 1883. He believed that anemia splenica was a primary disease of the spleen, but he also considered it a splenic form of leukemia. In the case studied and described by him, there were marked fibrous changes in

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