THE RELATION OF BACTERIUM PNEUMOSINTES TO INFLUENZA: A STUDY WITH A STRAIN OF THE ORGANISM DERIVED FROM THE NASOPHARYNGEAL WASHINGS OF A CASE OF INFLUENZA.*

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The laborious and carefully planned researches of Olitsky and Gates on the etiology of influenza, initiated during the great outbreak of 1918, and continued to the present time (1923) through several epidemic recurrences, have opened up an entirely new field in the investigation of this disease and of others of as yet unknown causation. The details of their findings are too well known to require detailed recapitulation. Suffice it to say that they have isolated from patients in repeated outbreaks of the disease, a minute, anaerobic organism, cultivable with difficulty, which when injected intratracheally into rabbits produces lesions which they believe to be specific and which resemble the pulmonary lesions of influenza as well as these can be deduced from the large amount of autopsy material on record. Animals infected with this organism (intratracheally) have, in their hands, proven susceptible to pulmonary localization of concurrently present microorganisms of the common respiratory types, with the production of typical pneumonias, whereas the same organisms, in animals without *Bacterium pneumosintes*, if producing infection at all, fail to localize in the lungs and cause instead general septicemias. The clinical symptoms produced by *Bact. pneumosintes* alone are very inconspicuous, consisting in a rise in temperature, combined with a leucopenia believed by them to parallel that of influenza[1] and occasionally conjunctivitis, but without other evidence of illness on the part of the animal.

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[1] The leucopenia observed in rabbits by Olitsky and Gates after *pneumosintes* inoculation is characterized by a relatively great reduction in the number of lymphocytes. Most reports on influenza describe the leucopenia in that disease as showing a relative reduction of the polynuclear neutrophils and increase in the proportion of lymphocytes.

This action of the organism on the rabbit accords well with the conception of influenza current at the present time which presents this disease as a mild illness of short duration, characterized by fever, leucopenia, inflammation of the upper respiratory tract, and a marked predisposition to secondary pulmonary infection by organisms of the types usually found in non-influenzal inflammations of the bronchi and lungs. From the standpoint of serious disease and mortality, therefore, the disease may be conveniently regarded as an infectious predisposition to pneumonia. This is apparently exactly the action of *Bact. pneumosintes* upon the rabbit, and taking into consideration the probability of this animal being not as susceptible to the action of this virus as others may be, notably man, the parallelism between their experimentally induced condition, and the natural disease in man, appears sufficiently striking. The probability of the relationship to influenza of *Bact. pneumosintes* is increased by the results of agglutination tests on the blood of convalescents performed by Olitsky and Gates (1921–22) in recent outbreaks which have given apparently specific results.

The general attitude of the profession with regard to this work, however, remains one of skepticism, and general confirmation of their findings is necessary before the organism of Olitsky and Gates can be accepted as the specific cause of influenza. This attitude on the part of the profession is perhaps partly due to the reaction from the too great ease with which the conclusions of Pfeiffer were accepted a generation ago, and the desire to be more than sure that a similar error is not committed at this time. Confirmation of their findings has been attempted by many, a few of whom have published their results. At least partial confirmation has been had at the hands of Loewe and Zeman (1920), who have isolated an organism apparently identical to *Bact. pneumosintes* from influenzal cases. Gordon (1922), Lister (1922), and Detweiler and Hodge (1924) have also partially confirmed this work. Others have failed in similar attempts. Certain details of the work have been criticized by several writers, notably the production of characteristic lesions in the rabbit (Maitland, Cowan, and Detweiler, 1920). Owing to the time-consuming and technically difficult procedures involved in the isolation of this organism, and the fact that only at times of epidemic outbreaks is undoubted influenzal

material available for experimentation, it is perhaps not to be wondered at that confirmation, even if ultimately forthcoming, should be slow in appearing. The attempt to repeat the work of Olitsky and Gates in its entirety is manifestly beyond the resources of most laboratories, and it therefore seems justified for the individual investigator to take up special features of their work and such fragmentary observations as are secured in this way should be placed on record to the end that a final decision as to the standing of *Bact. pneumosintes* may be reached as soon as possible. It is the purpose of the present report to record a study of the clinical effects and pathological lesions observed in experimental animals after inoculation with influenzal material, and the results of some attempts to cultivate the organism.

During February, 1922, an epidemic of acute respiratory disease occurred in the city of Washington. It was clinically typical influenza of a type in general greatly milder than that observed in 1918, but was accompanied by a very distinct increase in the incidence and mortality of pneumonia in the city at large. At the neighboring military post of Fort Myer, the epidemic, while unaccompanied by any fatality, ran a characteristically explosive course which, with the equally characteristic clinical characters of the disease, left no doubt in the minds of observers as to the nature of the outbreak. From one of the cases of this epidemic samples of blood and of nasopharyngeal washings were taken February 17, 1922. This soldier was at the time within 24 hours of the onset of the disease. He complained of a sudden onset, severe headache mainly postocular, sore throat, hoarseness, marked pain in bones and muscles, and great prostration, this last persisting for several days after defervescence. His temperature at the time the material was taken was 102.6°F., and his blood contained 5500 white cells per c.mm., of which only 47 per cent were polynuclears. His temperature became normal on the 2nd day following and except for the weakness which persisted, his convalescence was uneventful. Culture of the blood under aerobic conditions was reported as negative, while cultures from throat swabs and of the nasopharyngeal washings showed the presence of the Pfeiffer bacillus and of *Streptococcus viridans*. Inoculation of a mouse intraperitoneally with the nasopharyngeal washings resulted in the isolation of a pneumococcus of Group IV.

EXPERIMENTAL WORK.

The nasopharyngeal washings from this case were shaken with sterile glass beads to a uniform emulsion, and the resulting turbid fluid, which had about the opacity of the Army triple vaccine was used for animal inoculations. One rabbit and two guinea pigs were inoculated intratracheally, of which the two latter promptly died.[2] One guinea pig was inoculated with the unfiltered washings subcutaneously on account of the writer's earlier results with influenzal filtrates injected subcutaneously and intravenously (Hall, 1920). A rabbit was also inoculated with the citrated plasma from the blood of the patient. The results in these experiments will be recapitulated briefly.

First Animal Passage.

The rabbit inoculated with the citrated blood plasma from the patient showed a slight elevation of temperature on the 2nd day after inoculation but no leucocyte reaction. It was not killed until the 5th day. The lungs appeared normal in the gross but on microscopic examination showed a diffuse edematous thickening of the alveolar walls. The results, while perhaps suggestive, seemed so doubtful that no further work was done with material from this animal.

Rabbit 1 received intratracheally 3 cc. of the unfiltered nasopharyngeal washings from the case described. On the 2nd day there was a rise of temperature (1°F.), and a drop of 25 per cent in the total leucocyte count and of 40 per cent in the number of mononuclear leucocytes. The animal was killed and examination of the lungs showed a well marked diffuse lesion of the type discussed later. There was no microscopic evidence of pyogenic infection although cultures from lung and trachea were positive for *B. lepisepticus*. Portions of the lung emulsion from this rabbit were carried on in two rabbits and one guinea pig.

Guinea Pig 1 received 2 cc. of the unfiltered nasopharyngeal washings subcutaneously. It showed no temperature reaction. On the 4th day there was a definite drop in the total leucocyte count (40 per cent) and a somewhat greater fall in the mononuclears. The animal was sacrificed and microscopic examination of the lung showed the same diffuse lesion observed in Rabbit 1. In addition there were areas of the chronic proliferative lesion described by Maitland and so commonly seen in guinea pigs. The lung of this animal was preserved for several days in 50 per cent glycerol in the ice box and then emulsified and injected into Guinea Pigs 2 and 3. Cultures of fresh and glycerolated lung tissue (chocolate agar) remained sterile.

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[2] Olitsky and Gates gave up the use of guinea pigs on account of the difficulty of successful intratracheal inoculation with this material, and on account of the great frequency of concurrent pulmonary infections in these animals. All intratracheal inoculations were done by operative exposure of the trachea under ether anesthesia, the injection being done with a fine curved needle.

Second Animal Passage.

Rabbit 2 was inoculated intratracheally with unfiltered material from Rabbit 1. This material contained *B. lepisepticus*. On the day following inoculation the animal showed a rise of temperature which continued until the 3rd day (104.4°F.) when it was sacrificed. It showed during this time a progressive fall in total leucocytes and mononuclears. Microscopically the lung showed a fairly well marked diffuse lesion of the same type as did Rabbit 1, with scattered foci of suppurative pneumonia and areas of old proliferative change.

Rabbit 3 received 3 cc. of the same material as the one last described but filtered (Mandler) and aerobically sterile. There was no thermic or leucocytic reaction. There was no diffuse pulmonary lesion and the experiment was regarded as definitely negative.

Guinea Pig 4 received subcutaneously 3 cc. of the unfiltered lung emulsion from Rabbit 1 which contained *B. lepisepticus*. There was no thermic or leucocytic reaction and examination of the lung showed no diffuse pulmonary lesion.

Guinea Pig 2 was injected intratracheally with 0.5 cc. of lung emulsion from Guinea Pig 1, unfiltered but aerobically sterile. There was a definite progressive rise in temperature, no fall in total leucocytes, but a decided absolute reduction in mononuclears. The animal was sick with rapid respiration, palpable râles in chest, and cough. Sacrificed on the 2nd day after inoculation. The microscopic findings were those of an acute suppurative bronchopneumonia. There was no evidence of the diffuse lesion seen in the earlier animals. However, the prompt production of a pneumonia without leucocytosis by the introduction of material sterile to ordinary cultural test is suggestive of the action of *Bact. pneumosintes* as described by its discoverers.

Guinea Pig 3 received subcutaneously 2 cc. of the same material as the above. This animal showed a slight rise in temperature and a marked fall in leucocytes, especially the mononuclears. It showed, when sacrificed on the 3rd day following inoculation, a well marked diffuse lesion of the type to be described as characterizing *pneumosintes* animals.

Of these eight animals, one may be thrown out as having received blood plasma rather than nasopharyngeal material. Of the remaining seven which received the latter either in the first or second passage, Rabbit 1 showed a typical *pneumosintes* reaction of fever, and fall of leucocytes after 48 hours. Guinea Pig 1, after 4 days incubation (inoculation was subcutaneous) showed a marked leucocytic reaction but no fever. Of the five animals receiving material in the second passage, Rabbit 2 showed fever and leucocyte drop after 3 days; Rabbit 3 receiving filtered material gave an entirely negative result; Guinea Pig 4 showed a slight rise of temperature after 48 hours but no

leucocyte reduction. These three all received material from Rabbit 1 which had given a satisfactorily positive reaction to primary inoculation. The two guinea pigs inoculated with material from Pig 1 both showed decided reactions; No. 2 developed fever with sharp drop in mononuclear leucocytes, the total count remaining the same. This pig showed a definite pneumonia due to the organism so commonly found in guinea pig and rabbit lesions, *B. lepisepticus*. Pig 3 injected subcutaneously gave a very typical leucocyte curve and a slight rise in temperature. Of the seven animals then, four showed to some degree the *pneumosintes* reaction as defined by Olitsky and Gates, one other showed a doubtful reaction which, however, may be considered positive inasmuch as it was material from this animal which was used in the inoculation of Pig 3, which gave a definitely positive reaction, and from which, as will be shown later, there was isolated an organism which has been identified as *Bact. pneumosintes*. Two of the animals gave negative results. Without going into more detail with regard to individual animals, it may be said that further passage of the virus resulted in practically the same way, a certain number of doubtful or apparently negative reactions occurring in each series of inoculations.

In the discussion of the Rockefeller Institute studies much has been said as to the specificity of the pulmonary lesions described by Olitsky and Gates as occurring in rabbits inoculated with influenzal material and not in control animals. Their original description of the pulmonary findings in rabbits infected intratracheally with *pneumosintes* material, which so far as I know has not been since amplified, is as follows:

"*Pathological Effects.*—The respiratory organs were affected to the exclusion of all others. No pleuritis or exudate in the pleural cavity was evident. The lungs were voluminous as a result of edema and emphysema and had a mottled hemorrhagic appearance. The hemorrhages on the surface, beneath the pleura, were diffuse or discrete, occupying areas a few millimeters in extent or covering a large part of a lobe. In addition, minute petechiæ were seen scattered over the entire surface. On section of the lungs the cut surface revealed a hemorrhagic edema; it dripped a blood-stained, frothy fluid. The hemorrhages again were either diffuse and large, or discrete and small, in the latter instance being numerous.

"On microscopic section carried through various parts of the lungs the lesions were found to consist (*a*) of hemorrhagic foci, and (*b*) of edema and emphysema. The hemorrhages varied in size in accordance with the observed macroscopic

appearance, some being microscopic in nature. The edema was more extensive than the hemorrhages and involved alveoli and interalveolar strands of tissue. The alveoli contained coagulated serum or red corpuscles, mononuclear cells, and also at times polymorphonuclear cells of eosinophilic type and desquamated epithelial cells. The interalveolar strands were infiltrated with mononuclear cells and large cells the foreign nature of which was not always clear. Fibrin was sometimes present in small amounts. The bronchi, also, were at times filled with erythrocytes, exfoliated and degenerated epithelia, and leucocytes. The capillaries were distended with blood."

The authors do not mention any variations in the pathologic picture encountered in their experimental animals, such as would be expected to occur in any series of inoculations with a given virus, nor have they indicated that the lesions produced by *Bact. pneumosintes* isolated in later outbreaks of influenza produced less marked changes than those described. Certain it is that in degree, at any rate, the changes shown in the lungs of the animals that I have indicated as probably positive in the series under discussion do not correspond to the above description. The appearance of the lung on removal seldom corresponded to the description given. Only exceptionally was the voluminous appearance observed. Red or hemorrhagic spots on the surface occurred in all the animals of the series, but these spots varied so greatly in color, shape, and size that no description can be given that can be regarded as characteristic. Moreover, such spots are commonly found in control animals. The moist bloody condition of the section occurred regularly in my series, varying considerably in degree. The microscopic picture of my positive cases corresponded better with the photomicrographs presented by Olitsky and Gates than with their written description. The outstanding feature impressing one at first glance was in every case a *diffuse* thickening of the interalveolar walls. On examination with the 4 mm. objective, this thickening was seen to be due primarily to edema, separating the epithelial linings of adjacent alveoli. The capillaries in the walls were engorged and in some places interstitial hemorrhages were evident. Evidence of alteration of the blood in hemorrhagic areas is often seen. Infiltration by cells of a lymphoid type and also by larger cells resembling endothelium was constant though varying in degree. In the rabbits, scattered eosinophil polynuclears were usually seen. Intra-alveolar edema occurred in all cases but was usually of very limited

extent. Cellular exudation into the alveoli was not observed in this series, nor was hemorrhage or exudate observed in the bronchi. In other words, the findings in this series of cases might well correspond to those produced by an agent of a character similar to that of Olitsky and Gates, but acting with much less intensity, provided always that control animals fail to show the same changes.

Control Experiments.

It is necessary before drawing conclusions as to the presence or absence of a distinctive lesion in the animals studied above to establish the fact that such changes in the lungs as have been observed are the result neither of the method used for killing the animal, nor of the intratracheal injection of non-infectious material. The latter possibility is ruled out if, as has been the case in my series, characteristic pulmonary lesions may be produced by other than intratracheal routes of injection. I have, moreover, in connection with other work, given many intratracheal injections with sterile lung emulsions, filtered and unfiltered, without observing the lesion described above. For these reasons I will confine my attention at this time to a study of the effects upon the conditions observed in the lungs after various methods of killing experimental animals. It would appear too far fetched to assume that a hemorrhagic, edematous, and exudative lesion could occur in normal animals.

Some twenty-five rabbits, and a smaller number of guinea pigs, were studied in the attempt to establish satisfactory control conditions. Animals were killed by the inhalation of chloroform and ether, by subcutaneous injection of potassium cyanide, by pithing, and by the intracardiac injection of a saturated solution of magnesium sulfate. None of these methods produced with uniformity lungs as nearly normal on gross and microscopic examination as the method used by Olitsky and Gates, that of dislocating the cervical spine by a single properly directed blow. This method will occasionally fail to produce immediate death, though paralysis and apparent loss of consciousness result immediately. When this occurs agonal lesions in the lungs are observed. Careful microscopic study of a considerable series of normal animals killed in this way leads to the conclusion that there are definite differences between the lesions thus produced and those found in the positive cases of the influenzal series. It is true that areas of hemorrhage are often observed in these control cases, but in no case has the lesion presented the diffuse distribution found in the influenzal series. The hemorrhage in the control cases is often of interstitial character, indeed usually is so, but the evidence of interstitial

edema is entirely wanting. Furthermore, the cellular infiltration of the alveolar walls is absent. The hemorrhage is evidently very recent in point of time and no evidences of alteration are seen in the red cells. Such alterations are frequently observed in the influenzal series. (The presence of large pigmented cells is common in all rabbits as also are the eosinophilic leucocytes.) Animals killed by chloroform or ether give a microscopic picture more nearly approximating that of the influenza series, while those killed by intracardiac injection of magnesium sulfate show in most cases an intense engorgement of the pulmonary capillaries, with occasional hemorrhage into the alveoli.

The conclusion to which we are led by these observations is that the lung of a rabbit or guinea pig is very easily injured with the production of hemorrhagic lesions. That method of killing which produces most nearly instantaneous death without struggle or muscular spasm on the part of the animal seems to show on examination the most nearly unaltered lung tissue. Methods of killing somewhat less than instantaneous will give a greater or lesser proportion of hemorrhagic lesions on examination, the least extensive of these lesions showing an interstitial distribution, confined to the interalveolar walls. Such lesions are never diffuse and are characterized by the presence in the walls of fresh unaltered blood without edema or other evidence of inflammatory reaction in the form of cellular infiltration.

As a test of the validity of these perhaps slight distinctions in the pathology of these lungs I submitted a series of slides to Major George R. Callender, of the Army Medical Museum. These included two from rabbits with the influenzal lesion, one killed by chloroform, one by magnesium sulfate injection into the heart, and one by a blow. He promptly identified the two influenzal slides as an acute inflammatory process of similar nature in the two cases, the one from the animal killed by a blow as practically normal in spite of several localized purely hemorrhagic lesions, the one killed by magnesium sulfate as a passive congestion, while the chloroform case was the cause of some hesitation, but finally was placed as a congestion and edema without evidence of inflammatory reaction. My conclusion that the lesion seen in the influenzal cases is specific is also fortified by a previous observation (Hall, 1920) in which a rabbit inoculated intravenously with the filtered lung substance of another similarly injected with the filtrate of the sputum from an early case of influenza, died at the end of 40 hours.

Careful examination of this animal anatomically, histologically, and bacteriologically failed to show any cause of death other than an extreme hemorrhagic and edematous lesion of the type described for the influenza animals. The entire lung of this animal was of a red meaty appearance and the elasticity of the lungs must have been entirely destroyed. The animal had exhibited great difficulty in breathing and apparently died of suffocation. So far as I know this is the only rabbit which has succumbed to the uncomplicated action of a virus that could reasonably be interpreted as influenzal. The occasional occurrence of animals unusually susceptible to the action of this virus is perhaps to be expected from the similar occasional occurrence of fulminant cases in man.

In the light of the foregoing considerations, it appears to me justifiable to assume that the series of animals in question had received an agent which is capable of inducing a pathological condition in rabbits and guinea pigs characterized, after an incubation period of 1 or 2 days, by some elevation of temperature and reduction of the leucocytes, especially the mononuclears, and, when killed at this time, also showing a pulmonary lesion which is distinguishable from those accidentally incurred at time of death from other causes.

Cultivation Experiments.

When the opportunity for study of this case arose there was available no suitable ascitic fluid for the preparation of the Smith-Noguchi medium. Tubes satisfactorily controlled for sterility were first available at the time of the second animal passage and attempts at cultivation were made with material from all of the animals of this group. Of these only Guinea Pig 3 gave positive results. This animal had been inoculated subcutaneously with the unfiltered lung emulsion from Guinea Pig 1 which had proven sterile on aerobic cultivation on chocolate agar.

The turbidity of the inoculated tubes became noticeably greater than that in controls after about 10 days at 37°. Microscopic examination of these tubes showed minute coccobacillary forms, Gram-negative, and corresponding to the descriptions of *Bact. pneumosintes* as given by Olitsky and Gates. Subcultures on the same medium resulted in continuation of the growth and after three transfers it became possible to secure a good growth and evident colony formation on blood agar plates incubated in the Brown modification of the McIntosh and Fildes anaerobic jar. Emulsions of this growth readily

agglutinated in low dilutions with serum prepared against *Bact. pneumosintes* and kindly sent me by Dr. Gates, while failing to agglutinate with normal rabbit serum. Once adapted to growth on blood agar the strain was readily maintained by weekly transplants. Injected into animals this organism produced the same reactions as already described for the nasopharyngeal washings of the patient and for the emulsions of lung tissue. The relatively long sojourn in artificial media resulted in considerable diminution of the activity of the organism so that the proportion of animals injected which could be considered as giving positive reactions was smaller than was the case with the original material but sufficient, I believe, to show the connection between it and the lesions and clinical reactions. I was never able, however, to recover the organism from the lungs of animals so inoculated.

Lung-Injuring Properties.

One of the most telling points in the recorded work of Olitsky and Gates, tending to indicate that the action of *Bact. pneumosintes* on animals corresponds to that of the influenza virus on man, is the property of the organism to which it owes its name, that of so injuring the lung as to predispose an infected animal to pulmonary inflammations. These workers found that the guinea pig was an unsuitable animal for experimental work with *Bact. pneumosintes* on account of the frequency of resultant secondary infection of the lungs by organisms commonly found in the respiratory tracts of these animals. Such secondary infection was more rare in rabbits. However, concurrent infections by common bacteria of the respiratory tract were reported as readily induced experimentally.

If it can be conclusively shown that animals infected with *Bact. pneumosintes* are rendered seriously ill or killed by doses of various secondarily infecting organisms so small that control animals show little if any ill effect from their administration, an interesting point in the chain of evidence connecting *Bact. pneumosintes* with influenza will be made. The common organisms found in the respiratory diseases of man, the pneumococcus, for instance, when injected intravenously, show no tendency to localize in the lungs of experimental animals. When death is induced by large doses of a virulent strain

it is with the production of a septicemia without pulmonary localization. For this reason experiments were planned for the purpose of testing this point. There follows the description of one such experiment.

Three rabbits were placed under observation for several days, daily records being made of temperature, total leucocyte count, and differential count. On a given day two of these animals (Nos. 4 and 5) were injected intratracheally with 2.5 cc. of the unfiltered lung emulsion of Rabbit 6, of the series inoculated with the pure culture of *Bact. pneumosintes* isolated from Guinea Pig 3. Both these animals showed on the following day a drop in the leucocyte count as compared to previous records, which mainly involved the mononuclear elements, and one of them (No. 5) showed a slight rise in temperature. The latter, together with the third animal (No. 7) which had received no *pneumosintes* material, received intravenously 4 cc. of an 18 hour culture of Pneumococcus Type I, whose virulence had previously been shown to be insufficient to kill at that dose. The latter animal promptly developed a sharp rise in temperature with a doubling of the leucocyte count which persisted for several days with ultimate decided improvement. The animal was killed and the lungs and blood cultured for pneumococci, and the lungs examined microscopically. The latter showed no significant variation from normal and pneumococci were not isolated. The *pneumosintes* animal which received the pneumococcus also showed on the following day a sharp rise in temperature, 3°F. above previous records, but the leucocyte count remained practically constant until the 4th day when there was a drop to 3600, with a temperature of 106.4°F., and the animal died shortly thereafter. Pneumococci of Type I were recovered from the lungs and blood of this rabbit, and microscopic examination of the lungs showed, in addition to the usual signs of *pneumosintes* infection, diffuse invasion of the interalveolar walls by polynuclear leucocytes, with here and there the formation of minute abscesses, and a small amount of exudation into the alveoli. The rabbit receiving *pneumosintes* alone made the usual uneventful recovery.

This and several other similar experiments appear to bear out the contention of Olitsky and Gates that *pneumosintes* material predisposes animals to pulmonary invasion by organisms which ordinarily show no such tendency.

No attempts were made to determine the filterability of the strain of *pneumosintes* recovered at this time as it appears that this property of the organism has no direct bearing on the question of its relation to influenza, and the time at our disposal was limited. No further cases presented themselves for study owing to the prompt subsidence of the epidemic. No extensive control work on normal individuals has been attempted.

SUMMARY.

Nasopharyngeal washings from a case of epidemic influenza have proven capable of initiating a pathological change in rabbits and in guinea pigs characterized after an incubation period of 1 or 2 days, by some elevation of temperature, reduction in the number of circulating leucocytes, especially of the mononuclears, and by a pulmonary lesion during the period of reaction, which is distinguishable from those accidentally incurred at the time of death.

From one such animal, in the second passage of the virus, an anaerobic coccobacillus, corresponding in all respects to *Bact. pneumosintes*, was isolated by the method employed by Olitsky and Gates.

This organism also proved capable of initiating the pathological change in animals found after inoculation with influenzal material.

The observation of Olitsky and Gates that the presence of this organism in the lungs of experimental animals predisposes to pulmonary localization of other bacteria with the production of definite pneumonic lesions has been confirmed.

Bact. pneumosintes infections may be induced by subcutaneous injection of infected material.

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