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DISSERTATION

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on

A SEROLOGICAL STUDY OF HAEMOPHILUS INFLUENZAE.

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1st. August, 1937.

Albert Edward Platt.

*[Faint handwritten notes]*

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PREFACE.

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The dominating feature in the serology of Haemophilus influenzae (Pfeiffer's bacillus) is its marked antigenic heterogeneity and this fact alone serves to distinguish it from almost all other types of bacteria. This conclusion has been reached by all workers who have seriously investigated this problem.

Prior to the pandemic of 1918-19 several workers had drawn attention to this diversity of antigenic components and as this fact would tell strongly against Pfeiffer's bacillus being the causative agent of epidemic influenza, there appeared between the years 1919 and 1922 a flow of papers recording the results of investigations into this problem from all over the world.

There is a marked similarity in the results obtained and for this reason I have refrained from quoting the results of many workers and have included in the historical account only those findings which have a bearing on the investigations described in the following pages. Reference has been made at some length to the observations of Pittman, whose description of a "smooth-rough" variation within the species, in addition to serving as a possible explanation for the uninterpretable results of many earlier workers, made possible a more intelligent approach to the problem.

At the time when the investigation, which constitutes the subject matter of this dissertation, was commenced

(January, 1934) Miss Pittman's published work showed that she had been able to divide a number of "smooth" strains of Haemophilus influenzae into two serological groups which she designated a and b. The strains which were thus capable of being typed differed sharply in morphology and colony formation from the "typical" strains. This difference was thought to depend upon the presence in the former and its absence in the latter of a soluble substance which was shown by Dr Goebel (quoted by Pittman) to be carbohydrate in nature.

Shortly after this investigation commenced it became obvious that even though due attention was paid to the type (whether "smooth" or "rough") of the organisms being studied, they seemed to be much more difficult to classify than was expected in the light of Miss Pittman's findings.

In September of that year (1934), in answer to a request for cultures of her type strains, Miss Pittman informed me that, since publishing her last paper, she had found it necessary to create four more types, viz. c, d, e and f, stating that types c and d were rare, only one of each type having been encountered. Miss Pittman also kindly supplied me with cultures of her four common types and these were included among the strains under investigation to serve as controls.

This work was commenced and the greater portion of it carried out in the Department of Pathology, University of Cambridge, and continued in the Laboratory of the Adelaide Hospital, South Australia. Some of the results have already been published (J. Hygiene, 1937, 37, 98. - see reprint). The investigation is not yet complete. A more detailed

chemical examination of the fractions obtained is in progress, and the knowledge already gained will be used in a study of a greater number of strains.

For the continuance of the investigation and the designing of new methods of approach it has become necessary to sum up the evidence available and if possible to create a working hypothesis. In the succeeding pages I have attempted to meet this demand and claim that I have demonstrated-

1. That all strains of Haemophilus influenzae are serologically related; that the antigenic component responsible is protein in nature and that in addition to relating all strains of influenza bacilli it probably serves as a link between them and the other member of the Genus, viz. Haemophilus canis.
2. That the antigenic heterogeneity manifested by "rough" strains depends upon another protein component (fraction P) which is situated deeply within the organism.
3. That the component responsible for the difference between "smooth" and "rough" strains and the existence of serological types among the former is carbohydrate in nature (in confirmation of Pittman's findings); that it is toxic for animals and in small doses antigenic in the true sense of the word.
4. That the antigenic structure hypothesis put forward in Section 8. accounts for all the major observations with regard to the serology of this species.

In support of this thesis I am submitting reprints of some of my published papers. The titles of these are as follows:-

1. "Brucella Infections: The Frequency of Agglutinins for Brucella abortus in the Population at Large."
  2. "The Relationship of the Complement Fixation Optimum to the Agglutination Optimum."
  3. "The Viability of Bact. coli and Bact. aerogenes in water. A Method for the Rapid Enumeration of these Organisms."
  4. "A Serological Study of Haemophilus influenzae."
  5. "Investigations into the nature of the Condition known as 'Floating Yolk' in Eggs."
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