



SPECIES SUSCEPTIBILITY TO
PNEUMOCOCCAL INFECTION

Roger G. Bateman, B.Sc. Hons. (Adelaide)

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Department of Microbiology,
The University of Adelaide,
Adelaide,
South Australia.

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PUBLISHED PAPER

The natural resistance of pigeons to type III pneumococcus. R.G. Bateman and D. Rowley. Aust. J. exp. Biol. med. Sci. (1969). 47, 733-745.

ABSTRACT

A search has been made for immunological mechanisms which might account for susceptibility of mice and resistance of the common homing pigeon *Columba livia* to challenge by *Diplococcus pneumoniae* type III. The approach has been along three lines. The first has been to determine the relative abilities of mice and pigeons to respond to single and multiple doses of both pneumococcal vaccine and capsular antigen preparations. Although the pigeon responded with high serum antibody levels to small multiple doses of pneumococcal vaccine when compared with mice, no SIII-specific antibody response could be detected in pigeons following immunization with SIII. Mice responded optimally to 3 µg SIII and there was evidence of an anamnestic response to SIII.

Secondly, a study has been made of the natural opsonins present in normal pigeon and mouse sera against *D. pneumoniae* type III. Whereas normal pigeons exhibited a rapid serum-mediated blood clearance of pneumococci and this clearance could be transferred to mice and inhibited by prior injection of capsular polysaccharide, no such activity was regularly observed in the sera of normal mice. The nature of pigeon natural anti-PnIII serum opsonin has been investigated with regard to its ability to passively protect mice, bind with pneumococcal antigenic determinants and be suppressed by immunosuppressive agents.

The concentration of natural opsonins in the blood of normal pigeons and the numbers of immunocompetent cells producing anti-pneumococcal antibody in normal unstimulated pigeons and mice have been studied.

Thirdly, the removal of *D. pneumoniae* type III from the circulation of pigeons in the absence of specific and non-specific serum factors has been measured indirectly using isolated pigeon liver perfusion techniques. The involvement of normal serum factors in uptake of PnIII by phagocytic cells has been verified using this system.

It is postulated that the natural resistance of pigeons is partially explainable on a basis of natural anti-pneumococcal serum opsonins but their presence may reflect the existence of more fundamental defence mechanisms. The possible mechanisms by which such natural antibodies could arise are discussed. It is considered unlikely that natural susceptibility is due solely to a species' inability to respond with a rapid specific antibody response following exposure to pneumococci.

This thesis contains no material previously submitted by me for a degree in any University, and to the best of my knowledge and belief it contains no material previously published or written by another person except where reference is made in the text.

ROGER G. BATEMAN

August, 1973

RESUBMISSION NOTE:

This thesis was originally submitted for examination in August, 1970. It has since been extensively rewritten and numerous references have been cited which were published after this original submission date. This has been necessary for a full discussion of the work. However, it is necessary to bear in mind the earlier submission date when considering the experimental approach employed.

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