Yersinia pseudotuberculosis, iron and disease in birds

by

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Abstract

An epidemiological study was conducted to determine the relative prevalence of yersiniae in different species of wild bird and in the environment. The prevalence of *Y. pseudotuberculosis* in wild birds, determined using bacteriological techniques, was low. *Yersinia pseudotuberculosis* was not isolated from environmental samples. The prevalence of other yersiniae isolated from birds was similar to those isolated from the environment in rural locations but not in urban locations. A concurrent serological survey was carried out on a proportion of the wild birds studied. A high number of serologically positive birds indicated frequent exposure to *Y. pseudotuberculosis*.

Clinical cases of pseudotuberculosis in captive birds occurred in the winter and spring following a period of cold weather. Three outbreaks studied involved passeriforms and were associated with poor management. The sporadic cases studied involved individual columbiforms or psittaciforms with concurrent haemosiderosis.

To allow statistical comparisons of the amount and distribution of stainable iron in histological sections, an image analysis system was developed using an experimental model of haemosiderosis in the chicken. Using this technique for a retrospective study of 180 avian cases, it was found that birds which died from infectious diseases had significantly higher levels of iron in the Kupffer cells than did birds which died from non-infectious diseases. The total amount of hepatic iron was not significantly different between the two groups.

An experimental model was developed in the chicken to examine the effect of parenteral iron on the pathogenesis of pseudotuberculosis. Challenged birds pre-treated with iron-dextran had higher serological titres to *Yersinia* lipopolysaccharide, the organism was more readily isolated from the faeces and there were more intestinal lesions than in challenged chickens pre-treated with dextran or desferrioxamine. However, chickens pre-treated with iron-dextran had fewer bacterial lesions in the liver and spleen.

Intracellular survival of *Y. pseudotuberculosis* and *Y. frederiksenii in vitro* was enhanced in iron loaded macrophages. It was also determined that *Y. pseudotuberculosis* was able to acquire iron from normal chicken serum.

Statement

This thesis contains no material that has been used in whole or in part for the award of any other degree or diploma in any educational institution. The nature and extent of any assistance I have received is as stated in the Acknowledgements section of this thesis. Any animal experimentation outlined in this thesis has been approved by the Animal Ethics Committee of Massey University.

Susan Catherine Cork

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'There cannot be a philosophy, there cannot even be a decent science, without humanity.....the understanding of nature has as its goal the understanding of human nature, and of the human condition within nature'

The Ascent of Man, J Bronowski

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