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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 \textit{Y. pseudotuberculosis} in wild birds, determined using bacteriological techniques, was low. \textit{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 \textit{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 \textit{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 \textit{Y. pseudotuberculosis} and \textit{Y. frederiksenii} \textit{in vitro} was enhanced in iron loaded macrophages. It was also determined that \textit{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
Thesis table of contents

Title of the thesis i
Abstract ii
Statement iii
Acknowledgements iv
Table of contents vii
List of tables xiii
List of figures xx
List of appendices xxv

CHAPTER ONE: Review of the literature 1

General introduction
1-1 The genus Yersinia 3
1-2 Isolation techniques and ‘in vitro’ characteristics 6
1-3 Antigenic structure 7
1-4 Diagnosis 9
1-5 Epidemiology 10
1-6 Wildlife reservoirs of infection 12
1-7 Pseudotuberculosis; the disease 15
   1-7-1 Disease and virulence factors
   1-7-2 The disease
   1-7-3 Public health significance
   1-7-4 The disease in birds; historical overview
   1-7-5 The pathology and pathogenesis of pseudotuberculosis in birds and other species
1-8 Iron and disease 22
   1-8-1 Iron and the host (normal iron metabolism)
   1-8-2 In vivo models
   1-8-3 Iron and bacteria (in vitro)
1-9 Abnormal and physiological alterations in iron metabolism 32
   1-9-1 Human haemosiderosis / Haemochromatosis
   1-9-2 Avian haemosiderosis
1-10 Iron acquisition and other virulence factors of yersiniae
1-11 Conclusions drawn from the literature
1-12 Aims and scope of the thesis

SECTION ONE; The determination of factors predisposing to the development of psedotuberculosis in avian species and the development of a disease model

General introduction

CHAPTER TWO; Wildlife disease surveillance

2-1 Introduction
2-2 Materials and methods
   2-2-1 Seasonal study
   2-2-2 Regional comparisons
   2-2-3 Collection of samples
   2-2-4 Bacterial isolation and identification of yersiniae
   2-2-5 Statistical evaluation of results
2-3 Results
   2-3-1 Number of samples and location
   2-3-2 Summary of yersiniae isolated from different sources
   2-3-3 The effect of sampling techniques on the isolation of yersiniae from avian samples
   2-3-4 Yersiniae isolated from avian sources during the period of the survey
   2-3-5 The seasonal distribution of yersiniae isolated from avian sources during the period of the survey
   2-3-6 Yersiniae isolated from non-avian sources during
   2-3-7 The seasonal distribution of yersiniae isolated from non-avian sources during the period of the survey
   2-3-8 Yersiniae in soil in rural and urban areas
   2-3-9 Comparative prevalence of yersiniae isolated from avian and non-avian sources during the period of the survey
   2-3-10 The relationship between birds and the environment, yersiniae in rural and urban birds and soil
2-4 Discussion
CHAPTER THREE: Antigen studies and serology

3-1 Introduction

3-2 Materials and methods

3-2-1 Development of an ELISA to determine the presence of antibody to \textit{Y. pseudotuberculosis} serotypes I, II and III.

3-2-2 Evaluation of the 'indirect' ELISA test using sera from an experimentally infected group of chickens.

3-2-3 The development of a 'blocking' ELISA to measure the antibody titre to different serotypes of \textit{Y. pseudotuberculosis} in different species of bird.

3-2-4 Use of the 'indirect' ELISA test for measuring serum samples on discs from chickens and other species of bird.

3-2-5 The use of the 'direct' ELISA to determine the affinity of commercial anti-chicken IgG for IgG of other species.

3-2-6 SDS-PAGE gel electrophoresis and Western blot procedures.

3-2-7 The use of lectins to determine the location of polysaccharide antigen on Western blots of proteinase-K digests of \textit{Y. pseudotuberculosis} serotype II antigen (LPS).

3-3 Results

3-3-1 Preparation of hyperimmune serum in rabbits and chickens.

3-3-2 Determination of the affinity of commercial anti-chicken IgG for IgG of other avian species using ELISA and immunoblot studies.

3-3-3 Determination of the specificity of the 'indirect' ELISA test using hyperimmune sera raised in chickens and rabbits.

3-3-4 Determination of positive/negative 'cut-off' value in the LPS disc ELISA.

3-3-5 Evaluation of the serological response to LPS antigen, in chickens experimentally infected with \textit{Y. pseudotuberculosis} using the 'indirect' ELISA test.

3-3-6 Serological survey of wild birds.

3-4 Discussion

3-4-1 Antigens of yersiniae and determination of the sensitivity and specificity of a serological test.

3-4-2 Development of a serological test for the measurement of IgG antibody to \textit{Y. pseudotuberculosis} serotypes I, II and III in birds.
3-4-3 The use of the 'indirect' ELISA to determine the serological response of chickens following oral challenge with *Y. pseudotuberculosis*.

3-4-4 Application of a screening ELISA for serological surveys of wild bird populations

3-5 Summary

**CHAPTER FOUR; Pseudotuberculosis, the disease**

4-1 Introduction

4-2 Materials and methods

4-2-1 Experimental pseudotuberculosis in the chicken

4-2-2 Retrospective studies

4-2-3 Necropsy procedures and histological staining

4-2-4 Assessment of the amount of stainable iron in histological sections using visual evaluation

4-2-5 Assessment of the amount of stainable iron in histological sections using image analysis

4-2-6 Immunocytochemistry

4-2-7 Isolation and identification of bacterial strains

4-2-8 Storage and handling of the challenge isolate (LORIKEET-MUVPHP-92)

4-2-9 *In vitro* virulence tests

4-2-10 Plasmid isolation

4-3 Results

4-3-1 Experimental pseudotuberculosis in chickens

4-3-2 Retrospective cases of pseudotuberculosis in avian species

4-3-3 Predisposing factors associated with outbreaks of pseudotuberculosis in captive birds

4-3-4 Concurrent diseases associated with the development of systemic pseudotuberculosis in captive psittaciform and columbiform species

4-3-5 Immunocytochemistry and staining results

4-3-6 Virulence characteristics of *Yersinia* species isolated from avian samples

4-4 Discussion

4-5 Summary
CHAPTER FIVE; Haemosiderosis

5-1 introduction 169
5-2 Materials and methods 171
  5-2-1 Experimental haemosiderosis in the chicken
  5-2-2 Retrospective cases of haemosiderosis in birds
  5-2-3 Expression of the results
5-3 Results 175
  5-3-1 Experimental evaluation of the use of image analysis for assessment of the amount of iron stored in the livers of birds
  5-3-2 The use of image analysis to quantify the amount of stainable iron present in histological sections of avian liver tissue
  5-3-3 Factors associated with haemosiderosis in birds
  5-3-4 Statistical evaluation of the amount and distribution of iron in histological sections of liver tissue and the incidence of infectious disease
  5-3-5 Summary of the results
5-4 Discussion 193
5-5 Summary 199

SECTION TWO; Iron and disease, application of a disease model
General introduction 200

CHAPTER SIX; The effect of iron availability on the outcome of pseudotuberculosis in the chicken.
6-1 Introduction 201
6-2 Materials and methods 202
  6-2-1 Iron and exogenous siderophores
  6-2-2 Experimental birds and procedure
6-3 Results 207
  6-3-1 Clinical signs of disease in different treatment groups
  6-3-2 Faecal shedding of Y. pseudotuberculosis in chickens pretreated with iron dextran or dextran, with or without desferrioxamine
  6-3-3 Serological response
  6-3-4 Serum and tissue biochemistry
  6-3-5 Necropsy and histology
6-4 Discussion
6-5 Summary

CHAPTER SEVEN; Iron, yersiniae and the host immune response; In vitro studies
7-1 Introduction
7-2 Materials and methods
  7-2-1 Phagocytosis assay
  7-2-2 Serum resistance assay
7-3 Results
  7-3-1 Calibration and standardisation of the phagocytosis assay
  7-3-2 The survival and replication of yersiniae following phagocytosis by chick spleen macrophages in vitro
  7-3-3 The growth of Y. pseudotuberculosis in serum under different conditions
  7-3-4 The growth of Y. frederiksenii in serum under different conditions
  7-3-5 Summary of results
7-4 Discussion
  7-4-1 Phagocytosis assay
  7-4-2 Serum assay
  7-4-5 In vivo application
7-5 Summary

CHAPTER EIGHT; General discussion chapter
8-1 The role of wild birds and the environment in the epidemiology of Yersinia pseudotuberculosis for captive birds and mammals.
8-2 Disease, immune mediators and serological response
8-3 Pseudotuberculosis, the disease and predictive models
8-4 Avian haemosiderosis, a retrospective study
8-5 Experimental evaluation of the role of iron in the development of infectious disease in the chicken
8-6 Iron and yersiniae, in vitro work
8-7 Guidelines for future research
References
Appendices
List of tables

Chapter two

2-1 Source and number of avian and non-avian samples collected from rural areas between November 1991 and November 1991. ................................................................. 54

2-2 Source and number of avian and non-avian samples collected from urban areas between November 1991 and November 1992. ................................................................. 55

2-3 The number and species of yersiniae isolated from avian and non-avian sources between November 1991 and November 1992. ................................................................. 56

2-4 A comparison of the relative isolation rates of different yersiniae in avian material when different sampling techniques are used. ................................................................. 57

2-5 A comparison of the relative prevalence of yersiniae isolated from different species of bird. ................................................................. 59

2-6 Comparison of the prevalence of yersiniae isolated from starlings (Sturnus vulgaris) and house sparrows (Passer domesticus) using different sampling techniques. ................................................................. 60

2-7 Seasonal distribution of yersiniae isolated from avian sources during the period November 1991 to November 1992. ................................................................. 61

2-8 The seasonal pattern of yersiniae isolated from the faeces of starlings (Sturnus vulgaris) roosting in urban Wellington. ................................................................. 61

2-9 The seasonal pattern of yersiniae isolated from cloacal swabs taken from passeriform species caught in rural areas of the Manawatu. ................................................................. 62

2-10 The seasonal pattern of yersiniae isolated from cloacal swabs taken from passeriform species caught at the Wellington Zoo. ................................................................. 63
2-11 The seasonal pattern of yersiniae isolated from necropsy samples taken from a range of avian species inhabiting rural coastal regions and farm land. ......................... 63

2-12 The seasonal pattern of yersiniae isolated from necropsy samples taken from house sparrows (*Passer domesticus*) inhabiting farmland. ............................ 64

2-13 The seasonal pattern of yersiniae isolated from cloacal samples taken from house sparrows (*Passer domesticus*) inhabiting farmland. ............................. 65

2-14 The relative prevalence of different yersiniae isolated from different non-avian sources during the period of the survey. .................................................. 65


2-16 A comparison of yersiniae isolated from soil collected from rural and urban areas. ........................................................................................................ 68

2-17 A comparison of the relative prevalence of yersiniae isolated from avian and non-avian sources between November 1991 and November 1992. ....................... 69

2-18 Comparison of the relative prevalence of yersiniae isolated from rural and urban avian samples and rural and urban soil samples. ........................................ 69

Chapter three

3-1 Protocol for the production of hyperimmune serum in adult New Zealand rabbits and two-week-old male white leghorn chickens. .................................. 86

3-2 A comparison of agglutination titres for hyperimmune chicken and rabbit sera produced for the present study and determined by serial titration against the homologous antigen. 95

3-3 Titres of hyperimmune chicken and rabbit sera produced for use in immunoblotting and ELISA, determined by serial titration in ELISA test against the homologous antigen. 95
3-4 A comparison of the optical density values obtained using the ‘direct’ ELISA test to evaluate the binding of commercial anti-chicken IgG to sera from different avian species and rabbit sera coated on an ELISA plate as the antigen at a 1/100 dilution.

3-5 Determination of positive/negative cut-off points in the \textit{Y. pseudotuberculosis} serotype I, II and III LPS ELISA: examination of pre-inoculation sera from chickens used in experimental challenge work.

3-6 A comparison of the titres measured by ELISA, disc ELISA and agglutination, for sera collected 20 days following oral challenge with \textit{Yersinia pseudotuberculosis}.

3-7 Avian species from which cloacal swabs and blood samples were taken for concurrent examination.

3-8 Prevalence of positive serological reaction to \textit{Y. pseudotuberculosis} serotypes I, II and III in birds that were also sampled for faecal culture.

3-9 A Comparison of the prevalence of positive serological reactions to \textit{Y. pseudotuberculosis} serotype I in different locations and seasons during the year.

3-10 A Comparison of the prevalence of positive serological reactions to \textit{Y. pseudotuberculosis} serotype II in different locations and seasons during the year.

3-11 A Comparison of the prevalence of positive serological reactions to \textit{Y. pseudotuberculosis} serotype III in different locations and seasons during the year.

Chapter four

4-1 A comparison of the number of birds shedding bacteria in each treatment group and the duration of faecal shedding in two-week-old chickens following oral challenge with a single dose of \textit{Y. pseudotuberculosis} serotype II.

4-2 Body weights of experimental birds 20 days after an oral infection with \textit{Y. pseudotuberculosis} serotype II.
4-3 Source and serotype of *Y. pseudotuberculosis* strains isolated from clinical cases of pseudotuberculosis in captive birds submitted for necropsy in the period between November 1991 and November 1993 ................................................................. 145

4-4 Management changes associated with outbreaks of pseudotuberculosis in passerine species maintained in aviaries ................................................................. 148

4-5 Source of histological material from clinical and retrospective cases of avian pseudotuberculosis examined and stained for the purpose of the present study. ................................................................. 154

4-6 Retrospective material reviewed from post mortem reports of avian and mammalian pseudotuberculosis ................................................................. 154

4-7 A comparison of the amount and distribution of stainable iron and bacterial antigen in stained liver sections of birds with histological lesions in the liver. ................................................................. 158

4-8 Comparison of the staining intensity in different sections of tissue, infected with *Y. pseudotuberculosis* serotype II, incubated with homologous and heterologous primary antisera ................................................................. 159

4-9 The use of image analysis to quantify the relative amount of iron and the size of bacterial lesions in Perls' iron-Gram Twort stained liver sections from clinical cases of pseudotuberculosis in birds ................................................................. 160

4-10 *In vitro* virulence characteristics of *Y. pseudotuberculosis* in comparison with non-pathogenic yersiniae isolated from avian material and other sources. ................................................................. 161
Chapter five

5-1 A comparison of the amount and distribution of stainable iron in histological sections, stained for ferric iron and for a combination of ferric and ferrous iron, taken from the liver tissue of experimental chickens examined at 1, 2, 6 and 10 days following a single injection of 10 mg of iron dextran. ................................................................. 176

5-2 Comparison of the area, intensity of staining and relative distribution of stainable iron in histological sections of liver taken from chickens 1, 2, 6 and 10 days following a 10 mg injection of iron dextran, and stained with Perls’ iron stain. ............................... 177

5-3 Comparison of the total amount of iron detectable in hepatocytes and Kupffer cells, measured biochemically, and the mean value for stainable iron in liver sections, determined by image analysis. .................................................. 178

5-4 Comparison of the area, intensity of staining and relative distribution of stainable iron in histological sections of liver in retrospective cases taken from chickens 2 and 6 days following a 10 mg injection of iron dextran, and stained with Perls’ iron stain with that in retrospective cases of haemosiderosis from other species. ......................... 181

5-5 A comparison of the amount of stainable iron in histological sections, measured using image analysis, of liver tissue taken from birds representative of different avian orders which died from infectious and non-infectious causes. ........................................... 183

5-6 A comparison of the relative distribution of stainable iron in representative liver sections, determined by image analysis, of birds from different species with concurrent diseases. .......................................................... 184

Chapter six

6-1 Treatment regimens given to experimental and control groups of chickens. ......................................................................................................................... 204

6-2 A comparison of the prevalence of faecal shedding of Yersinia pseudotuberculosis in groups of chickens treated with iron dextran or dextran with or without desferrioxamine and
exposed to *Y. pseudotuberculosis* in the drinking water. 208

6-3 A comparison of the number of seropositive birds in each group of chickens treated with iron dextran or dextran with or without desferrioxamine and exposed to *Y. pseudotuberculosis* in the drinking water. 208

6-4 A comparison of serological titres against the lipopolysaccharide of *Y. pseudotuberculosis* serotype II, in chickens treated with iron dextran or dextran with or without desferrioxamine, and exposed to *Y. pseudotuberculosis* serotype II in the drinking water for 10 days. 209

6-5 A comparison of serum iron profiles measured in birds treated with iron dextran or dextran with or without desferrioxamine, with and without bacterial challenge. 211

6-6 A comparison of serum iron profiles measured in chickens injected with purified LPS, Heat killed bacteria, untreated controls and chickens orally challenged with *Y. pseudotuberculosis*. 212

6-7 A comparison of the biochemically measured iron content in the livers of two-week-old male chickens, treated with iron dextran or dextran with or without desferrioxamine, 10 days after oral challenge with *Yersinia pseudotuberculosis* serotype II. 213

6-8 A comparison of the body weight and the necropsy findings of chickens treated with iron dextran or dextran with or without desferrioxamine, with and without bacterial challenge. 217

6-9 A comparison of the number of birds in each group of chickens challenged with *Y. pseudotuberculosis* with lesions in the liver, spleen and intestine following treatment with iron dextran or dextran with or without desferrioxamine. 217

6-10 A comparison of hepatic iron levels and the number and distribution of histological lesions in the liver, spleen and intestine of birds treated with iron dextran or dextran with or without desferrioxamine, and challenged with *Y. pseudotuberculosis*. 217

6-11 A comparison of the amount and distribution of iron in the livers of two-week-old male
chickens treated with iron dextran or dextran with or without desferrioxamine, 10 days following challenge with *Y. pseudotuberculosis* serotype II. ........................................ 220

Chapter seven

7-1 Summary of the content of each media preparation applied to wells used in the serum experiments. .......................................................... 237

7-2 A comparison of the scintillation counts recorded for Uracil-H$^3$ labelled *yersinia* titrated in media with and without iron at 37 °C. ......................... 240

7-3 A comparison of the scintillation counts obtained for titrated *yersinia* incubated for 2 hours with radiolabelled Uracil-H$^3$ in untreated medium, medium with saponin added and medium with iron dextran added. .................................................. 242

7-4 A comparison of the scintillation counts recorded for intracellular *yersinia* released from iron-treated and untreated phagocytic cells. ............................ 244

7-5 A comparison of the colony counts obtained from a 10 microlitre aliquot of *Y. pseudotuberculosis* following 24 hr incubation at 28 °C and 37 °C in different media and plated as a 1/10$^4$ dilution. ......................................................... 248

7-6 A comparison of the colony counts obtained from a 10 microlitre aliquot of *Y. frederiksenii* following 24 hr incubation at 28 °C and 37 °C in different media and plated as a 1/10$^4$ dilution. ......................................................... 250
List of figures

Chapter three

3-1 A comparison of SDS-PAGE gel electrophoresis band patterns from different avian species run on a 15% polyacrylamide gel and stained with Coomassie blue stain ....................................................... 98

3-2 Immunoblot of the gel in figure (3-1) probed with a commercial anti-chicken IgG to determine the degree of cross reactivity between IgG in different species .............................................................................. 99

3-3 A comparison of optical density values obtained in the 'direct' ELISA test when commercial anti-chicken IgG (Sigma) was incubated with a plate coated with serial dilutions of a commercial chicken IgG (Sigma), chicken serum and chicken serum eluted from blood coated discs. ....................................................... 101

3-4 Immunoblot of different bacterial antigen preparations run in a 15% SDS-PAGE gel probed with rabbit hyperimmune serum raised against heat killed (HK) *Y. pseudotuberculosis* serotype II (IP-2935) antigen ......................................................................................... 102

3-5 Lectin probed western blot of the lipopolysaccharide (LPS) antigen of *Y. pseudotuberculosis* serotype II (LORIKEET-MUVPPH) using the biotinylated lectins, TP and BSI (Sigma) ......................................................................................... 103

3-6 A comparison of the optical density values for different rabbit hyperimmune sera raised against heat killed (HK) bacterial antigen when used in an 'indirect' ELISA test and incubated with different preparations of homologous and heterologous bacterial antigen ......................................................................................... 105

3-7 A comparison of the optical density values for different chicken hyperimmune sera raised against heat killed (HK) bacterial antigen when used in an 'indirect' ELISA test and incubated with different preparations of homologous and heterologous bacterial antigen ......................................................................................... 106

3-8 A comparison of the optical density values, measured in an 'indirect' ELISA, for chicken sera eluted from blood coated discs collected at intervals following oral challenge with a single titrated dose of *Y. pseudotuberculosis* ......................................................................................... 109

Chapter four

4-1 Sections taken from the viscera of experimental birds and clinical cases at necropsy
4-2 Immunocytochemical staining of a section of spleen taken from a canary which died following infection with *Y. pseudotuberculosis* serotype II. x 10

4-3 Immunocytochemical staining of a section of jejunum taken from a canary which died following infection with *Y. pseudotuberculosis* serotype II. x 10

4-4 Immunocytochemical staining of a section of proventriculus taken from a canary which died following infection with *Y. pseudotuberculosis* serotype II. x 10

4-5 Immunocytochemical staining of a section of proventriculus taken from a canary which died following infection with *Y. pseudotuberculosis* serotype II. x 10

4-6 A native pigeon (*Hemiphaga novaeseelandiae*) showing the non-specific ‘fluffed-up’ appearance often associated with lethargy, and weight loss in clinical pseudotuberculosis.

4-7 Gross picture of the enlarged dark liver of a native pigeon which died following infection with *Y. pseudotuberculosis* serotype II. There are numerous miliary foci of necrosis scattered throughout the hepatic parenchymal tissue. The dark colour of the liver indicates that this bird has concurrent haemosiderosis.

4-8 Gross picture of the enlarged bronzed liver of a rainbow lorikeet (*Trichoglossus haematodus mollucanus*) which died following infection with *Y. pseudotuberculosis* serotype II. There are numerous foci of necrosis scattered throughout the hepatic parenchymal tissue.

4-9 Histological section of the liver illustrated in figure (4-8) showing large areas of necrotic tissue and numerous bacterial colonies. Iron pigment is stained blue and is present in both hepatocytes and Kupffer cells. Perls’ iron stained section x 20

4-10 Histological section of the liver seen in figure (4-11) showing a well defined granulomas and numerous foci of necrosis containing bacteria. H & E stained section x 10
4-11 Gross picture of the enlarged liver of a Kakariki (Cyanoramphus novaezelandiae) which died following infection with *Y. pseudotuberculosis* serotype II. There are numerous foci of necrosis scattered throughout the hepatic parenchymal tissue.

4-12 Photograph of the ‘image grabber’ screen showing the amount of stainable iron seen in a Perls’ iron stained hepatic section taken from a stitchbird (*Notiomystis cincta*) with haemosiderosis. x 40.

4-13 Photograph of the ‘image grabber’ screen showing the image analysis evaluation of stainable iron in a sector of the stained section seen in figure 4-14

4-14 Perls’ iron stained section of the liver of a rainbow lorikeet showing a well defined bacterial lesion and iron in hepatocytes and Kupffer cells. Perls’ iron stain x 40. The image analysis outline of this section in illustrated in figure (4-13).

4-15 Plasmid content of *Yersinia pseudotuberculosis* strains isolated from avian sources and outlined in Table (4-10).

Chapter five

5-1 The distribution of stainable hepatic iron in chickens at 1, 2, 6 and 10 days following a single parenteral dose of 10 mg iron dextran.

5-2 Histological section of the liver of a chicken taken 6 days following an injection of 10 mg iron dextran. Iron pigment can be seen in the hepatocytes and the Kupffer cells as blue staining granules. Perls’ iron stained section. x 40.

5-3 Histological section of the liver of a regent parrot (*Polytelis anthopeplus*) which had concurrent fungal disease. Iron can be seen in the Kupffer cells, there is also evidence of erythrophagocytosis. Perls’ iron stain. x 40.

5-4 Histological section of the liver of a black swan (*Cygnus australis*) which died following trauma. Iron pigment can be seen in Kupffer cells surrounding the blood vessel and is also
seen scattered diffusely throughout the hepatic parenchymal tissue. Perls' iron stain. x 40. ................................................. 187

5-5 Histological section of the liver of a saddleback (Philesturnus carunculatus) which died from unknown causes. Iron pigment can be seen scattered throughout the hepatic parenchymal tissue but there is little iron in the Kupffer cells. Perls' iron stained section. x 20. ................................................. 187

5-6 PAS stained section of the liver of the saddleback illustrated in figure (5-5). Iron pigment appears dark brown in PAS stained sections and can be seen within the purple staining lysosomal structures of hepatocytes. ................................................. 188

5-7 H&E stained section of the liver of the saddleback illustrated in figure (5-5). Iron pigment and bile appears brown in H&E stained sections. Perls' iron stain stains loosely bound ferric iron blue in histological sections and is semi-quantitative. ................................................. 188

5-8 A comparison of the total stainable hepatic iron in birds from different avian orders which died of infectious and non-infectious diseases. ................................................. 189

5-9 A comparison of the total stainable Kupffer cell iron in birds from different avian orders which died of infectious and non-infectious diseases. ................................................. 190

5-10 A comparison of the total stainable hepatocyte iron in birds from different avian orders which died of infectious and non-infectious diseases. ................................................. 191

Chapter six

6-1 A comparison of the serological response of chickens challenged with Y. pseudotuberculosis following treatment with iron dextran or dextran, with or without desferrioxamine ................................................. 210

6-2 A comparison of the hepatic iron content in infected and non-infected chickens treated with iron dextran or dextran, with or without desferrioxamine. ................................................. 214
6-3 Histological section taken from the spleen of a chicken challenged with *Y. pseudotuberculosis* following treatment with iron dextran. H & E. x 10 (see text for description). .......................... 218

6-4 Histological section taken from the spleen of a chicken challenged with *Y. pseudotuberculosis* following treatment with desferrioxamine. H & E. x 10 (see text for description). ........................................ 218

6-5 Histological section taken from the spleen of a chicken challenged with *Y. pseudotuberculosis* following treatment with dextran. H & E. x 10 (see text for description). ........................................ 219

6-6 Histological section taken from the intestine of a chicken challenged with *Y. pseudotuberculosis* following treatment with iron dextran. H & E. x 10 (see text for description). ........................................ 219

Chapter seven

7-1 Template of assay wells containing modifications of minimal essential medium (MEM) such as the addition of serum (S), iron dextran (ID) or an exogenous siderophore (De). 239

7-2 Standard curves showing the scintillation counts obtained following the addition of different numbers of yersiniae to the system with and without iron dextran added to the medium. ........................................ 241

7-3 A comparison of the number of viable intracellular *Y. pseudotuberculosis* bacteria released following phagocytosis with chick spleen macrophages with and without supplementary iron dextran. .......................... 246
7-4 Stained slides showing fixed chick spleen cells including macrophages following phagocytosis of iron dextran which was added to a suspension of chick spleen cells. Perls’ iron stained section. x 1000.

Appendices

A-1 Glossary of terms used in the text. ........................................... 318
A-2 Common and scientific names of avian species examined in the present study.
A-3 Biochemical tests used to identify yersinia from avian and non-avian sources in the present study. .................................................. 323
A-4 Recipes for buffers and media not listed in the text. ...................... 325
A-5 Antigenic scheme for *Yersinia pseudotuberculosis*. ..................... 328
A-6 Source and identification of bacterial strains used in the present study.
A-7 Yersinia isolated from avian sources in the survey described in chapter two.
A-8 Yersinia isolated from non-avian sources in the survey described in chapter two.
A-9 Yersinia isolated from birds sampled by DoC during disease surveillance for *Chlamydia psittaci* and other organisms during 1992 and 1993. .... 334
A-10 Optical density values measured at 492 nm in the ‘indirect’ LPS ELISA for sera of wild birds sampled for the serological survey described in chapter three.
A-11 The survival of *Yersinia pseudotuberculosis* serotype I, II and III in PBS and distilled water at 4 °C and 28 °C .................................... 346
A-12 Statistical evaluation of the relationship between the amount and distribution of stainable iron in histological sections of liver tissue in birds from different orders which died of infectious and non-infectious diseases. .............. 348
A-13 Image analysis values for stainable iron in liver sections of different avian species and diagnostic comments associated with each case. ................. 351
A-14 Statistical analysis of the scintillation count data from the phagocytosis assay and calibration of the scintillation system described in chapter seven. 356
A-15 Statistical analysis of the colony counts for *Y. pseudotuberculosis* and *Y. frederiksenii* obtained in the serum assay described in chapter seven.
A-16 Optical density values for the chicken sera tested in the experiments outlined in chapters three and six. ................................................... 361