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THE AETIOLOGY AND PATHOGENESIS OF AVIAN INCLUSION BODY HEPATITIS

by

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A Thesis presented in partial
fulfilment of the requirements for
the degree of

DOCTOR OF PHILOSOPHY IN VETERINARY VIROLOGY

Massey University

March 1990

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ABSTRACT

Naturally occurring inclusion body hepatitis (IBH) in broiler flocks in New Zealand, and the experimental disease were characterized by a sudden onset of illness resulting in up to 30% mortality and severe liver damage associated with the formation of intranuclear inclusion bodies in the hepatocytes. Other features were anaemia and atrophy of the bursa and thymus associated with lymphoid depletion.

Serotype 8 avian adenoviruses (AAVs) were isolated from several affected broiler and one breeder flock. High titres of virus neutralizing (VN) antibodies were demonstrated in flocks which had recovered from the disease. By restriction endonuclease fingerprint analysis, two of the New Zealand isolates were found to be similar to each other and to the reference strain HVI, but markedly different from three Australian isolates of the same serotype.

Fatal disease resembling IBH was reproduced in 30% of broiler chickens following oral administration of one of the local isolates. Immunosuppression was demonstrated in both natural and experimental infections.

An enzyme-linked immunosorbent assay and an immunocytochemical technique were developed for the detection and quantification of adenoviral antigens in various chicken tissues. Both techniques detected less than 100 mean tissue culture infective doses per gram of infected tissue and a group-specific antigen common to the 12 serotypes of AAV.

A study of the pathogenesis of IBH infection was conducted following oral administration of AAV. Virus first multiplied to a high titre in the intestinal organs and passed into the blood by way of the lymphatics. Viral antigens were subsequently detected in phagocytic cells in the liver and then in the hepatocytes. Extensive replication resulted in severe liver damage, with release of virus into the blood stream and spread to other organs. Recovery was associated with the appearance of VN antibody from 7 days post inoculation.

Viral antigens were detected by ELISA directly in yolk and albumin of eggs derived from 50-60-week-old breeder flocks, although all birds had high titres of VN antibody in their blood.

The inclusion bodies found in hepatocytes were characterized antigenically and ultrastructurally.

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.

Md. Saifuddin

ACKNOWLEDGEMENTS

I wish to express my sincere thanks and gratitude to the people whose tremendous encouragement, assistance and support have helped to a great extent, towards the completion of the work reported in the thesis.

Special thanks is due to my supervisor, Dr. C.R. Wilks who has given me an invaluable source of strength and inspiration through his genuine and immense interest in my welfare, both academic and personal. Despite the ups and downs faced in the course of this study, Dr. Wilks' unfailing assistance, constant encouragement, forthright comments and the unlimited time he has generously spent in careful supervision of my work have allowed this study to go ahead.

It is with gratitude that I also express my appreciation to my other supervisors, Professor B.W. Manktelow and Dr. K.M. Moriarty whose forthcoming support and guidance have substantially increased my perserverance to pursue this study. Their constructive critisisms and meticulous attention to editorial detail are also gratefully acknowledged.

Special mention must be made of Mr. N.H. Christensen whose clinical investigations provided the materials from which these studies derived. He also arranged for the supply of chickens from commercial farms for use in these experiments. I would also like to convey my deep appreciation to Mr. M.J. Birtles for his help in conducting the immunocytochemical experiments and to Dr. A. Murray and Mr. S.G. Fenwick for their assistance in the DNA work.

Regarding the administration of my scholarship funding, I am most grateful to Ms. K. Newth, the Secretary, Commonwealth Scholarship Committee and Mrs. B.M. Coles, administrative assistant (Academic) and Mrs. N.R. Ormsby, administrative assistant (Finance), Massey University who have kindly assisted me in one way or another.

My heartfelt thanks also go to Mr. W. Stanislawek, Central Animal Health Laboratory, Wallaceville for his reliable supply of specific pathogen free chickens and eggs whenever required; to Dr. D.A. Barr, Veterinary Research Institute, Melbourne and Dr. J.B. McFerran, Veterinary Research Laboratories, Belfast for supplying the reference strains of avian adenoviruses.

Not forgetting the non-academic staff of the Veterinary Science Faculty, Massey University who have provided excellent assistance in the course of my study, my appreciation is due to Mrs. A. Scott for assistance with typing of this thesis and papers for publication, Mr. P.N. Wildbore for administrative assistance, Mr. T.G. Law for preparation of the photographs, and Mr. M. Rice, Mrs. P.M. Slack, Mrs. P.M. Davey, Mr. R.I. Sparksman, Mrs. E. Davies, Mrs. J. Schrama and Miss L.C. Cullinane for their technical support. I would like to thank Mr. K.A. Korndorffer for designing the graphs.

Also to my friends at Massey University whose friendship has gone a long way to making life more bearable when the going gets tough, thank you for your assistance and forbearance.

In particular, I am most indebted to my parents whose love, understanding and sacrifices have enabled me to leave home in order to undertake further studies for these long years.

It must be stated that all of these people and many more have influenced the present work, but responsibility for the final product and all imperfections are solely mine.

PUBLICATIONS

Christensen NH, Saifuddin Md (1989) : A primary epidemic of inclusion body hepatitis in broilers. Avian Dis **33:** 622-630.

Saifuddin Md, Wilks CR (1990) : Development of an enzyme-linked immunosorbent assay to detect and quantify adenovirus in chicken tissues. Avian Dis **34:** (in press).

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TABLE OF CONTENTS

Page

TITLE OF THE THESIS i
ABSTRACT ii
STATEMENT iii
ACKNOWLEDGEMENTS iv
PUBLICATIONS vi
TABLE OF CONTENTS vii
LIST OF TABLES xvi
LIST OF FIGURES xix
ABBREVIATIONS xxv

CHAPTER ONE : REVIEW OF THE LITERATURE

Introduction 1

Classification 3
Morphology 5
Biochemical and biophysical properties 6
a) Resistance to chemical agents 7
b) Changes in pH 7
c) Heat 7
d) Light 8
Adenoviral genome 8
Structural proteins 10
Viral antigens 11
Haemagglutination 12
Virulence 13
Occurrence 15
Host range 16
Transmission 17
Pathogenesis 18
Pathology 19

Page

Immune response to infection. 21
Serological tests used for diagnosis. 23
Cultivation
a) Cell culture. 24
b) Avian embryo. 25
Entry of adenoviruses into the cells and their replication. 26
Oncogenicity. 27
Adenovirus-associated virus (A-AV). 28

Aims and scope of the thesis. 30

CHAPTER TWO : INVESTIGATION OF THE FIELD OUTBREAKS OF INCLUSION BODY HEPATITIS IN CHICKENS IN NEW ZEALAND

Introduction. 31

Materials and Methods

Broiler flocks. 33
Breeder flocks. 33
Feed trial 34
Analysis of feed for mycotoxin. 35
Post mortem examination. 35
Isolation and identification of AAV. 35
Serological evidence of adenoviral infections in New Zealand poultry flocks 36
Examination of the infected liver tissues for CAA. 36
a) Cell culture. 37
b) IF test. 37
c) Challenge of birds. 37
d) Inoculation of avian embryos. 38
Transovarian transmission. 38

Page

Results

Clinical and necropsy findings in affected broilers . . . 40
Histopathology . . . 42
PCV. . . . 44
Breeder flocks. . . . 44
Feed trial . . . 45
Analysis of mycotoxin in feed. . . . 46
Serological examination. . . . 47
Isolation and identification of virus
a) AAV. . . . 49
b) CAA. . . . 49
Detection of viral antigens in eggs. . . . 49

Discussion. . . . 51

Summary. . . . 57

CHAPTER THREE : ISOLATION AND IDENTIFICATION OF AVIAN ADENOVIRUSES FROM FLOCKS WITH INCLUSION BODY HEPATITIS

Introduction. . . . 58

Materials and Methods

SPF chickens. . . . 60
Preparation of CKC culture. . . . 60
Passaging of the cells. . . . 61
Preparation of inoculum. . . . 61
Cultivation of virus in cell culture
a) Isolation of virus in CKC. . . . 62
b) Propagation of virus in CKC. . . . 62
Titration of virus in CKC. . . . 63
Cytopathology. . . . 63

Page

Cultivation of virus in embryonating eggs. 63
EM examination. 64
Sensitivity to Chloroform. 64
Temperature sensitivity. 64
Preparation of viral antigen. 64
Production of antiserum. 65
Viruses and antisera used in neutralization tests. 65
Neutralization test procedure. 66
Staining of the cell culture plates. 66
Extraction of viral DNA. 66
Digestion of DNA by restriction endonucleases. 67
Analysis of the restriction patterns of the
genomes of AAVs. 68

Results

Isolation and identification of virus in CKC. 69
Cultivation of virus in embryonating eggs. 70
EM examination. 71
Resistance. 73
Serotyping of AAVs. 74
Restriction endonuclease analysis. 76

Discussion. 79

Summary. 82

CHAPTER FOUR : REPRODUCTION OF INCLUSION BODY HEPATITIS IN CONVENTIONALLY RAISED CHICKENS AND AN ASSESSMENT OF THE IMMUNOSUPPRESSIVE EFFECTS OF INCLUSION BODY HEPATITIS VIRUS

Introduction. 83

Page

Materials and Methods

Virus. 86
Birds. 86

Reproduction of IBH
Challenge of birds. 86
Monitoring of the effects of IBH infection. 87
Reisolation of virus from the infected birds. 87
Measurement of VN antibodies. 87

IBH virus as an immunosuppressive agent
Examination of birds naturally infected with IBH virus. 88
Examination of birds experimentally infected with IBH virus. 88
Humoral immune response in birds challenged with IBH virus. 88
HA test. 89

Results

Field outbreaks of disease
History of the disease. 90
Post mortem lesions. 90
Histopathology. 90
Isolation and identification of virus from naturally infected birds 91

Reproduction of IBH
Clinical features. 91
Post mortem and histopathology. 91
Recovery of virus. 92
Antibody response. 95

IBH virus as an immunosuppressive agent
Post mortem lesions. 96
Histopathology. 96

Page

Detection of viral antigens in lymphoid tissues. 96
Antibody response to SRBC. 101

Discussion. 103

Summary. 106

CHAPTER FIVE : DEVELOPMENT OF AN ENZYME-LINKED IMMUNOSORBENT ASSAY AND AN IMMUNOCYTOCHEMICAL PROCEDURE TO DETECT, QUANTIFY AND LOCATE ADENOVIRAL ANTIGENS IN CHICKEN TISSUES

Introduction. 107

Materials and Methods

Viruses. 109
Preparation of gamma globulin. 109
Monitoring of the recovery of gamma globulin. 110
a) GD test. 110
b) Cellulose acetate electrophoresis. 110
c) Neutralization test. 110

E L I S A

Preparation of antigen. 111
Preparation of tissues. 111
ELISA procedure. 111
Standardization of the reagents. 113
Interpretation of the ELISA result. 113
Comparison of EA value with titre of infectious virus. 113
Cross-reactivity between adenoviruses in VN test and ELISA. 114

Immunocytochemistry

Fixation of tissues. 114

Page

Preparation and handling of the sections. 115
Development of optimum staining procedure. 115
a) Endogenous peroxidase. 115
b) Unmasking of intracellular antigen. 115
c) Blocking of non-specific binding. 115
d) Primary antibody. 116
e) Indicator system. 116
f) Counter staining. 116
Expression of the results. 116
Cross-reactivity between adenoviruses in ABC technique. 117

Results

E L I S A. 118
Immunocytochemistry. 121

Discussion. 127

Summary. 132

CHAPTER SIX : PATHOGENESIS OF INCLUSION BODY HEPATITIS IN CHICKENS

Introduction. 133

Materials and Methods

Virus. 135
Birds. 135
Detection of viral antigen by ELISA. 135
Detection of viral antigen by immunocytochemistry. 135
Pathogenesis of AAV infection
a) Viraemia. 135
b) Viral antigen in tissues. 136
c) Antibody response. 136

Page

Persistent infection. 136

Results

Viraemia. 137
Viral antigen in tissues. 138
Immunocytochemistry. 140
Antibody response. 146
Persistent infection. 147

Discussion. 150

Summary. 154

CHAPTER SEVEN : MORPHOLOGICAL AND ANTIGENIC CHARACTERIZATION OF INCLUSION BODIES IN HEPATOCYTES OF CHICKENS WITH INCLUSION BODY HEPATITIS

Introduction. 155

Materials and Methods

Virus. 157
Inclusion bodies in cell culture. 157
Inclusion bodies in experimentally infected liver tissue. 157
a) HE staining. 157
b) Immunocytochemistry. 157
c) Antigenic identity of the inclusion bodies. 158
d) Electron microscopy. 158

Results

Inclusion bodies in cell culture. 159

Page

Inclusion bodies in livers of experimentally infected birds

a) HE staining. 160

b) Immunocytochemistry. 160

c) Antigenic identity of the inclusion bodies. 160

d) Electron microscopy. 162

Discussion. 165

Summary. 168

CHAPTER EIGHT : GENERAL DISCUSSION. 169

REFERENCES 175

APPENDICES

APPENDIX I. 210

APPENDIX II. 212

APPENDIX III. 214

APPENDIX IV. 215

APPENDIX V. 218

APPENDIX VI. 220

LIST OF TABLES

Table		Page
1	Classification of Group I chicken adenoviruses by cross-neutralization in cell culture	5
2.1	Relative severity of previously documented IBH outbreaks in broiler flocks	32
2.2	Relationship of turkey herpesvirus (Marek's disease vaccine) vaccination to the appearance of inclusion body hepatitis (IBH) in broiler flocks	42
2.3	Growth and mortality rates of one-week-old broilers fed on suspected breeder mash (feed)	46
2.4	Serum antibodies to chicken anaemia agent in New Zealand poultry flocks tested by indirect immunofluorescent test	47
2.5	Virus neutralizing antibody levels to avian adenoviruses (AAVs) in broiler and broiler breeder chicken flocks in New Zealand	48
2.6	Detection by ELISA of AAV antigens in eggs derived from conventional breeder chickens (50-60 weeks of age)	50
3.1	Passages required before detection of a cytopathic effect in chicken kidney cell cultures and titre of each virus isolate	70
3.2	Sensitivity of avian adenoviruses to chloroform	73
3.3	Sensitivity of avian adenoviruses to various temperatures	73

Table		Page

3.4 Cross-neutralization between 12 prototype avian adenoviruses (AAVs) and AAV isolates in New Zealand. 75

4.1 Previous reports of lymphocytic depletion in lymphoid organs of chickens which were affected with inclusion body hepatitis. 85

4.2 Mortality and growth response of conventionally raised chickens following exposure to avian adenovirus strain 717B at 2 days of age. 92

4.3 Detection of virus neutralizing antibody in sera of conventionally raised chickens before and after exposure to avian adenovirus (strain 717B). 95

4.4 Detection of viral antigens in lymphoid organs by ELISA after oral inoculation of strain 717B (serotype 8) avian adenovirus in 2-day-old SPF chickens. 98

4.5 Comparison of the level of viral antigens detected by ELISA and by immunocytochemistry in various tissues following oral administration of strain 717B (serotype 8) avian adenovirus to 2-day-old SPF chickens. 101

4.6 Humoral antibody response to sheep RBC (SRBC) in 3-day-old SPF chickens which were inoculated intramuscularly with SRBC at the same time as oral administration of 717B strain (serotype 8) of avian adenovirus. 102

5.1 Reactions between antiserum to avian adenovirus (AAV) 716W (serotype 8) and representatives of 12 serotypes of AAV in neutralization tests and by enzyme-linked immunosorbent assay (ELISA). 120

Table | Page

5.2 Detection of viral antigens by ABC and ELISA assays in tissues of birds infected orally with a locally isolated strain of serotype 8 avian adenovirus. 123

6.1 Detection of viral antigens in different tissues by ELISA after oral administration of 717B strain (serotype 8) of AAV in chickens. 139

6.2 Detection of viral antigens in various tissues and faeces of chickens by ELISA following oral administration of 717B strain (serotype 8) of AAV and recovery from clinical disease. 148

6.3 Virus neutralizing (VN) antibody in chickens following oral administration of 717B strain (serotype 8) of AAV and recovery from clinical disease. 149

7 Previous reports of inclusion bodies in the hepatocytes of chickens infected with inclusion body hepatitis virus. 156

LIST OF FIGURES

Figure		Page
2.1	Positive-pressure bubble isolator.	38
2.2	Cumulative daily mortality in five flocks affected by IBH and one unaffected flock.	41
2.3	Comparison between thymuses of affected (right) and unaffected (left) birds. Field outbreak in 4-week-old broilers.	41
2.4	Eosinophilic intranuclear inclusion body in hepatocytes of 18-day-old broiler field case (haematoxylin and eosin, x40).	43
2.5	Early lesions in bursa characterized by depletion of medullary lymphocytes in 17-day-old broiler (haematoxylin and eosin, x20).	43
2.6	Advanced bursal atrophy. Field case in 24-day-old broiler (haematoxylin and eosin, x20).	44
2.7	Breeder flock performance during IBH outbreak.	45
3.1	Advanced cytopathic effects on monolayer cultures of chicken kidney cells caused by locally isolated avian adenovirus (716W) at 2 days pi (unstained, x10).	71
3.2	Icosahedral adenovirus particles observed with a locally isolated strain of AAV which had been propagated in cell culture (Bar = 100 nm).	72

Figure | Page

3.3 Adeno-associated parvovirus particles observed in association with a locally isolated avian adenovirus (WV6642) (Bar = 100 nm). 72

3.4 Electrophoretic patterns of DNAs of six different strains of serotype 8 avian adenoviruses generated by digestion with the restriction endonucleases EcoRI and BamHI. Lanes 1-6 respectively represent viruses 717B, 716W, QLD, VRI, WA and HVI. Bacteriophage lambda (L) DNA, digested with HindIII, used as a molecular weight marker. 77

3.5 Schematic drawing of the restriction patterns of the six strains of serotype 8 AAVs generated by EcoRI and BamHI. 78

4.1 Enlarged and mottled liver of chicken which died 5 days after receiving an oral inoculation of serotype 8 avian adenovirus. 93

4.2 Lymphoid depletion from bursa of Fabricius of a chicken which died 5 days after receiving an oral inoculation of serotype 8 avian adenovirus (haematoxylin and eosin, x10). 93

4.3 Severe lymphoid depletion from peri-arteriolar area of spleen of a chicken which died 5 days after receiving an oral inoculation of serotype 8 avian adenovirus (haematoxylin and eosin, x20). 94

4.4 Liver of chicken which died on day 5 following oral inoculation of strain 717B of serotype 8 avian adenovirus. Extensive necrosis and intranuclear inclusion bodies are apparent (haematoxylin and eosin, x40). 94

Figure | Page

4.5 Lymphocytic depletion in thymus from experimentally infected chicken at 4 days post infection (haematoxylin and eosin, x10). 97

4.6 Viral antigens in epithelial cells and lymphoid tissue of the caecal tonsil detected by avidin-biotin peroxidase complex technique at 5 days post infection (haematoxylin counterstain, x20). 99

4.7 Viral antigens in the lymphoid tissues of spleen detected by avidin-biotin peroxidase complex technique at 5 days post infection (haematoxylin counterstain, x20). 100

4.8 Viral antigens in lymphoid aggregates of thymus detected by avidin-biotin peroxidase complex technique at 4 days post infection (haematoxylin counterstain, x40). 100

5.1 Flow diagram for the ELISA. 112

5.2 Correlation between ELISA absorbance (EA) value and concentration of infectious virus in infected liver tissue (O---O) and in suspension of SPF liver and cell-culture virus (●---●). 119

5.3 Flow diagram for the standardized staining procedure of avidin-biotin peroxidase complex technique. 122

5.4a Immunoperoxidase staining of viral antigens in liver tissue following oral administration of serotype 8 avian adenovirus. Dense staining mainly in the nuclei of the hepatocytes without nonspecific background staining (4 days pi, haematoxylin counterstain, x10). 124

Figure		Page
5.4b	Dense staining of a large number of hepatocytes (both nucleus and cytoplasm) of a chicken which died at 5 days pi (x20).	124
5.4c	Section of spleen showing strong staining in groups of cells (5 days pi, x20).	125
5.4d	Section of liver from a non-infected SPF chicken showing no nonspecific staining (x20).	125
6.1	Detection of viral antigens in blood plasma collected from SPF birds following oral inoculation of 717B strain (serotype 8) of AAV at the age of 2 days.	137
6.2	Adenoviral antigens in various tissues including blood and faeces following oral administration of 717B strain of AAV. ✳ represents the positive values (mean of 5 birds; ESA >0.06) and **P** the peak values.	140
6.3a	Immunoperoxidase staining of viral antigens in intestinal tissues of chickens following oral administration of serotype 8 avian adenovirus. Diffuse staining along the lumenal surface of the epithelial cells of an ileal villus (12 hours pi, haematoxylin counterstain, x20).	141
6.3b	Dense staining in individual epithelial cells of intestinal villi (1 day pi, x20).	141
6.3c	Dense staining in epithelial cells overlaying the caecal tonsil and small granules of stain within the lymphoid tissue (arrows) (3 days pi, x40).	142
6.3d	Discrete staining within cells lining liver sinusoids (presumably Kupffer cells) (2 days pi, x40).	143

Figure	Page
6.3e Dense staining of both nucleus and cytoplasm of hepatocytes. Stained hepatocytes are arranged linearly along a hepatic sinusoid (3 days pi, x20)	143
6.3f Extensive involvement of hepatocytes (4 days pi, x10)	144
6.3g Staining of many hepatocytes (both nucleus and cytoplasm) in the liver of a chicken which died subsequent to inoculation (6 days pi, x20)	144
6.3h Infiltration of mononuclear cells in the liver of a chicken which survived infection (9 days pi, x20)	145
6.3i Dense staining of cells in the peri-arteriolar area of the spleen (5 days pi, x20)	145
6.4 Detection of viral antigens in ileum (O----O), blood (△---△) and liver (●----●) by ELISA, and appearance of virus neutralizing antibodies (▲----▲) in serum of chickens following oral inoculation of serotype 8 avian adenovirus	146
6.5 Schema of the spread of inclusion body hepatitis virus through the body based on qualitative and quantitative measurements of viral antigens by ELISA and avidin-biotin peroxidase complex techniques in various tissues following oral administration of locally isolated serotype 8 (strain 717B) avian adenovirus	147
7.1 Basophilic inclusion bodies with clear halo in chicken kidney cells infected with locally isolated serotype 8 avian adenovirus at 24 hr pi (haematoxylin and eosin, x20)	159

Figure | Page

7.2a Basophilic inclusions in the liver tissue derived from experimentally infected chickens at 4 days pi (haematoxylin and eosin, x20). 161

7.2b Same liver section stained by avidin-biotin peroxidase complex procedure (haematoxylin counterstain, x20). Densely stained areas corresponded to the inclusion bodies shown in Fig. 7.2a 161

7.3a One enlarged and several apparently normal nuclei in the hepatocytes of a bird infected with IBH virus (EM). 162

7.3b Hexagonal adenoviral particles arranged in a crystalline array in the enlarged nucleus (EM). This nucleus is more likely to contain a basophilic inclusion. 163

7.4a Margination of nuclear chromatin (arrow) and aggregation of granular materials in the enlarged nucleus but no complete viral particles apparent (EM). Most probably this nucleus contained an eosinophilic type of inclusion. 163

7.4b Higher power view of granular aggregate in the nucleus shown in Fig. 7.4a. 164

7.5 Enlarged nucleus containing a dense clump of chromatin material (arrow) in the hepatocytes (EM). No viral particles or extensive margination of nuclear chromatin is apparent. This probably represents a third type of nucleus where no obvious inclusion was detected by haematoxylin and eosin staining. 164

ABBREVIATIONS

AAV	Avian adenovirus
A-AV	Adenovirus-associated virus
ABC	Avidin-biotin peroxidase complex
AC	Allantoic cavity
AE	Avian encephalomyelitis
ATV	Antibiotic-trypsin-versene
BAV	Bovine adenovirus
BSA	Bovine serum albumin
CAA	Chicken anaemia agent
Ca-EDTA	Calcium-ethylenediamine tetraacetic acid
CAM	Chorioallantoic membrane
CELO	Chick embryo lethal orphan
CF	Complement fixation
CI	Challenge interference
CKC	Chicken kidney cells
CPE	Cytopathic effect
DAB	Diaminobenzidine
DEAE	Diamino ethane acetic acid
DNA	Deoxyribonucleic acid
EA	ELISA absorbance
EDS	Egg drop syndrome
ELISA	Enzyme-linked immunosorbent assay
EM	Electron microscope (y)
ESA	ELISA specific absorbance
FBS	Foetal bovine serum
FITC	Fluorescein isothiocyanate
GAL	Gallus adeno-like
GC	Guanine plus cytosine
GD	Gel diffusion
GMT	Geometric mean titre
HA	Haemagglutination
HAD	Haemadsorption
HAd	Human adenovirus
HAI	Haemagglutination inhibition

ABBREVIATIONS (continued)

HE	Haematoxylin and eosin
HRP	Horseradish peroxidase
HUR	Hatchery utilization rate
HVT	Turkey herpes virus
IB	Infectious bronchitis
IBD	Infectious bursal disease
IBH	Inclusion body hepatitis
ICH	Infectious canine hepatitis
IF	Immunofluorescence
IM	Intramuscular (ly)
INIB	Intranuclear inclusion body
IP	Intraperitoneal (ly)
IP	Immunoperoxidase
LR	London Resin
MD	Marek's disease
MDCC-MSB1	Marek's disease lymphoma cell line
MEM	Minimum essential medium
mRNA	Messenger ribonucleic acid
MSD	Marble spleen disease
MW	Molecular weight
ND	Newcastle disease
NE	Necrotic enteritis
NGS	Normal goat serum
OPD	Ortho-phenylenediamine
PA	Passive agglutination
PAGE	Polyacrylamide gel electrophoresis
PBS	Phosphate buffered saline
PCV	Packed-cell volume
pi	Post inoculation/Post infection
PSK	Penicillin, streptomycin and kanamycin
PTA	Phosphotungstic acid
QB	Quail bronchitis
RPMI1640	Prefix derived from Roswell Park Memorial Institute
SAS	Saturated ammonium sulphate

ABBREVIATIONS (continued)

SD	Standard deviation
SDS	Sodium dodecyl sulphate
SPF	Specific pathogen free
T	Tumour
TAE	Tris-acetate EDTA
TBE	Tris-borate EDTA
TCID50	Mean tissue culture infective dose
TE	Tris-EDTA
THE	Turkey haemorrhagic enteritis
UV	Ultraviolet
VN	Virus neutralization
WLH	White Leghorn