



AUSTRALIAN AND NEW ZEALAND COLLEGE OF VETERINARY SCIENTISTS

FELLOWSHIP GUIDELINES

Veterinary Clinical Pathology

ELIGIBILITY

1. The candidate must meet the eligibility prerequisites for Fellowship outlined in the *Fellowship Candidate Handbook*.
2. Membership of the College must be achieved prior to the Fellowship examination.
3. Membership must be in Veterinary Pathology (*includes both Anatomical and Clinical Pathology*).

OBJECTIVES

To demonstrate that the candidate has sufficient knowledge, training, experience and accomplishment to meet the criteria for registration as a specialist in **Veterinary Clinical Pathology**.

LEARNING OUTCOMES

1. The candidate will have **detailed**¹ knowledge of:
 - 1.1. General and systemic pathobiology, including:
 - 1.1.1. The concepts of host-pathogen-environment interactions to produce disease.
 - 1.1.2. Principles of disease related to *pathological processes* (mechanisms of cell injury, inflammation and repair, vascular disturbances, disorders of growth, and pigmentations and deposits) and their *causes* (physical, chemical, infectious, genetic and immune-mediated).
 - 1.1.3. Pathobiology of organ systems, including the *structural* and *functional* changes at the subcellular, cellular, tissue and organ levels.
 - 1.2. The aetiology, pathogenesis, and pathological features of:
 - 1.2.1. Diseases of companion and commercial animals, including poultry and commercially-farmed aquatic species in Australia and New Zealand

¹Knowledge levels:

Detailed knowledge — candidates must be able to demonstrate an in-depth knowledge of the topic including differing points of view and published literature. The highest level of knowledge.

Sound knowledge — candidate must know all of the principles of the topic including some of the finer detail, and be able to identify areas where opinions may diverge. A middle level of knowledge.

Basic knowledge — candidate must know the main points of the topic and the core literature.

- 1.2.2. Major **infectious** animal diseases exotic to Australia and New Zealand.
- 1.3. Diagnostic (technical and interpretive) aspects of Veterinary Clinical Pathology, including:
 - 1.3.1. Concepts of reference interval determination, and accuracy and precision in analyte measurements.
 - 1.3.2. Specimen selection and laboratory instrumentation.
 - 1.3.3. Haematological investigation for erythroid disturbances, leukocyte variations, neoplasia and bleeding disorders, utilizing peripheral blood analysis, bone marrow examination, biochemical and immunohaematological techniques.
 - 1.3.4. Clinical biochemistry/endocrinology, including the selection and interpretation of appropriate biochemical/endocrinological tests.
 - 1.3.5. Cytology and body fluid analysis including the collection and preservation of samples from all body surfaces, effusions into body cavities and fluids such as synovial fluid, cerebrospinal fluid and urine, and solid tissues.
2. The candidate will have **sound** knowledge of:
 - 2.1. The aetiology, pathogenesis, and pathological features of:
 - 2.1.1. Major diseases of laboratory animals, and wildlife and zoo species in Australia and New Zealand.
 - 2.2. Diagnostic (technical and interpretive) aspects of related disciplines, including Veterinary Anatomical Pathology, Veterinary Microbiology, Veterinary Parasitology, Immunology and Toxicology including:
 - 2.2.1. Routine laboratory procedures.
 - 2.3. Principles of related disciplines, including Comparative Anatomy, Biochemistry, Physiology, Veterinary Medicine, and Veterinary Public Health.
3. The candidate will have **basic** knowledge of:
 - 3.1. Principles of related disciplines including Molecular Biology (*predominantly the principles of PCR and in situ hybridisation*), Veterinary Epidemiology, and Statistics.
4. The candidate will **be able to**:
 - 4.1. Collect, process and examine needle aspirates, scrapings and other samples from any body source, including solid tissue, effusions into body cavities, and fluids such as synovial fluid, cerebrospinal fluid and urine. Process and examine cytological smears (*solid tissue, body fluid*). Detect, describe and interpret morphological changes. **Detailed**² *microscopic expertise is required for cytological smears.*
 - 4.2. Collect, process and examine haematological smears (*peripheral blood, bone marrow*). Detect, describe and interpret morphological changes. Apply an understanding of the dynamics of haematological changes in assessing a haematological profile and of the factors or agents

² Skill levels:

Detailed expertise – the candidate must be able to perform the technique with a high degree of skill, and have extensive experience in its application. The highest level of proficiency.

Sound expertise – the candidate must be able to perform the technique with a moderate degree of skill, and have moderate experience in its application. A middle level of proficiency.

Basic expertise – the candidate must be able to perform the technique competently in uncomplicated circumstances.

influencing or causing any changes. **Detailed** microscopic expertise is required for haematological smears.

- 4.3. Apply appropriate laboratory methods of assessment of bleeding disorders.
- 4.4. Interpret the results of haematological, biochemical, endocrinological and cytological examinations of specimens from companion and commercial animal species, for both single-animal and herd/flock problems. **Detailed** diagnostic expertise is required.
- 4.5. Interpret the results of immunological examinations of specimens from companion and commercial animal species, for both single-animal and herd/flock problems. **Sound** diagnostic expertise is required.
- 4.6. Apply the principles and practice of quality control and quality assurance in a clinical laboratory.
- 4.7. Detect, describe and interpret microscopic (histopathological) changes in necropsy and biopsy specimens from animal species. **Sound** microscopic expertise is required for histopathological sections, with evaluation only to the level of pathological processes (ie degenerative changes, inflammation, vascular disturbances, disorders of growth [hyperplasia, cysts, neoplasia], and pigmentations and deposits).
- 4.8. Provide to veterinarians and non-veterinarians, information and advice on the pathological features of diseases in animals, using concise, clear verbal and written communication.

EXAMINATIONS

Refer to the *Fellowship Candidate Handbook*, Section 7. The Fellowship examination has **four separate, autonomous components**:

1. **Written Paper 1 (Component 1)**
Principles of the Subject (three hours)
2. **Written Paper 2 (Component 2)**
Applied Aspects of the Subject (three hours)
3. **Practical Examination (Component 3)**
Microscopy (three hours - 60%)
Clinical Pathology (Projected Images) (2 hours - 40%)
4. **Oral Examination (Component 4)**
Oral (two hours)

The written examination will comprise of two separate three-hour written papers taken on two consecutive days. There will be an additional 20 minutes perusal time for each paper, during which no writing on the examination paper is permitted. Each paper presents five (5) long answer questions, worth 36 marks each, providing a total of 180 marks. There is no choice of questions. Marks allocated to each question and to each sub-section will be clearly indicated on the written paper.

Written Paper 1:

Written Paper 1 assesses the candidate's knowledge of the principles of **Veterinary Clinical Pathology** as described in the Learning Outcomes. Answers may cite specific examples where general principles apply, but should primarily address the theoretical basis underlying each example.

Written Paper 2:

Written Paper 2 assesses the candidate's ability to apply the principles of Veterinary Clinical Pathology, with an emphasis on knowledge of the aetiology, pathogenesis, pathological features, and diagnosis of animal diseases, as described in the Learning Outcomes. At least one hour of this paper will consist of analysis of clinical laboratory data within case reports.

Practical Examinations:

The **Practical** consists of two (2) parts:

1. Microscopy (3 hours - 60%)

Microscopy primarily assesses the candidate's ability to detect, describe and interpret morphological changes in cytological and haematological smears. The candidate may also be provided with histopathological sections, for evaluation only to the level of pathological processes (ie degenerative changes, inflammation, vascular disturbances, disorders of growth [hyperplasia, cysts, neoplasia], and pigmentations and deposits). The candidate is informed of the animal species. Written answers will be required. This practical will consist of a series of twelve (12) questions, presenting one case each and equating to a total of 180 marks. Marks allocated to each question and to each sub-section will be clearly indicated on the written paper.

2. Clinical Pathology (Projected Images) (2 hours - 40%)

This component assesses the candidate's ability to detect, describe and interpret microscopic changes illustrated in projected images of cytological smears (solid tissue, body fluid), urine components, and haematological smears (peripheral blood, bone marrow) of animal species. The candidate may be required to write morphological and/or aetiological diagnoses and possibly brief comments. The candidate is informed of the animal species and tissue. Written answers will be required. This practical will consist of a series of six (6) questions with sub-questions, equating to a total of 125 marks. Marks allocated to each question and to each sub-section will be clearly indicated on the written paper.

There will be no perusal time given during the practical examinations.

Oral Examination:

The **Oral** provides the candidate with a further opportunity to demonstrate knowledge of **Veterinary Anatomical Pathology** as described in the Learning Outcomes. Candidates may be asked to discuss detailed case material. Five (5) cases are presented with supporting questions asked verbally in a face-to-face setting. The oral examination has a total of 100 marks with each case allocated 20 marks. Projected images may be used during this examination.

TRAINING PROGRAMS

Refer to the *Fellowship Candidate Handbook*, Section 4.3.

In addition to the *Fellowship Candidate Handbook* requirements:

1. The residency-type training program should provide intensive training in **Veterinary Clinical Pathology**. This must encompass both companion and commercial animal species.
2. The candidate should be actively involved in the diagnosis and reporting of haematological, biochemical and cytological results from cases involving all body systems.
3. In addition to directly-supervised case responsibilities, the candidate should be involved in formal training activities such as clinical rounds, resident seminars, and journal clubs, and should attend

relevant lectures or continuing education courses. The candidate is encouraged to participate in regional, national and international meetings relevant to disease investigation and diagnosis.

4. **Case thresholds** are recommended to ensure the candidate's range of training experience. *There is an acceptance that in some candidate's circumstances not all thresholds can be achieved.*

SPECIES	CUMULATIVE CASE TOTAL (Recommended <u>minimum</u> numbers)		
	CYTOLOGY	HAEMATOL/ BIOCHEM/ ENDOCRINOL	BODY FLUID ANALYSIS (<i>incl</i> <i>Urinalysis</i>)
Dog	100	2000	100
Cat	100	1000	100
Farm Animals (<i>excl Poultry</i>)	10	200	30
Horse	50	200	50
Other	40	200	50
Total	500	5000	500

TRAINING IN RELATED DISCIPLINES

Refer to the *Fellowship Candidate Handbook*, 3.4.2. Candidates for Fellowship must spend time as stipulated by the *Fellowship Candidate Handbook* in one or more related disciplines. Examples of related disciplines appropriate for Fellowship in **Veterinary Clinical Pathology** include: Veterinary Anatomical Pathology, Veterinary Microbiology, Veterinary Parasitology, Molecular Biology, Immunology, Toxicology, Veterinary Epidemiology and Veterinary Clinical Medicine.

EXTERNSHIPS

Refer to the *Fellowship Candidate Handbook*, Section 3.4.1.

ACTIVITY LOG SUMMARY

The Activity Log Summary (ALS) should be recorded using the format of Appendix 1, identifying the laboratory procedure and further subdivided by Species.

PUBLICATIONS

Refer to the *Fellowship Candidate Handbook*, Section 3.11.

RECOMMENDED READING LIST

The candidate is expected to read widely within the discipline, paying particular attention to areas not part of their normal work experiences. This list of books and journals is intended to guide the candidate to some core references (*, **, and *** indicate the likely most important references) and other source material. Candidates also should be guided by their supervisor. *The list is not comprehensive and is not intended as an indicator of the content of the examination.*

Textbooks

General Veterinary Pathology

**Cheville NF. *Cell Pathology* Iowa State University Press, Ames.

**Kumar, V, Abbas, AK, Fausto, N *Robbins and Cotran Pathologic Basis of Disease*. 7th edn. Elsevier Saunders (2005).

**McGavin MD, Zachary JF. *Pathologic Basis of Veterinary Pathology* 4th edn. Mosby, St Louis (2007).

**Slauson, DO, Cooper, BJ. - *Mechanisms of Disease*, 3rd edn. Mosby (2002).

Anatomical Pathology

**Aughey E, Frye FL. *Comparative Veterinary Histology with Clinical Correlates* Manson Publishing Ltd London (2001).

Ferguson HW. *Systemic Pathology of Fish. A text atlas of comparative tissue responses in diseases of teleosts* Iowa State University Press, Ames (1989).

**Gross TL, Ihrke PJ, Walder EJ, Affolter, VK *Skin Disease of the Dog and Cat – Clinical and Histopathologic Diagnosis*. 2nd edn. Blackwell (2005).

***Maxie MG editor. *Jubb, Kennedy & Palmer's Pathology of Domestic Animals*, 5th edn. Elsevier. Volumes 1-3 (2007).

Ladds PW. *A Colour Atlas of Lymph Node Pathology in Cattle*, James Cook University, Townsville (1986).

McGavin MD, Zachary JF. *Pathologic Basis of Veterinary Pathology* 4th edn. Mosby, St Louis (2007).

**Meuten, DJ - *Tumours in Domestic Animals*, 4th edn. Iowa State Press (2002).

Percy DH, Barthold SW. *Pathology of Laboratory Rodents and Rabbits* Iowa State University Press, Ames (1993).

Randall CJ, Reece RR. *A Colour Atlas of Avian Histopathology* Mosby-Wolfe, London (1996).

*Roberts RJ. *Fish Pathology* 3rd edn. WB Saunders London (2001).

Robinson WF, Huxtable CRR. *Clinicopathologic Principles for Veterinary Medicine* Cambridge University Press, Cambridge (1988).

*Schmidt, RE, Reavill, DR and Phalen, DN *Pathology of Pet and Aviary Birds*. Iowa State Press (2003).

Sims LD, Glastonbury JRW. *Pathology of the Pig. A Diagnostic Guide* Pig Research and Development Corporation. (1996).

**Summers BA, Cumming JP, de Lahunta A. *Veterinary Neuropathology* Mosby, London (1995).

**Yager JA, Wilcock BP. *Color Atlas and Text of Surgical Pathology of the Dog and Cat. Volume 1. Dermatopathology and Skin Tumors* Mosby-Wolfe, London (1994).

Clinical Pathology

** Baker R, Lumsden JH, editors. *Color Atlas of Cytology of the Dog and Cat*. 1st edn, Mosby, Inc., St Louis, USA. ISBN 0-8151-0402-2 (2000).

*Canfield P, Martin P, *Veterinary Cytology*, 1st edn, Postgraduate Foundation in Veterinary Science, University of Sydney (1998).

Clark P. *Haematology of Australian Mammals*. (CSIRO Publishing 2004)

*** Cowell RL, Tyler RD, Meinkoth JH, editors *Diagnostic Cytology and Hematology of the Dog and Cat*. 2nd edn. Mosby Inc., St Louis, USA. ISBN 0-8151-0362-X (1999).

*** Cowell RL, Tyler RD, editors. *Diagnostic Cytology and Hematology of the Horse*. 2nd edn, Mosby Inc., St Louis, USA. ISBN 0-323-01317-1 (2002).

* Davidson M, Else R, Lumsden J, editors. *Manual of Small Animal Clinical Pathology*, British Small Animal Veterinary Association, Cheltenham, UK. ISBN 0-905214-41-2 (1998)

**Day MJ *Clinical Immunology of the Dog & Cat* Iowa State Univ Press, Ames. 1999.

Eade SC, Bounous DI. Editor PW Pratt. *Laboratory Profiles of Equine Diseases*. 1st edn, Mosby Inc, St Louis, USA. ISBN 0-8151-1731-0 (1997)

** Feldman BF, Zinkl JG, Jain NC editors *Schalm's Veterinary Hematology*. 5th edn. Lippincott Williams & Wilkins, Philadelphia, Pennsylvania, USA. ISBN 0-683-30692-8 (2000).

Feldman EC, Nelson, RW. *Canine and Feline Endocrinology and Reproduction*, 3rd edn. Saunders (2004)

* Harvey J. *Atlas of Veterinary Hematology*, 1st edn, WB Saunders Co., Philadelphia, USA. ISBN 0-7216-6334-6 (2001).

*** Kaneko JJ, Harvey JW, Bruss ML, editors. *Clinical Biochemistry of Domestic Animals*. 5th edn Academic Press Inc., San Diego, California, USA. ISBN 0-12-396305-2 (1997).

** Latimer KS, Mahaffey EH, Prasse KW. editors, *Duncan & Prasse's Veterinary Laboratory Medicine – Clinical Pathology*. 4rd Edition. Iowa State Press, Blackwell Publishing Co, Ames, Iowa, USA. ISBN 0-8138-2070-7 (2003).

Meyers DJ, Coles EH, Rich LJ. *Veterinary Laboratory Medicine*. 1st edn 1992. WB Saunders Co., Philadelphia, Pennsylvania, USA. ISBN 0-7216-2654-8.

*, Raskin RE, Meyer DJ, editors. *Atlas of Canine and Feline Cytology*. 1st edn, WB Saunders Co., Philadelphia, USA. ISBN 0-7216-6335-4 (2001).

Reagan WG, Sanders TG, DeNicola DB. *Veterinary Hematology – Atlas of common domestic species*, 1st edn, Manson Publishing, London, UK. ISBN 01-874545-88-X (1998)

Rebar AH, MacWilliams PS, Feldman BF, *et al. A Guide to Hematology in Dogs and Cats*. 1st edn, Teton NewMedia, Jackson Wyoming, USA. ISBN 1-893441-48-2 (2002)

Sodikoff CH. *Laboratory Profiles of Small Animal Disease*. 3rd edn. Mosby Inc., St Louis, USA. ISBN 0-323-00956-5 (2001).

Troy DB, editor *Veterinary Hematology and Clinical Chemistry*. MA Thrall, DC Baker, D DeNicola, MJ Fettman, ED Lassen, A Rebar and G Weiser. 1st Edition, Lippincott Williams and Wilkins, Philadelphia, USA. ISBN 0-683-30415-1(2004).

Willard MD, Tvedten H, Turnwald GH, editors. *Small Animal Clinical Diagnosis by Laboratory Methods*. 3rd edn. WB Saunders Co, Philadelphia, Pennsylvania, USA. ISBN 0-7216-7160-8 (1999).

General References and Associated Disciplines

- Calnek BW *et al Diseases of Poultry* 10th edn Iowa State University Press, Iowa (1997).
- Geering WA, Forman AJ, Nunn MJ. *Exotic Diseases of Animals. A Field Guide for Australian Veterinarians*. Australian Government Publishing Service Canberra (1995).
- Noga EJ. *Fish Disease. Diagnosis and Treatment* Mosby-Year Book Inc, Missouri. (1996)
- Quinn PJ, Carter ME, Markey B, Carter GR. *Clinical Veterinary Microbiology* Mosby, London (1994).
- Scott, DW, Miller, WH. *Equine Dermatology*. Saunders (2003).

Journals (particularly issues from the immediate past 5 years).

- Amer J Vet Res.*
- *Aust Vet J.*
- Aust Vet Practitioner.*
- Comp. Clin. Pathol.*
- Comp. Continuing. Education for the Practising Veterinarian.*
- Equine Vet J.*
- J Amer Anim Hosp Assoc.*
- J Amer Vet Med. Assoc.*
- J Comp Pathol.*
- **J Vet Diagn Investig.*
- NZ Vet J.*
- Res Vet Sci.*
- **Vet Clin Pathol.*
- **Vet Pathol.*
- Vet Clinics N. Amer (Small Animal Practice, Equine Practice and Food Animal Practice).*
- Vet Rec.*

Journals for Review Articles

- Immunology Today.*
- New England Journal of Medicine.*
- *These books and journals are considered essential for candidates preparing for Written Paper 1 (General Pathology).*

Websites

Animal Health Australia (to access AUSVETPLAN through publications link):

<http://www.animalhealthaustralia.com.au/aahc/home-page.cfm>

FURTHER INFORMATION

For further information contact the College Office

Telephone: International +61 (07) 3423 2016

Email: admin@anzcvs.org.au

Web: www.anzcvs.org.au

Postal Address : Building 3, Garden City Office Park, 2404 Logan Road
EIGHT MILE PLAINS QLD 4113 Australia

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APPENDIX 1: ACTIVITY LOG SUMMARY (BY ACTIVITY AND SPECIES) Veterinary Clinical Pathology		Fellowship candidate Name:					Date:								
	NUMBER OF CASES														
LAB PROCEDURE /Species	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Current TOTAL	Previous TOTAL	Cumulative TOTAL
CYTOLOGY															
1. Dog															
2. Cat															
3. Farm Animals (<i>excl Poultry</i>)															
4. Horse															
5. Other (<i>incl Poultry</i>)															
HAEMATOLOGY/ BIOCHEMISTRY/ ENDOCRINOLOGY															
1. Dog															
2. Cat															
3. Farm Animals (<i>excl Poultry</i>)															
4. Horse															
5. Other (<i>incl Poultry</i>)															
BODY FLUID ANALYSIS (<i>incl Urinalysis</i>)															
1. Dog															
2. Cat															
3. Farm Animals (<i>excl Poultry</i>)															
4. Horse															
5. Other (<i>incl Poultry</i>)															

Signature of Supervisor: