



AUSTRALIAN AND NEW ZEALAND COLLEGE OF VETERINARY SCIENTISTS

FELLOWSHIP GUIDELINES

Animal Nutrition and Management (Ruminant)

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 Animal Nutrition (Ruminant), Epidemiology, Medicine of Dairy Cattle, Medicine of Beef Cattle or Medicine of Sheep, Veterinary Pathobiology or another Veterinary Pathobiology subject.

OBJECTIVES

To demonstrate that the candidate has attained sufficient knowledge, training, experience, and accomplishment to meet the criteria for registration as a specialist in Animal Nutrition and Management (Ruminant).

LEARNING OUTCOMES

For the purposes of this document, 'ruminant' is defined as sheep, dairy, beef, goats and camelids. The candidate will be required to nominate **one** of the following **five** electives that will comprise 25% of Written Paper II, Practical and Oral Examination.

Elective 1: Beef Cattle

Elective 4: Goats

Elective 2: Dairy Cattle

Elective 5: Camelids

Elective 3: Sheep

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1. The candidate will have a **detailed¹ knowledge** of:
 - 1.1. the physiology and biochemistry of digestion and metabolism in the ruminant including but not limited to:
 - 1.1.1. the structure and function of individual compartments of the ruminant digestive system
 - 1.1.2. ruminal bacteria including typical function and dysfunction of the ruminant microbial system
 - 1.2. all aspects of the various ruminant production systems in Australia and New Zealand, including, but not limited to, preventative medicine, management systems, the effect of nutrition on disease and reproduction, genetics, epidemiology, and farm economics
 - 1.3. nutrition of the ruminant, including:
 - 1.3.1. nutritional requirements for maintenance of normal body function within ruminants including; ‘energy’ nitrogenous compounds, ‘fibre’, water, minerals, vitamins and other feed additives
 - 1.3.2. the principles of growth of animals including muscle, meat and fibre quality and growth the diagnosis of sub-clinical deficiency, deficiency, nutritional requirements and supplementation (requirements, methods of supplementation)
 - 1.3.3. nutrition and physiology of the neonate including metabolism of the foetus
 - 1.3.4. nutrition of the pregnant ruminant and feeding for optimal reproductive performance
 - 1.3.5. lactational physiology including knowledge of biological adaptations associated with the non-lactating and lactating status
 - 1.3.6. pasture based nutrition, supplementary feeding on pasture and intensive feedlot systems
 - 1.3.7. the basis for, and application of, the major international systems for describing nutrient requirements

¹ **Knowledge 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.

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- 1.4. ruminant feed, including:
 - 1.4.1. the factors influencing feed intake
 - 1.4.2. the value, composition and evaluation of feeds and the value of and different feeds to ruminants
 - 1.4.3. methods, both laboratory and physical, of evaluation of feeds
 - 1.4.4. pasture and crop agronomy and pasture management.
2. The candidate will have a **sound knowledge** of:
 - 2.1. the principles of anatomy, physiology, embryology of the gastrointestinal (including liver, spleen and pancreas), musculoskeletal, respiratory, integumentary, nervous/special senses, urogenital and reproductive, endocrine, cardiovascular/haemic/lymphatic systems, as these apply to ruminant nutrition
 - 2.2. the aetiology and pathogenesis, clinical signs, diagnosis (including a knowledge of the appropriate clinical pathology), epidemiology, treatment, management, prevention and control of the infectious and non infectious diseases that affect ruminants in Australia and New Zealand, with a particular focus on metabolic disorders and the potential for nutritional management to modify immune function
 - 2.3. the reproductive physiology of ruminants as well as the diseases and management factors associated with ruminant reproduction
 - 2.4. the principles of pharmacology, immunology, pathology and toxicology applicable to ruminant nutrition including a detailed knowledge of rumen modifier and post ruminal production modifiers
 - 2.5. dairy farm, beef and sheep economics, including the major profit drivers under the various production systems
 - 2.6. veterinary epidemiology as applied in ruminant disease investigation and in study on-farm design, particularly as these apply to nutrition
 - 2.7. the major and significant exotic diseases relevant to ruminants in both Australia and New Zealand and the potential for these to be a differential diagnoses for nutritional diseases
 - 2.8. an understanding of veterinary toxicology, particularly as it relates to nutrition eg toxic plants, anti-nutritional factors in feed
 - 2.9. formulation of diets for different classes of stock
 - 2.10. facility design for more intensive livestock facilities.

3. The candidate will have a **basic knowledge** of:
 - 3.1. statistics
 - 3.2. the role of genetics and genetic evaluation systems in the production systems
 - 3.3. the feed milling industry
 - 3.4. principles of modelling and investigation of metabolism including experimental surgery used in research.
4. The candidate will be able to, with a **detailed² expertise**:
 - 4.1. demonstrate extensive practical skills and expertise relevant to management of ruminants in either Australia or New Zealand including handling, diagnostic sampling, and necropsy techniques
 - 4.2. collect, interpret and record clinical data from the relevant production systems including historical and physical examinations of livestock and production facilities eg farms or lots and conduct appropriate examinations including individual animal or herd or flock. This could include but not be limited to:
 - 4.2.1. the evaluation sub-optimal nutrition in an enterprise
 - 4.2.2. the performance of a clinical examination of a group of ruminants including individual animals and the farm
 - 4.2.3. use appropriate diagnostic methods including necropsy findings, animal and feed samples to solve complex clinical problems and make sound clinical judgements
 - 4.2.4. undertake a detailed investigation to determine the cause, and implement subsequent treatment and control measures, of a herd /flock based problem, especially the investigation of causes of poor or suboptimal production and profit
 - 4.2.5. the estimation, with reasonable accuracy, of the energetic and protein needs of a specific class of stock examined in the field
 - 4.2.6. the formulation of diets, including appropriate mineral and vitamin concentrations for different classes of stock using a software program of

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.

their choice (being aware of the strengths and limitations of such software)

- 4.2.7. the evaluation of pasture and crop availability, and, with reasonable accuracy, the energy, protein and fibre content by physical and visual examination of the forage
 - 4.2.8. the evaluation of different by-product, concentrate feeds and conserved forages by physical and visual examination of the feed
 - 4.2.9. the examination of mating or production records from a herd or flock
 - 4.2.10. integrate these skills to provide high-quality care for ruminants with the most efficient use of resources in a manner that is responsive to the farmer's needs and wishes.
- 4.3. Critically evaluate the relevant literature and concepts in the field of ruminant nutrition and management.
5. The candidate will be able to, with a **sound expertise**:
- 5.1. evaluate causes of failure of reproductive performance in a ruminant flock or herd
 - 5.2. evaluate the possible causes of epidemics, or high rates of endemic disease, of common diseases that affect ruminant production, including non-nutritional causes. (Specific examples include mastitis and lameness in dairy herds, bovine respiratory disease in beef feedlots and lameness in sheep.)
 - 5.3. demonstrate sufficient understanding to recognise, investigate and formulate sound and rational approaches to new and rare ruminant diseases
 - 5.4. communicate effectively with clients, referring veterinarians and peers
 - 5.5. advance knowledge in ruminant nutrition and management through clinical innovation, research and publication.

Electives

At the time of submission of the Fellowship Training Program Document the candidate will be required to nominate **one** of the following **five** electives that will comprise 25% of the Written Paper II, Practical and Oral Examination.

Elective 1: Beef Cattle

Elective 4: Goats

Elective 2: Dairy Cattle

Elective 5: Camelids

Elective 3: Sheep

EXAMINATIONS

Candidates should refer to the *Fellowship Candidate Handbook*, Section 5.

Written Paper I

This paper is designed to test the candidate's knowledge of the general principles of Animal Nutrition (Ruminant) and Management as described in the Learning Outcomes. Answers may cite specific examples in which general principles apply, but should primarily address the theoretical basis underlying each example. Questions may be long essay type, a series of shorter answer sub-questions, or multiple-choice questions.

Written Paper II

This examination covers beef cattle (30%), dairy cattle (30%), sheep (15%) and the candidate's nominated elective (25%).

The paper is designed to (a) test the candidate's ability to apply the principles of the Animal Nutrition (Ruminant) and Management to particular cases/problems or tasks, and to (b) test the candidate's familiarity with the current practices and current issues that arise from activities within the discipline in Australia and New Zealand.

Practical Examination

This examination covers beef cattle (30%), dairy cattle (30%), sheep (15%) and the candidate's nominated elective (25%).

This examination further tests the candidate's achievement of the listed Learning Outcomes. The practical examination will be a minimum of three hours, but may extend to six hours duration, if a farm visit and investigation is included. The method(s) of delivery of the question material may include, but not be limited to, audiovisual presentation of images, verbal presentation of scenarios, written presentation of clinical material, evaluation of feeds, evaluation of clinical pathology results, evaluation of feed test results, evaluation of pathology reports and examination of a production facility. The method(s) by which the candidate will deliver their response to questions include oral explanation, report writing, ration formulation, statistical analysis or analysis of production or reproductive records.

Oral Examination

This examination covers beef cattle (30%), dairy cattle (30%), sheep (15%) and the candidate's nominated elective (25%).

This examination further tests the candidate's achievement of the Learning Outcomes listed earlier. The oral examination will be a minimum of one hour and may include, but not be limited to, audiovisual presentation of images, verbal presentation of scenarios, written presentation of clinical material, evaluation of feeds, evaluation of clinical pathology results, evaluation of feed test results, and evaluation of pathology reports.

TRAINING PROGRAMS

Refer to *Fellowship Candidate Handbook*, Section 3.3

Training may be undertaken as specified in the *Fellowship Candidate Handbook*, Section 3.3. Alternatively, a remote directly supervised training program, as outlined below, may be submitted for approval.

Remote Directly Supervised Training Program

A remote direct supervised training program comprises 96 weeks of supervised training made up of:

- 16 weeks of directly supervised training
- 68 weeks of remote directly supervised training
- 8 weeks of directly supervised training in related disciplines
- 4 weeks of directly supervised externship.

Directly Supervised Training (DST) Component

The training program will begin with a minimum period of 16 weeks (80 working days) of direct supervised training (DST) in the primary discipline of Ruminant Nutrition and Management. This will involve regular, in-person, one-on-one, daily contact between the supervisor and the candidate in the same workplace with co-visiting of facilities by the supervisor and the candidate

Remote Directly Supervised Training (RDST) Component

After this period, a minimum period of 68 weeks (340 working days), of remote DST (RDST) in the primary discipline of Ruminant Nutrition and Management will be completed. RDST is defined as the candidate working in their own workplace and their activities overseen by a supervisor in a different location. This will involve regular, one-on-one, daily contact between the Supervisor and candidate either in person, by telephone or by internet conferencing (email, skype, web-based discussions or other appropriate technologies). The purpose of this meeting is for the candidate to receive support and advice about cases they have been managing. Daily contact with the supervisor is recorded in a '**daily contact diary**'.

The candidate and supervisor will meet formally once every seven days either in person, by telephone or by synchronous internet conferencing. This meeting will be formally documented in the '**weekly meeting report**'. Case information and data/images from all cases for the previous week will be transferred from the Candidate to the Supervisor prior to the meeting in order to ensure a complete and thorough review of each case. The purpose of this meeting is for the supervisor to become familiar enough with the case details that they can make an independent judgement of the appropriateness of the candidate's decisions and actions and provide feedback. Cases which the supervisor

feels can be adequately understood without direct observation may be included in the remote supervision activity log.

The candidate and supervisor will meet formally for a minimum of two days once every six months to co-visit facilities and to review the performance of the candidate. This meeting will be formally documented in the ‘**co-visit report**’.

Additional Requirements

The candidate is encouraged to actively participate in electronic journal club, resident seminars or teaching rounds, and record this in the credentials document.

A minimum of two seminar presentations must be made by the candidate during the training period and reported in the credentials document. A seminar is defined as a scientific presentation attended by peers and followed by informed discussion.

The candidate must attend relevant scientific meetings and conferences and attendance at a national veterinary conference is recommended. The credentials document must show documentary evidence that the candidate has prepared and presented at least one scientific paper at a national or international conference.

REPORTING DST

Co-visit Report (Appendix 3)

The co-visit report details the cases seen during direct supervised training. This report must be submitted after the first three months, then with each Annual Supervisor Report for review by a member of the Chapter CEC.

Activity Log Summary DST (Appendix 4)

The Activity Log Summary will be kept for both direct and remote direct supervised cases. This report must be submitted after the first three months then with each Annual Supervisor Report for review by a member of the Chapter CEC.

Activity Log (Appendix 5)

A six months section of the AL must be submitted at any stage after the first twelve months of training.

REPORTING RDST

Daily Contact Diary (Appendix 1)

Candidates must maintain a diary of all activity and contact with the supervisor. This diary must be submitted with each Annual Supervisor Report for review by a member of the TCC.

Weekly Meeting Report (Appendix 2)

The weekly meeting report details the date of the meeting and the nature and the outcome of each weekly discussion. This report must be signed by the supervisor and submitted after the first three months then with each Annual Supervisor Report for review by a member of the Chapter CEC.

Co-visit Report (Appendix 3)

This report must be submitted after the first three months then with each Annual Supervisor Report for review by a member of the Chapter CEC.

Activity Log Summary RDST (Appendix 4)

This report must be submitted after the first three months then with each Annual Supervisor Report for review by a member of the Chapter CEC.

Activity Log (Appendix 5)

A six months section of the AL must be submitted at any stage after the first twelve months of training.

CASE MINIMA

Herd Cases

120 herd assessment and replanning cycles are required to be seen during the training period, of which a minimum of 20 must be directly supervised (greater requirements for directly supervised cases may be necessary, subject to supervisor discretion). A herd is defined as an individual assessment which leads to investigation or change in management for the entire group

Herd Categories for Activity Log

1. Reactive: first visit
 - 1.1. Trouble shooting Health
 - 1.2. Trouble shooting Reproduction
 - 1.3. Trouble shooting Lameness
 - 1.4. Trouble shooting Production Performance
 - 1.5. Unsatisfactory Replacement Management (includes weaner ill-thrift, calf morbidity or mortality)
 - 1.6. Disease (other)
 - 1.7. Assessment Cycle
2. Proactive:
 - 2.1. Assessment and planning
 - 2.2. Replanning Cycles

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TRAINING IN RELATED DISCIPLINES

Refer to the *Fellowship Candidate Handbook*, Section 2.4.2.

Related Disciplines

Candidates for Fellowship in Ruminant Nutrition and Management must spend **two** weeks of direct supervised training in each of the related disciplines as per the following.

- Dairy, sheep, beef, goat or camelid medicine
- Pathology, especially ruminant necropsy
- Epidemiology (this TRD ONLY can be completed as RDST)

AND one week of direct supervised training in each of the related disciplines as per the following.

- Analytical Laboratory Analysis, including but not limited to feed testing (1 week)
- Applied biochemistry or physiology (1 week)

EXTERNSHIPS

Direct supervised training, refer to the *Fellowship Candidate Handbook*, Section 2.4.1.

PUBLICATIONS

Refer to the *Fellowship Candidate Handbook*, Section 2.10.

RECOMMENDED READING LIST

The candidate is expected to research the depth and breadth of the knowledge of the discipline. The reading list below is very extensive and is intended as a guide to the candidate to some core references and source material. The list is not intended as an indicator of the content of the examination. Books are regularly updated and the most current edition should be sourced.

The relevant references are the most recent editions of the following texts and the most recent years of the journals (i.e. all journals published since the last issue of the relevant texts).

Core Texts

AFRC Technical Committee, *Energy and protein requirements of ruminants*, CAB International, 1993.

BANR. *Nutrient requirements of small ruminants: Sheep, goats, cervids, and New World camelids*, National Academies Press, 2007.

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Kellaway R & Harrington T. *Feeding concentrates*. rev. edn. Landlinks Press, Collingwood Vic 3066, 2004.

Radostits et al., *Large animal medicine* (numerous volumes). Veterinary Clinics of North America.

SciQuest. Australian and New Zealand Dairy Cattle Vets Proceedings, Vetlearn NZ, 2003.

Subcommittee on Beef Cattle Nutrition, Committee on Animal Nutrition, National Research Council. *Nutrient requirements of beef cattle*. 7th edn (Update 2000). National Academies Press, 2000.

Sub-committee on Dairy Cattle Nutrition. *Nutrient requirements of dairy cattle*, 7th edn. National Academies Press, 2001.

Underwood E & Suttle N, *The mineral nutrition of livestock*. 3rd edn. CABI Publishing, 2001.

ADDITIONAL REFERENCES

TEXTBOOKS

Chapman et al., editors, *Meeting the challenges for pasture-based dairying*. Australasian Dairy Science Symposium 2007, Dairy Australia and Dairy Insight (NZ), 2007.

Davis CL & Drackley JK. *The development, nutrition, and management of the young calf*. Iowa State Press, 1998.

Davison T & Andrews J. *Feed pads Down Under*. Queensland Department of Primary Industries, 1997.

Feeding standards for Australian livestock — Ruminants SCA, CSIRO Publishing, 1990.

Freer M & Dove H. *Sheep nutrition*. CSIRO Publishing, 2002.

Grace, ND, editor. *Mineral requirements of grazing ruminants*, New Zealand Society of Animal Production, 1983.

Grace, ND. *Managing trace element deficiencies*, AgResearch New Zealand, 1994.

Griffiths et al., editors, *Successful silage (top fodder silage manual)*, NSW Agriculture, 2006.

Holmes et al., *Milk production from pastures*, Butterworths, 2002.

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Lean IJ, Nutrition of dairy cattle. University of Sydney Post Graduate Committee in Veterinary Science, 1987.

Lot Feeding and Beef Production, University of Sydney Post Graduate Committee in Veterinary Science, 1992.

Lovett JV & Scott JM. *Pasture production and management*. Inkata Press, 1997.

Malcolm B, Makeham J & Wright, V. *The farming game: Agricultural management and marketing*. Cambridge University Press, 2005.

McDonald P, et al., *Animal nutrition*, 6th edn. TransAtlantic Publications, 2002.

Moran J & McLean D, *Heifer rearing*, DRDC, 2001.

Moran J, *Calf rearing — a practical guide*. Landlinks Press, 1996, 2002.

Moran J, *Forage conservation. Making quality hay and silage in Australia*, Agmedia , 1996.

Rattray PV, Brooks IM, Nichol AM. *Pasture and supplements for grazing animals*. New Zealand Society of Animal Production Occasional Publication, Number 14, 2007.

Roy JHB, *The calf*. Butterworths, London, 1980.

SCA, *Nutrient requirements of domesticated ruminants*. CSIRO Publishing, 2007.

Smith B. *Large animal internal medicine*, Moseby.

Trace elements for pastures and animals in Victoria, Agmedia , 1986.

Journals

The journals listed below contain original papers and reviews suitable for preparation for the Fellowship examination. There may be relevant papers in other journals not listed below.

Australian Veterinary Journal

Journal of Animal Science

Journal of Dairy Science

New Zealand Veterinary Journal

Small Ruminant Research

The Veterinary Journal

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FURTHER INFORMATION

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APPENDIX 1: DAILY CONTACT DIARY

Animal Nutrition and Management (Ruminant) Daily Contact Diary				
<i>Date</i>	<i>Time</i>	<i>Mode of Contact</i>	<i>Purpose of Contact</i>	<i>Outcome of Contact</i>

APPENDIX 2: WEEKLY MEETING REPORT

Animal Nutrition and Management (Ruminant) Weekly Meeting Report											
Individual animal cases											
Case log											
<i>Date</i>	<i>Category</i>	<i>Case ID</i>	<i>Presentation</i>	<i>Investigation</i>	<i>Diagnosis</i>	<i>Treatment and management</i>	<i>Outcome</i>	<i>Feedback from Supervisor</i>			

APPENDIX 3: CO-VISIT REPORT

Animal Nutrition and Management (Ruminant) Co-visit DST Case Report							
Individual animal							
Case log							
<i>Category</i>	<i>Case ID</i>	<i>Presenting Scenario</i>	<i>Collection of Data</i>	<i>Assessment</i>	<i>Recommendations and plan</i>	<i>Replanning</i>	<i>Outcome</i>
Reactive: first visit							
Health							
Reproduction							
Lameness							
Production performance							
Unsatisfactory replacement management (includes weaner ill-thrift, calf morbidity or mortality)							
Disease (other)							
Assessment Cycle							
Proactive:							
Assessment and planning							
Replanning Cycle							
Herd							
Case log							
<i>Category</i>	<i>Case ID</i>	<i>Presenting Scenario</i>	<i>Collection of Data</i>	<i>Assessment</i>	<i>Recommendations and plan</i>	<i>Outcome</i>	

APPENDIX 4: ACTIVITY LOG SUMMARY

Animal Nutrition and Management (Ruminant) Activity Log Summary																
DST Cases																
Category	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Current Total	Previous Total	Cumulative Total	
Current Total																
Previous Total																
Cumulative Total																
RDST Cases																
Category	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Current Total	Previous Total	Cumulative Total	

APPENDIX 5: ACTIVITY LOG (TEMPLATE)

	Date (S)	*Category	Animal/ Herd	Problem Defenition	Problem Solving Aids	Solution Proposed	Outcome	**Initials
		e.g. species, organ system, type of activity	Details					
227	3/08/2009	Bovine	Nehls Brother	Increased respiratory disease in calves	Record Analysis	Reccomended changing from mattress to sand in freestalls	Comments were accepted by owner and will be undertaken over time when money and labour is available.	MI
		Reproduction	2000 cows HF freestall dairy	Poor transition	Herd test analysis	Adjustment of sprinklers in order to direct water properly		
		Transition management		Poor bunk utilisation	Stall evaluation	Decrease crowding in far off dry pen and change freestalls (too short)		
		Heifer management		Poor housing	Housing Evaluation	Increase pen size in calf sheds, adjustment of fans to proper speed.		
					Respiratory scoring	Increase detection and early intervention in calf pneumonia by using respiratory scoring sheet		
					Calf total protein	Increase effectiveness of colostrum management		
					Ventilation assessment			
228	6/08/2009	Bovine	Ripps Dairy	Evaluate calf barn, transition management , freestall design	Record Analysis	Some failure of passive transfer evident- recommended adjust colostrum collection and feeding times	Comments given to owner will be assessed by the University of Wisconsin vets in 2 months	MI
		Transition management	1800 cow HF freestall		Herd test analysis	Some overcrowding in pre fresh barn		