



AUSTRALIAN AND NEW ZEALAND COLLEGE OF VETERINARY SCIENTISTS

MEMBERSHIP GUIDELINES

Animal Nutrition (Ruminant)

INTRODUCTION

For details of membership definition, standards of membership, study recommendations and other points about the written and oral/practical examinations, prospective membership candidates should consult the *Membership Candidate Handbook*.

For further information on membership and fellowship of the Australian College of Veterinary Scientists, the College should be contacted directly.

The examinations will cover the following species and production systems;

- Dairy cattle (grazing only through grazing/intensive supplementation/cropping to feedlot)
- Beef cattle (grazing, cropping, supplementary feeding, feedlot and cow/calf)
- Sheep (milk, wool and fat lamb; extensive grazing situations through to feedlot)

LEARNING OUTCOMES

A. Principles of Animal Nutrition.

Irrespective of their species or production system of interest the candidate will have a **sound**¹ knowledge of:

1. The physiology of digestion;

- 1.1 Structure and function of individual compartments of ruminant digestive system, from neonate through to functioning ruminant.
- 1.2 Rumen microflora: broad groups, their digestion of nutrients and end products, requirements for optional function.
- 1.3 How organic material is harvested by ruminants and how nutrients are transferred to maintenance, liveweight, milk production, growth and/or foetal development.
- 1.4. Physiology behind the maintenance of optimal rumen function.

¹ **Knowledge Levels:**

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.

2. The nutrient requirements and functions within ruminants including;

- 2.1. Water requirements and the importance of water quality.
- 2.2. Energy utilisation in the animal:
 - 2.2.1. How “energy” is transferred from feedstuffs to “physiological work” within the ruminant, including the potential losses at each transformational stage from Gross Energy to Net Energy
 - 2.2.2. How ruminal microflora provide benefit to ruminant animals
 - 2.2.3. Methods of quantifying energy at different stages.
- 2.3. Protein digestion and metabolism:
 - 2.3.1. Amino acid and protein catabolism and anabolism for the production of body tissue, growth, foetal development and milk production
 - 2.3.2. How ruminal microflora are involved in ruminal protein production, costs and benefits.
- 2.4. Mineral and vitamin nutrition of ruminants:
 - 2.4.1. Requirements for macro minerals, trace minerals and vitamins for ruminant health, including requirements for different productive states
 - 2.4.2. Risk factors, diagnosis and treatment of sub-clinical and clinical deficiencies
 - 2.4.3. Risk factors, diagnosis and treatment of vitamin and mineral toxicities.
- 2.5. The basis for, and application of, the major International systems for describing nutrient requirements of ruminants.

3. Risk factors for reduced feed intake by ruminants;

- 3.1 Feed
- 3.2 Environmental
- 3.3 Animal
- 3.4 Diagnosis and management of these risk factors.

4. Nutrition and physiology of the neonate;

- 4.1. Effect of the foetus on the metabolism and physiology of the dam.
- 4.2. Colostrum: production, composition, importance to the newborn.
- 4.3. Nutrition of newborn from birth to when classed as ruminant in own right.

5. Principles of growth of animals;

- 5.1. Growth of different body components throughout life of ruminant, with special reference to;
 - 5.1.1. Efficiencies of liveweight gain,
 - 5.1.2. Carcase composition, and
 - 5.1.3. The potential for nutrition to manipulate aspects of growth.

6. Lactational physiology;

- 6.1. Biological adaptations associated with change from non-lactating to lactating state.
- 6.2. Milk synthesis and milk secretion mechanisms and factors that moderate and control milk secretion.
- 6.3. Potential risks of lactation and nutritional management of the lactating ruminant.

7. **Energy storage and transport within the ruminant and how it relates to the pathogenesis of disease (such as ketoacidosis).**
8. **Value of feeds, composition and evaluation of feeds (interpretation of feed reports);**
 - 8.1. Methods of quantitative and qualitative evaluation of feeds, and different parameters, which are of importance to ruminants.
 - 8.2. Uses and limitations of quantitative assessments.
 - 8.3. Other methods of assessing/differentiating feeds.
 - 8.4. Collection and storage of feed and forage samples.
9. **The mechanisms by which rumen modifiers change rumen and animal physiology and the potential to influence ruminant production systems.**

B. Applied Nutrition of Ruminants

The candidate will have a **sound**¹ knowledge of:

1. **Nutrient requirements for production and health;**
 - 1.1. Feeding for optimal production of specific products (e.g. milk, wool, weaner growth) at different points in production cycle.
 - 1.2. Some appreciation of economic constraints and objectives in different enterprises and markets.
 - 1.3. How reproductive function and performance is influenced by nutritional management, and how it can be improved through altered feeding techniques.
 - 1.4. Evaluating sub-optimal nutrition:
 - 1.4.1. Clinical examination of the individual animal, groups of ruminants and the farm as a whole
 - 1.4.2. Risk factors for inadequate nutrition of ruminants
 - 1.4.3. Clinical signs and evaluation of energy and protein deficiency, and sub-optimal rumen function
 - 1.4.4. Clinical signs of trace mineral and macro mineral deficiencies (metabolic diseases) and cost-effective means to correct these deficiencies
 - 1.4.5. Basic knowledge of the effects of diet on immune function.
2. **Traditional and non-traditional feedstuffs and how they can be utilised by ruminants, particularly in the Australian and New Zealand context;**
 - 2.1. Pasture and forage crop growth and management:
 - 2.1.1 Composition of common species
 - 2.1.2 Assessing/measuring pasture growth and production
 - 2.1.3 Potential toxicities or deficiencies
 - 2.1.4 Grazing management.
 - 2.2. Conserved feeds:
 - 2.2.1 Different pasture and crop conservation methods
 - 2.2.2 Costs and benefits of feed conservation
 - 2.2.2 The influence of pasture/crop growth, conservation and storage as it influences ruminants that subsequently eat the material.
 - 2.3 Cereal and pulse grains:
 - 2.3.1 Different processing methods
 - 2.3.2 Composition
 - 2.3.3 Health challenges.

- 2.4 A variety of by-product feeds, including the:
 - 2.4.1 Composition
 - 2.4.2 Feeding to minimise dietary disturbances, toxicity, residues and other problems.

3. Diet formulation and feed delivery;

- 3.1. Feed additives including rumen (production) modifiers, buffers, alkalising agents, macro and micro minerals
- 3.2. Practical delivery of different feeds to ruminants within a range of ruminant production systems
- 3.3. The principles of formulating bulk total mixed ration diets.

EXAMINATIONS

For general information on the required standards for both the Written and Oral examinations, candidates are referred to the *Membership Candidates Handbook*. The Membership examination has **two separate components**:

- 1. **Written Examination** (*Component 1*)
 - Written Paper 1** (two hours): Principles of Ruminant Nutrition
 - Written Paper 2** (two hours): Nutritional Management of Ruminants
- 2. **Oral Examination** (*Component 2*)
 - Oral** (one hour)

The written examination will comprise of two separate two-hour written papers taken on the same day. There will be an additional 15 minutes perusal time for each paper, during which no writing in an answer booklet is permitted. In each paper you are provided with four (4) questions to answer, worth 30 marks each, giving a total of 120 marks per paper. There is no choice of questions. Questions may be long essay type, a series of shorter answer sub-questions, or multiple-choice questions. Marks allocated to each question and to each subsection of questions will be clearly indicated on the written paper.

Written Paper 1:

This paper is designed to test the candidate's knowledge of the principles of Ruminant Nutrition as described in the Learning Outcomes.

Written Paper 2:

This paper is designed to (a) test the candidate's ability to apply the principles of Ruminant Nutrition to particular cases/problems or tasks and (b) test the candidate's familiarity with current issues in Ruminant Nutrition and recommended current diagnostic and management practices in Ruminant Nutrition.

Oral Examination:

This examination will consist of images, video of livestock and farms, feed samples and other clinically relevant material to assess the candidate's skills in the practical nutrition of ruminants, problem solving skills and ability to solve farm health and production problems which have a nutritional basis. An understanding of pathogen or toxin related diseases that may influence the differential diagnosis of nutritional problems appropriate to a veterinary education and orientation is expected. The duration of this examination is approximately one (1) hour. Five 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.

RECOMMENDED READING MATERIAL

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 other source material. Candidates also should be guided by their mentors. *The list is not comprehensive and is not intended as an indicator of the content of the examination.*

Texts²

Nutrient Requirements of Ruminant Livestock - ARC (1980) Publ. CAB, Slough, UK.

Nutrient Requirements of Beef, Dairy Cattle, Sheep and Goats - NRC Publications, Nation Academy, Washington.

Milk Production from Pastures (1984) Holmes and Wilson, Butterworth Agricultural Books, Wellington, New Zealand.

Nutrition of Dairy Cattle (1987) I. J. Lean, University of Sydney Post Graduate Committee in Veterinary Science.

Dairy Cattle Medicine and Production (1991) Proceedings of the Postgraduate Committee in Veterinary Science 161.

Lot Feeding and Beef Production - Proceedings of the Postgraduate Committee in Veterinary Science 137.

Quantitative Aspects of Ruminant Digestion and Metabolism (1993) Forbes and France Ed Pub. CAB, Slough, UK.

Nutrition and Lactation in the Dairy Cow (1987) Ed P Garnsworthy, Pub. Butterworths, London, UK.

Feeding of Concentrates (1992) R C Kellaway, Publ. Agmedia, Melbourne.

Feeding of Beef Cattle (1979) Matsushima, Pub. Springer-Verlag, Berlin.

Occasional Publication No. 8 New Zealand Society of Animal Production (1983) "Mineral Requirements Grazing Ruminants" Ed. Grace, ND.

Feeding Standards for Australian Livestock - Ruminants S.C.A. (Ruminants) Pub. CSIRO 1990.

Trace Elements for Pastures and Animals in Victoria DARA (1986) Agmedia.

Animal Nutrition (1988) 4th Edition, McDonalds et al, Pub. Longman.

Scientific and Technical

Calf rearing: a practical guide (2002) 2nd Edition, Moran J., Landlinks Press, Victoria.

Heifer rearing: a guide to rearing dairy replacement heifers in Australia (2001) Eds. Moran J. & McLean D., Bolwarrah Press, Victoria.

² **Definitions of Textbooks**

Recommended textbook – candidates should own or have ready access to a copy of the book and have a sound knowledge of the contents.

Additional references – candidates should have access to the book and have a basic knowledge of the contents.

Journals³

Australian Veterinary Journal
Australian Journal of Experimental Agriculture
Feed Science and Technology
Journal of the American Veterinary Medical Association
Journal of Dairy Science
Journal of Dairy Research
Journal of Animal Science
Journal of Agricultural Science (Cambridge)
Proceedings of the New Zealand Society of Animal Production

FURTHER INFORMATION

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³ **Definitions of Journals**

Recommended Journal – candidates should have ready access to either print or electronic versions of the journal and have a sound knowledge of the published articles in the subject area.

Additional Journal – candidates should be able to access either printed or electronic versions of the journal and have a basic knowledge of the published articles in the subject area.

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