



# Australian College of Veterinary Scientists

## Membership Examination

June 2010

## Veterinary Epidemiology

### Paper 1

Perusal time: **Fifteen (15)** minutes

Time allowed: **Two (2)** hours after perusal

You must answer all **eight (8)** questions.

All questions are of equal value

Subsections of questions are of equal value unless stated otherwise.

Where appropriate, use examples from your own experience to illustrate your understanding

# Paper 1: Veterinary epidemiology

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Answer all eight (8) questions.

## Overview of epidemiology

1. Write brief notes to explain your understanding of **one (1)** of the following:
  - a) 'one medicine - one health'
  - b) Koch's Postulates and why they have been superseded in causal reasoning.

## Patterns of disease

2. Write brief notes to explain your understanding of **one (1)** of the following:
  - a) how knowledge of host-agent-environment factors is used in disease investigation and mitigation
  - b) how spatial mapping of disease is used in disease investigation and mitigation.

## Population-based measurements

3. Write brief notes to explain your understanding of **one (1)** of the following:
  - a) incidence of disease
  - b) measures of central tendency.

## Principles of epidemiological study design

4. Write brief notes to explain your understanding of **one (1)** of the following:
  - a) multi-stage random sampling
  - b) pooling of samples for detection of disease.

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## **Types of epidemiological studies**

5. Write brief notes to explain your understanding of **one (1)** of the following:
- a) the characteristics and limitations of cohort studies
  - b) methods of regional disease surveillance.

## **Description and analysis of epidemiological data**

6. Write brief notes to explain your understanding of **one (1)** of the following:
- a) descriptive analysis of different types of data
  - b) the application and assumptions underpinning logistic regression analysis.

## **Animal health economics**

7. Write brief notes to explain your understanding of **one (1)** of the following:
- a) net present value
  - b) pay-off matrices.

## **Risk analysis and simulation modelling**

8. Write brief notes to explain your understanding of **one (1)** of the following:
- a) risk assessment
  - b) the Poisson distribution, and where you might use it.

**End of paper**





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### Paper 2

Perusal time: **Fifteen (15)** minutes

Time allowed: **Two (2)** hours after perusal

You must answer all **three (3)** questions

All questions are of equal value.

Subsections of questions are of equal value unless stated otherwise.

# Paper 2: Veterinary epidemiology

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Answer all three (3) questions.

## Outbreak and disease investigation

1. Answer **either** Part A **or** Part B of this question:

(A) **Disease investigation — Pig weaner mortality**

A veterinary pig practitioner has been investigating a 900-sow herd of pigs with increased rates of mortality amongst weaners from four to ten weeks of age. Some pigs die acutely in very good condition, showing signs of respiratory distress. Others die over a period of time, with some loss of condition. Although a variety of organisms have been isolated from specimens submitted, treatment with antibiotics has not provided much improvement.

The pig farmer does not keep count (inventory) records of animals beyond weaning. In the period from January to June 2006 a total of 7,706 pigs were weaned, and abattoir records showed that 6,387 pigs were slaughtered at 20 weeks post-weaning (June-November 2006). A number of gilts were retained (estimated 3% of killings) as replacement sow breeding stock.

As a veterinary epidemiologist you have been asked to assist with the investigation.

Answer **all** of the following:

- a) Calculate and describe the apparent mortality rate in this herd.
- b) List the additional information you would require to progress this investigation and how this information might be obtained.
- c) What type of study could you use to determine the cause of these mortalities and what are the strengths and weaknesses of the chosen study design?
- d) Briefly describe the study design, including the objectives, hypothesis, unit(s) of interest, sample size, reference and study populations.
- e) Describe any potential or actual bias in the calculated mortality rate and the results of your study.

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**(B) Outbreak investigation – Aquaculture mortality**

Barramundi farming along with other forms of aquaculture are relatively new forms of livestock production and have been the focus of both research and refinement over recent years. Currently the accepted industry-wide mortality rate is 5%.

At this farm in the Northern Territory, barramundi stock are introduced at 100 mm and grown to market size over a period of 18 months in land-based ponds utilising marine water. Barramundi stock is sourced from a hatchery/nursery which supplies all barramundi enterprises within the Northern Territory. There are six ponds at this site, each containing a cohort of barramundi stock. Each pond is stocked and harvested using an all in all out process. Stocking and harvesting of the ponds is rotated throughout the year to maximise labour efficiency. The barramundi are fed a commercial pelleted diet.

You have been asked to investigate the cause of a mortality rate that has increased to 7% at this farm.

Answer **all** of the following:

- a) Discuss how you would approach this outbreak investigation.
- b) Identify possible risk factors.
- c) Explain how you would analyse the relative significance of the various risk factors.
- d) Discuss possible sources of bias.

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## Research design and analysis

2. Answer **either** part A **or** part B of this question:

(A) **Research design — Tuberculosis in seals**

Tuberculosis caused by *Mycobacterium pinnipedii* has been diagnosed in New Zealand fur seals. This organism has been detected through post mortem investigations of dead seals found on beaches by the public and reported to authorities. Little is currently known on the distribution of this disease or its prevalence in seal populations. It is also not known whether it is a major cause of mortality, or simply an incidental finding.

You have been invited to be part of a multi-disciplinary team investigating the disease. In particular, you have been asked to design one or more studies to estimate the prevalence and geographical distribution of the organism in New Zealand fur seals, and whether or not seals with the organism have increased mortality rates.

Answer **all** of the following:

- a) Outline your approach to investigating this disease.
- b) Describe the study design(s) you would use to investigate the particular study objectives, hypotheses, unit(s) of interest, and reference and study populations.
- c) List the sampling method(s) you would use and outline how you would select your sample size(s). Explain the reason for your choice of sampling method(s).
- d) Discuss the possible means of data collection, and the advantages and disadvantages of alternative sources of data.
- e) Describe any potential biases and how you may control these.
- f) Discuss how you would analyse and interpret the results.

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**(B) Research design — Fertility control in dogs**

Fertility control is one of the primary objectives of Dog Health Programs conducted in remote indigenous communities. Current approaches include surgical sterilization or use of an injectable progestagen that induces temporary anoestrous. These approaches have resource and logistic limitations.

A GnRH agonist implant has been developed which has the potential to induce temporary infertility. The length of fertility control is uncertain but may exceed two years. You have been asked to design a study to investigate the longevity of induced infertility using this implant in dogs.

Answer **all** of the following:

- a) Explain the type of study you would use and the strengths and weaknesses of your chosen type of study.
- b) Describe the study design, including the study objectives, hypothesis, unit(s) of interest, outcome variables, reference and study populations.
- c) Describe how you would allocate treatment and how you would determine your group size.
- d) Discuss possible means of data collection and the advantages and disadvantages of alternative sources of data.
- e) Describe any potential biases and how you may control these.
- f) Discuss how you would analyse and interpret the results.

**Research evaluation**

3. Attached as an appendix to this examination is an excerpt from a paper describing a study of risk factors associated with musculoskeletal disorders in veterinarians.

You are asked to critically evaluate the design of this study. Your answer should include consideration of **all** of the following:

- a) research hypotheses
- b) study type
- c) reference population and study population
- d) key outcome and explanatory variables
- e) key aspects of sampling
- f) management of possible bias, including selection bias, confounding and interaction, and measurement error or misclassification
- g) further information that you feel would help you to evaluate the study.

**End of paper**