Australian and New Zealand College of Veterinary Scientists

Membership Examination

June 2017

Veterinary Epidemiology

Paper 1

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

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

Answer **ALL <u>EIGHT (8)</u>** questions

Answer **<u>EIGHT</u>** questions each worth 15 marks .....total 120 marks

Paper 1: Veterinary Epidemiology

Answer all eight (8) questions

1. List and describe the steps required to conduct an import risk analysis (IRA). Use **one (1)** example of an IRA to aid your description. *(15 marks)*

2. Answer **all** parts of this question:

   a) Nominate **and** explain the relevance of a regional, national, state or district animal health program that you are familiar with. *(2 marks)*

   b) Describe in detail the objectives of this program. *(5 marks)*

   c) State the reasons for it being either a control or eradication program. *(3 marks)*

   d) Explain the key strengths and weaknesses of this program in relation to its ability to meet the stated objectives. *(5 marks)*

3. You are a government veterinarian and have been called by a local dairy farmer to attend his property because a number of cattle have died suddenly. You are the first veterinarian to investigate these sudden deaths and you suspect an infectious cause. Describe in detail the key steps **and** their rationale that you undertake on your first visit to the dairy farm to investigate this event. *(15 marks)*

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4. Answer **both** parts of this question:

   a) Use **two (2)** examples to explain **two (2)** differences between incidence and prevalence as measures of disease frequency. *(7 marks)*

   b) You have read a journal paper that reports a relative risk of 4.2.
   State, with justification, **two (2)** additional pieces of information that should be presented within the paper in order for you to accurately interpret this relative risk. *(8 marks)*

5. Discuss in detail the important factors that influence the extent of an epidemic of an infectious viral disease. *(15 marks)*

6. Answer **both** parts of this question:

   a) Use an example to explain how variation in the prevalence of a disease affects the interpretation of positive and negative test results in an individual animal. *(10 marks)*

   b) Explain the benefits **and** limitations of interpreting multiple tests in parallel, in a clinical setting. *(5 marks)*

7. Answer **both** parts of this question:

   a) Briefly describe a herd health program for an animal species/industry that you are familiar with. Explain in detail how data is collected and used in this herd health program including specific examples of performance or production indicies. *(7 marks)*

   b) Nominate **and** describe an economic method that could be used to evaluate if a change in management practice for the herd health program described in question 7a) is economically beneficial. Explain the basic steps and information needed to perform your economic analysis. *(8 marks)*

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8. As an epidemiologist, you are investigating the potential impact and control of an exotic disease on the livestock populations in your country.

Answer **all** parts of this question:

a) Nominate a disease **and** describe the basic structure of **one (1)** type of model.
(4 marks)

b) List the steps in the development of this type of epidemiological model.
(3 marks)

The model developed and implemented in question 8 a) shows that early identification is critical to the effective eradication of an outbreak of this exotic disease. As a result, you design a passive surveillance program to contribute to the early detection of this exotic disease.

c) Describe the key features of this program **and** discuss the limitations of using passive surveillance to support early detection of your nominated exotic disease.
(*8 marks)*

End of paper

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Paper 2

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

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

Answer **ALL <u>THREE (3)</u>** questions

Question 3 requires review of excerpts from the journal article provided.

Answer **<u>THREE</u>** questions each worth 40 marks.....total 120 marks

Paper 2: Veterinary Epidemiology

Answer all three (3) questions

1. You have a colleague working in clinical practice in a regional town in New Zealand. Her employer advocates 'drug A' for post-operative use in canine gastrointestinal (GIT) surgeries to reduce inflammation. Your colleague is certain that this use of 'drug A' is outdated and potentially dangerous, but her employer cites a case report of a dog that did well after surgery when treated with this drug.

   Answer **all** parts of this question:

   a) Discuss, using your understanding of the 'hierarchy of evidence', why case report evidence is inadequate to make a decision about the use of 'drug A' post-operatively for canine GIT surgeries. *(5 marks)*

   b) Identify a situation/scenario (this can be general), with justification, where a case report would be a more appropriate source of information. *(5 marks)*

   You are interested to know how many veterinarians are still using 'drug A' for the reduction of GIT inflammation in clinical practice in New Zealand. You decide to design a questionnaire to collect this information.

   c) What is the objective of this questionnaire? *(2 marks)*

   d) What information is necessary to estimate the sample size required for this questionnaire survey? *(3 marks)*

   e) Identify and fully describe (using the context outlined in this question) an appropriate sampling method for this particular survey. *(10 marks)*

   You decide that you would also like to reliably assess the usefulness of 'drug A' for reducing post-operative inflammation in canine GIT surgeries.

   f) Can you do this using the aforementioned questionnaire? Justify your answer. *(5 marks)*

   g) Describe **and** justify another study design that provides higher level evidence to investigate the usefulness of 'drug A' post-operatively in canine GIT surgeries. Compare the proposed study design to the aforementioned questionnaire with respect to level of evidence. *(10 marks)*

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2. You are investigating the cause of a newly-identified disease in dogs called jelly nail. This is a fictitious disease for the purposes of this examination.

You have received the following data from a cross-sectional study of 100 dogs.

- 60 dogs had jelly nail. 20 dogs with jelly nail are male and 40 are female.
- 40 dogs had no jelly nail. 30 of these are male and 10 are female.

Answer **all** parts of this question:

a) What is the prevalence of jelly nail? Calculate prevalence and confidence intervals for prevalence. Interpret the confidence interval. *(5 marks)*

Use the following formula for confidence intervals:

$$confidence\ interval = p \pm z\sqrt{\frac{p(1-p)}{n}}$$

Where: p = prevalence; n = sample size; z = 1.96

b) Prepare a contingency table (two-by-two table) and calculate a measure of association for the risk factor, by sex. Justify the measure of association used. Note: you are not required to calculate confidence intervals for this part. *(10 marks)*

c) What is your interpretation of the measure of association? *(5 marks)*

d) What additional information is required to demonstrate that sex is a cause of this disease? Provide a list of criteria required to demonstrate the cause of a disease. *(10 marks)*

e) A fellow researcher points out that the female dogs in your study are, on average, much older than the male dogs in your study. What issue does this raise in your mind about your results thus far regarding the association between sex and jelly nail? Explain how this issue would affect your results **and** describe how to control this issue. *(10 marks)*

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3. The excerpts in attachment 1 on the following page, are from a study examining a disease of unknown aetiology, 'Grass Sickness' in horses in the United Kingdom, (The Veterinary Journal 1998, 156:7–14. Wood JLN, Milne EM and Doxey DL). The disease causes extensive and severe degeneration of the enteric and autonomic nervous system. The disease is generally fatal and can only be diagnosed at post mortem. The disease has been identified in a number of countries and there are several hypothesised risk factors.

Answer **all** parts of this question:

a) What type of study is this? Discuss whether this is an appropriate study design for the investigation of this condition. What are the advantages of this study design? *(5 marks)*

b) Briefly outline **two (2)** other possible observational study designs for the investigation of risk factors for this condition. *(6 marks)*

c) Referring to the materials and methods of this study, identify any possible sources of bias. Discuss how the identified biases can affect the validity of the study results **and** provide suggestions for how these biases could be removed. *(18 marks)*

d) Referring to the printed text under 'Results', comment on the return rate. How does the return rate affect the study validity? What can be done to improve the return rate in a study? *(3 marks)*

e) Provide an interpretation of the findings in Table III under 'Time since field change', in plain English for a lay audience. Discuss briefly any concerns you have with the interpretations of the findings you have provided. *(8 marks)*

Attachment 1 over page

Attachment 1

The Veterinary Journal 1998, 156:7–14. Wood JLN, Milne EM and Doxey DL

Material and Methods

Study design
The study was carried out between 1992 and 1995. During this period, owners of cases or veterinary surgeons attending cases of grass sickness in the United Kingdom were asked to contact one of the authors. The study was publicised in the veterinary and lay equine press by local television and radio and by word of mouth. All data from outside this period were excluded.

Upon contact, the study was briefly explained to the owner or veterinary surgeon and they were sent a set of three uniquely numbered questionnaires, a covering letter and a reply paid envelope. The recipient was asked to complete one questionnaire for the case of grass sickness, one for a healthy animal on the same premises and one for a healthy animal on a different premises.

The questionnaires requested information on (1) the animal (age, breed, sex, height, body condition); (2) its recent management and use (stabled or not, type of use, whether the animal had recently moved between fields and, if so, when, type of grazing, supplementary feeding, anthelmintic and tetanus vaccination history); (3) details of the premises where the animal was being kept (type of premises, how long the animal had been there, whether grass sickness had previously occurred on the premises and, if so, when, whether the animal had been in contact with the previous case of grass sickness or in the same field in which a previous case had occurred, the number of animals on the premises, in the same field and also the field size); (4) details of the weather conditions in the previous 2 weeks and (5) if a case, how the disease had been diagnosed and whether the animal had survived. All answers were requested to reflect the date of clinical onset of the case.

Results

Descriptive and univariate analyses
Questionnaires were returned from 183 cases from 154 incidents. However, control data were only returned from 124 incidents, representing 135 cases and 226 controls. A control of 281 questionnaires sets had been sent out. Although the overall return rate was 55%, the useable return rate was 44%.

Grass sickness was diagnosed after *post mortem* in 40% of cases and by veterinary surgeons on clinical grounds after death in a further 43% of cases. The remaining 17% of cases survived and were diagnosed as having grass sickness by veterinary surgeons.

Excerpt continued over page

Table III: Final multivariate conditional logistic regression model of the probability of grass sickness in equids, using dead cases and all controls.

Variable	*β*	*S.E.β*	*P-value*	*O.R*	*95% C.I.*
Age:					
≥10 years	Referent	—	—	—	—
6–9 years	1.659	0.468	<0.001	5.3	2.1–13.2
3–5 years	2.039	0.473	<0.001	7.7	3.0–19.4
<3 years	1.569	0.529	0.003	4.8	1.7–13.5
Sex:					
female	-1.059	0.361	0.003	0.3	0.18–0.7
Time since grass sickness last occurred on premises	0.780	0.271	0.004	2.2	1.3–3.7
In contact with previous grass sickness	-2.758	1.43	0.05	0.06	0.003–1.0
Time since field change:					
>3 months	Referent	—	—	—	—
2–3 months	1.655	0.822	0.044	5.2	1.0–26.2
2 months	1.310	0.883	0.138	3.7	0.7–20.9
1 month	0.815	0.831	0.327	2.3	0.4–11.5
2–4 weeks	1.677	0.800	0.036	5.3	1.1–25.6
<2weeks	3.209	0.803	<0.001	24.8	5.1–120

End of paper