

## Meeting 15: Modelling and Risk Analysis

### Reading

#### *Modelling*

- Thrusfield 2<sup>nd</sup> Edn, pp 296-311 or 3<sup>rd</sup> Edn pp 340-356
- Hurd H, Kaneene J (1993) The application of simulation models and systems analysis in epidemiology: a review. *Prev Vet Med* 15: 81 - 99.

#### *Risk Analysis*

- McDiarmid S (1991) Risk analysis and the importation of animals. *Surveillance* 18(5): 8-11.
- Biosecurity Australia (2003) Import risk analysis handbook, Agriculture, Fisheries and Forestry– Australia, Canberra.
- Pharo HJ (2002) Foot-and-mouth disease: an assessment of the risks facing New Zealand. *New Zealand Veterinary Journal* 50(2): 46-55.
- MacDiarmid S and Pharo H (2003) Risk Analysis: assessment, management and communication. *Rev. sci. tech. Off. Int. Epiz* 22(2) 397-408

### Presentations

1. Examples of where simulation modelling has been useful in devising methods to control disease or enhance production in animals (e.g. foot-and-mouth disease, classical swine fever, UDDER, AusPIG).
2. Mathematical vs simulation models – advantages and disadvantages.
3. Deterministic vs stochastic models – advantages and disadvantages.
4. Terms used in risk analysis: hazards, risk assessment, risk management, risk communication. Applications, principles and components of risk analysis.
5. An overview of The Sanitary and Phytosanitary Agreement and The Technical Barriers to Trade Agreement from the Uruguay Round of World Trade Organisation negotiations.
6. Advantages and disadvantages of qualitative, semi quantitative and quantitative risk analysis methods.

### Exercises

1. List the potential disease hazards that should be considered when importing adult cattle from Australia into New Zealand. The following resources might be useful:
  - The HandiStatus page and the International Animal Health Code on the OIE web site: <http://www.oie.int>.
  - Various risk analyses on the MAF New Zealand web site: <http://maf.govt.nz>.
  - Market access and biosecurity documents on the Australian Government Department of Agriculture Fisheries and Forestry web site: <http://www.affa.gov.au>.
  - Disease status of Pacific Island countries - see the Secretariat of the Pacific Community web site: <http://www.spc.org.nc/>.

2. You have been asked to qualitatively assess the risk that Parma ham (from Parma, Italy) will be infected with classical swine fever at the point of import into your country. Consider the following information:

Pigs for Parma ham come from the Parma region of Italy. Classical swine fever is endemic in Italy. Experimental evidence suggests that classical swine fever virus is inactivated within Parma hams over a period of around 6 months. The minimum curing time for Parma ham is 12 months. Parma ham, as it will be imported into your country will be designated 'Prosciutto di Parma' and qualifies for official certification. Ham contains mainly muscle meat, and experimental studies show that classical swine fever virus is present in high concentrations in muscle.

Draw a diagram to outline the release risk pathway. For each step of the pathway, make an assessment of the probability that classical swine fever virus might be present. Make an overall assessment of the probability of the risk that Parma ham will be infected by classical swine fever virus at the point of import into your country. Set your results out in a transparent qualitative risk assessment format.

3. Using the concepts in the paper by Carpenter develop (on paper/whiteboard) a model for the spread of disease of an infectious disease relevant to your work. What inputs need to be included, what outputs would you like to generate and how could the model assist you to make decisions.

### Example exam questions

1. Briefly describe the essential features, applications and limitations of epidemiological simulation models (2005 written).
2. Using examples, write brief notes on the advantages and disadvantages of quantitative risk analysis models (2003 written).
3. As a government epidemiologist, you have been asked to undertake an import risk analysis for the importation of horse semen from South America. Describe how you would proceed (2002 written).
4. The risk of animal or zoonotic disease is an important consideration for countries importing agricultural products. Under the WTO-SPS Agreement, it is important that any restrictions placed on trade for animals, plant, or human health are based on international standards or on the outcomes of a scientifically sound import risk analysis. It is also important that countries considering health risks do so in a way that is consistent across all imports.
  - a. The OIE Terrestrial Animal Health Code (the Terrestrial Code) provides protocols relating to the management of the risks associated with a range of important diseases. The Terrestrial code also provides an explanation of the steps required for a scientifically sound import risk analysis, for those cases where disease-specific protocols do not exist or are not considered sufficient to meet an importing country's accepted level of risk. Explain the key steps in carrying out an import risk analysis, as described in the Terrestrial Code.
  - b. One of the questions facing import risk analysts is the decision to carry out a qualitative or quantitative assessment of likelihood. What do you see to be the advantages and constraints of each approach, and in what situations might each be most appropriate.

- c. A critical step in any import risk analysis is the evaluation of a risk estimate. What do you feel to be the important components of an import risk estimate? How might these components be combined? How might the import risk estimate be evaluated? IN answering these questions, consider methods or approaches for qualitative and quantitative components, as you see relevant.
- d. A final step in many import risk analyses is the specification of risk management options. What do you understand by the principle of 'least trade restrictive measures', and how would you ensure these are specified? What do you understand by the principle of equivalence?

### **Additional reading/resources**

- De Jong M (1995) Mathematical modelling in veterinary epidemiology: why model building is important. *Prev Vet Med* 25: 183-193.
- Nairn ME, Allen PG, Inglis AR, Tanner C (1996) *Australian Quarantine*, Department of Primary Industries and Energy, Canberra, ISBN 0 642 25971 2, pp 83 - 113.
- Noordhuizen J, Frankena K, van der Hoofd C, Graat E (1997) *Application of Quantitative Methods in Veterinary Epidemiology*. Wageningen Pers, Wageningen pp 247 – 270.
- Taylor N (2003) *Review of the use of models in informing disease control policy development and adjustment* (London, Defra). URL: <http://www.defra.gov.uk/science/documents/publications/2003/UseofModelsInDiseaseControlPolicy.pdf>
- Murray N (2002) *Import risk analysis: animals and animal products*. New Zealand Ministry of Agriculture and Forestry, Wellington New Zealand.
- Murray N (2004) *Introduction and Qualitative Risk Analysis, Vol 1*. Office International des Epizooties, 59 p.
- Murray N (2004), *Quantitative Risk Assessment, Vol 2*. Office International des Epizooties, 126 p.