Title post-conference workshop: "Design and Analysis of Transmission Experiments"

Workshop organizers:
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This workshop is organized jointly by the Quantitative Veterinary Epidemiology (QVE) group of Wageningen University, and the Central Veterinary Institute (CVI Lelystad). In the past decade, these groups have designed, carried out, and developed methods for analysing many experiments to quantitatively study transmission of various pathogens under different conditions. This vast amount of experience will be the basis of this course. A previous edition of this course was held in Wageningen in 2009 under the auspices of Epizone, with 25 participants, and received good evaluation marks.

1. Introduction

The course of infectious diseases in an animal population depends not only on the interaction between the individual host and the (infectious) agent but also on the contact patterns between hosts. When studying the effectiveness of control measures against infectious diseases it is therefore necessary to study their effect on the transmission in a population of hosts. It is not enough to establish a reduction of disease (symptoms) in individual animals (Velthuis et al., 2002 and 2007). For example, it is known that some species of birds vaccinated for Avian Influenza do not show disease symptoms but still shed virus in such quantities that transmission is possible (Van der Goot et al., 2007). Transmission can be quantified by the reproduction ratio, R_0 (Kroese and De Jong, 2001). This can be done in both experiments and field studies. Transmission experiments to e.g. study treatments or control strategies can be done on a small scale under controlled conditions, and are relatively less expensive and time-consuming than field studies (Velthuis et al., 2002 and 2007). Moreover, transmission of agents that cannot be studied in the field (e.g. notifiable diseases that are absent) can be studied via this way. It is possible to quantify effects of e.g. vaccination on transmission dynamics in a population of known characteristics (Velthuis et al., 2002 and 2007; Van der Goot et al., 2005). Transmission experiments are of importance for both studying control measures in the veterinary field as well as in animal models meant for human medicine (Kroese and De Jong, 2001).

The aim of this course is to increase knowledge on biological and mathematical aspects of transmission experiments. The design and (statistical) analysis of transmission experiments are the main subjects of the course.

2. Aimed for the following participants

This course/workshop is primarily aimed at professionals working in the field of veterinary microbiology, bacteriology, virology, and epidemiology who are interested in carrying out or are involved in (transmission) experiments with infectious diseases. The course/workshop is also suitable for both Masters and PhD students with an interest in the above-mentioned areas.

3. Assumed knowledge on

Experience with basic statistics (up to basic knowledge on the application of logistic regression) and using the spread-sheet programme Excel is required.

4. Aims

After following this course, the participant should be able to design transmission experiments, to do basic analyses and interpret the outcomes of transmission studies and to evaluate relevant literature.

5. Contents

Within this advanced course several aspects of transmission experiments will be dealt with, like biological and statistical aspects of the study design, the quantification of transmission by the reproduction ratio, R_0, and the transmission rate parameter β and to test whether R_0 and/or β differ between treatments with basic statistical approaches developed specifically for transmission studies, and how to interpret the results.

6. Course elements

This course consists of lectures, and intensively supervised computer practicals. Participants are required to bring laptops, which runs MS Excel.

7. Time and Course Schedule: ISVEE post-conference 27-29 August (3 days)

Day 1*

- Registration
- Short introduction
- Lecture by Mart de Jong/Thomas Hagenaars: "Introduction to biological and mathematical aspects of transmission" (Ch. 1)
- Lecture by Mart de Jong: "SIR modelling: basics" (Ch. 2)
- Lecture by Mart de Jong: "SIR modelling: continued I" (Ch. 2)
- Computer practical "SIR modelling": Mart de Jong, Thomas Hagenaars, Lisette Graat
- Presentation by Phaedra Eblé: "Examples of transmission experiments in pigs and cattle"

Day 2*

- Computer practical "SIR modelling": Mart de Jong, Thomas Hagenaars, Lisette Graat
- Lecture by Mart de Jong: "SIR modelling: continued II" (Ch. 2)
- Computer practical "SIR modelling": Mart de Jong, Thomas Hagenaars, Lisette Graat
- Lecture by Mart de Jong: "Final size analysis for pair experiments" (Ch.3)
- Computer practical: "Calculation of final size for pair experiments": Mart de Jong, Thomas Hagenaars, Lisette Graat
- Presentation by Phaedra Eblé: "Quantification of experimental transmission of FMDV in pigs"

Day 3*

- Lecture by Thomas Hagenaars: "Final size analysis for experiments larger than pair experiments" (Ch. 3)
- Computer practical: "Final size analysis for group experiments": Thomas Hagenaars, Mart de Jong, Phaedra Eblé, Lisette Graat
- Lecture by Thomas Hagenaars: "Analysis of longitudinal data" (Ch. 3)
- Computer Practicals: "Analysis of longitudinal data, pair-wise experiments", "Analysis of longitudinal data, group experiments", "Constructing input tables for GLM-like analyses, running and interpreting output of GLM routines in standard statistical packages": Thomas Hagenaars, Mart de Jong, Phaedra Eblé, Lisette Graat
- Presentation by Phaedra Eblé: "Practical implications when designing transmission experiments"
- Closing Session/Evaluation

***Break times**

10.30-11.00: Coffee/tea
12.30-13.30: Lunch
15.00-15.30: Coffee/tea

8. Fee

Workshop will cost € 1775, and includes coffee/tea and lunches. A minimum number of 15 participants is required, with a maximum of 25 participants.

9. Literature

J. A. VAN DER GOOT, G. KOCH, M. C. M. DE JONG and M. van BOVEN (2005). Quantification of the effect of vaccination on transmission of avian influenza (H7N7) in chickens. *Proceedings of the National Academy of Sciences of the USA,* **102**, pp 18141-18146

J. A. VAN DER GOOT, M. van BOVEN, G. KOCH, M. C. M. DE JONG and M. van BOVEN (2007). Variable effect of vaccination against highly pathogenic avian influenza (H7N7) virus on disease and transmission in pheasants and teals. *Vaccine,* **25**, pp 8318-8325

A. H. KROESE and M. C. M. DE JONG (2001). Design and analysis of transmission experiments. In: Proceedings of the Society for Veterinary Epidemiology and Preventive Medicine, 28-30 March 2001, Noordwijkerhout, The Netherlands (Eds. F.D. Menzies and S.W.J. Reid). pp xxi-xxxvii

A. G. J. VELTHUIS, M. C. M. DE JONG, J. DE BREE, G. NODELIJK and M. VAN BOVEN (2002). Quantification of transmission in one-to-one experiments. *Epidemiology and Infection,* **128**, pp 193-204

A. G. J. VELTHUIS, A. BOUMA, W. E. A. KATSMA, G. NODELIJK and M. C. M. DE JONG (2007). Design and analysis of small-scale transmission experiments with animals. *Epidemiology and Infection,* **135**, pp 202-217

For questions about this workshop please contact Mart de Jong of the Quantitative Veterinary Epidemiology Group, tel.+31(0)317- 483120. E-mail: Mart.deJong@wur.nl