Looking forward from FMD epidemiology to FMD ecology

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Two Paradigms

Epidemiology and Ecology

– Epidemiology describes risks of disease in a population.
– Ecology describes interactions among populations including, but not limited to disease.
Similarities

- Both provide information about a disease.
- Both can provide information about control.
- Both can be descriptive or analytic.
- Both summarize results as they apply to the population(s).
Differences

• Ecology provides context and for epidemiology.
• Ecology has more inherent complexity and non-linearity.
• Ecology is mechanistic while epidemiology is statistic.
Ecological Studies – Virus and Host

Current Questions in FMDV Transmission

• What is the role of movement in disease transmission?
• What are carriers and how do they contribute to disease transmission?
• Where and how do wildlife spread disease?
• If we control clinical disease does subclinical disease still spread significantly?
• Do co-circulating strains and/or serotypes enhance or reduce each other’s effects?
• How do human dimensions (economics, compliance, motivation for control, regulatory decision-making) influence transmission and how can we influence them?
What can ecology tell us?

Land Use

Pictures from Paul Scholte and Mark Moritz
What can ecology tell us?

Water Management and Human Health

Pictures from Jessica Healy Profitos
What about FMD(V)?
Case Study 1 – The Role of Movement in Cameroon

Risk of disease due to transhumance

- Bronsvoort et al. 2004 – odds ratio 2.6
- Garabed et al. (2010 data) – relative risk 1.32
Modeling dynamic transmission
(not yet published)

Differences in reproductive parameters can explain some differences in risk.

Work with Patrick Schnell, Yibo Shao, and Joseph Tien
Movement accounts for an average of 10.8% of the incidence in endemic models.
The difference in incidence is not statistically significant when accounting for variation among simulations.
Case Study 2 – Human Dimensions of FMD in the UK

Pictures from bbc.co.uk and telegraph.co.uk
Effects of humans on FMD


Uses actual mechanisms of human behavior, animal movement, and species differences (all interacting) in key inferences and conclusions.
Effects of FMD on humans

The Economy-Wide Effects of Foot and Mouth Disease in the UK Economy
Adam Blake, M. Thea Sinclair, Guntur Sugiyarto

Psychosocial effects of the 2001 UK foot and mouth disease epidemic in a rural population: qualitative diary based study
Maggie Mort, Ian Convery, Josephine Baxter, Cathy Bailey

Death in the wrong place? Emotional geographies of the UK 2001 foot and mouth disease epidemic
Ian Convery, Cathy Bailey, Maggie Mort, Josephine Baxter
Human Dimensions of FMD

The interactions of humans and FMD

– Adaptive decision-making
– Modeling the complete social-ecological system
Methods We Need

• Looking across scales
  – Hierarchical models
  – Differential equation models
  – Agent-based models

• Looking at feedback, adaptation, and endogeneity
  – Emergent simplicity
  – Emergent complexity
  – Perturbations to the system
Teams We Need

• Quantitative and qualitative
• Virology, genetics, and immunology
• Movement from the geographic perspective and movement from the human perspective
• Policy, economics, and psychology
• Wildlife and livestock
• Anthropology and other social sciences
• International
• Communicators (translators within teams)
Data We Need

• Some questions are theoretical questions that do not require data.
• Wide-spread animal tracking and large scale surveillance have a place.
• Data from controlled laboratory studies.
• Small scale detailed data that looks at all of the complexity is needed.
Summary

• Epidemiology is about risk and ecology is about interactions.
• Both are needed in FMDV research.
• Questions like the role of movement and human dimensions of FMD need to be examined under the ecological paradigm.
• New multi-scale models and interdisciplinary teams are needed to answer these questions.
• We also need small-scale, high-resolution data.
What does this mean for me?

• Make a new friend here today.
• Make the effort to understand other disciplines and settings.
• If you are doing a study consider including additional questions, tests and samples.
• Support data collection at all scales.

Think Ecologically!
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