Computational Sustainability
On Friday March 12, 2010 at 1:25PM to 2:40PM, 1150 Snee Hall

Optimizing intervention strategies in food animal systems: modeling production, health and food safety

1. **Optimal Clinical Mastitis Management in Dairy Cows**

Objective:
To determine the economically optimal amount of information needed to make mastitis treatment decisions.

References:

1. Bar D, Tauer LW, Bennett G, González RN, Hertl JA, Schulte HF, Schukken YH, Welcome FL, Gröhn YT. 2009. Use of a dynamic programming model to estimate the value of clinical mastitis treatment and prevention options utilized by dairy producers. *Ag Systems* 99: 6-12.
2. Bar D, Tauer LW, Bennett G, González RN, Hertl JA, Schukken YH, Schulte HF, Welcome FL,
Gröhn YT. 2008b. The cost of generic clinical mastitis in dairy cows as estimated using dynamic programming. *J Dairy Sci* 91: 2205-2214.
3. Gröhn YT, Rajala-Schultz PJ, Allore HG, DeLorenzo MA, Hertl JA, Galligan DT. 2003. Optimizing replacement of dairy cows: modeling the effects of diseases. *Prev Vet Med* 61: 27-43.
4. Kristensen AR and Jorgensen E. 2000. Multi-level hierarchic Markov processes as a framework for herd management support. *Ann Operations Res* 94: 69-89.
5. Kristensen AR. 2003. A general software system for Markov decision processes in herd management applications. *Computers and Electronics in Agriculture* 38: 199-215.

2. **Cost Effective Control Strategies for The Reduction of Johne's Disease on Dairy Farms**

Objective:
To examine the economic effect of current control strategies used for Johne's Disease and to define economically optimal control strategies.

References:

1. Mitchell, R.M., Whitlock, R.H., Stehman, S.M., Benedictus, A., Chapagain, P., Gröhn, Y.T.,
and Schukken, Y.H.: Simulation modeling to evaluate the persistence of Mycobacterium avium subsp. paratuberculosis (MAP) on commercial dairy farms in the United States. Prev Vet Med, 2008, 83: 360-380.
2. Lu, Z., Mitchell, R.M., Smith, R.L., Van Kessel, J.S., Chapagain, P.P, Schukken, Y.H., and
Gröhn, Y.T.: The Importance of Culling in Johne's Disease. J. of Theoretical Biology. 2008, 245: 135-146.

3. **Develop, evaluate and improve food animal systems-based mathematical models of antibiotic resistance among commensal bacteria**

Objective:
To provide a theoretical framework upon which to assess and optimize interventions designed to reduce the dissemination of antibiotic resistance in animal agriculture systems.

References:

1. Lanzas, C., Brien, S., Ivanek, R. Lo, Y., Chapagain, P., Ray, K.A., Ayscue, P., Warnick., L.D.,

   and Gröhn, Y.T.: The effect of heterogeneous infectious period and contagiousness on the dynamics of *Salmonella* transmission. Epidemiology and Infection. 2008, 136, 1496-1510.

2. Lanzas, C., Warnick., L.D., Ivanek, R., Ayscue, P., Nydam, D., McDonough, P., and Gröhn, Y.T.: The risk and control of *Salmonella* outbreaks in calf-rearing operations. Veterinary Research. 2008: 39:61.

3. Ayscue, P., Lanzas, C., Ivanek, R., and Gröhn Y.T.: Modeling *Escherichia coli* O157:H7

   Population Dynamics in Feedlots. Foodborne Pathogens and Disease. 2009. 6: 461-470.

4. Lanzas, C., Ayscue, P., Ivanek, R., Gröhn, Y.T.:. Model or meal? Animal agriculture systems

   as models for infectious diseases of humans. Nature Reviews, Microbiology. 2010, 8: 139-148.