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Impacts and Control of Insidious Infectious Diseases – Beat Them Before They Beat You and Your Clients

***Mycobacterium avium* subspecies *paratuberculosis*, *Neospora caninum*, Bovine Leukemia Virus, and Bovine Viral Diarrhea Virus in Dairy Cattle**

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Bovine viral diarrhea, enzootic bovine leukosis, Johne's disease, and neosporosis are insidious infectious diseases found on many dairy farms in most parts of the world. Strict biosecurity measures can prevent introduction of these diseases to farms. However, infected farms have to deal with potentially large direct and indirect productivity losses, requiring a variety of control measures to eliminate transmission, as discussed.

Infection with bovine leukemia virus (BLV), bovine viral diarrhea virus (BVDV), *Mycobacterium avium* subspecies *paratuberculosis* (MAP), and *Neospora caninum* (NC), the causative agents of enzootic bovine leukosis (EBL), bovine viral diarrhea, Johne's disease (JD), and neosporosis (NEOSP), respectively, are found on many cattle farms world-wide. The World Trade Organisation's new trading rules state that health certification standards for imported cattle, semen and embryos cannot exceed those required under domestic regulatory programs.⁸ All 4 have been used to limit international trade. As a result, there is renewed interest in many countries to determine the prevalence, regional distribution and productivity effects of these diseases (both clinical and subclinical) on their cattle industries, and to determine how these infectious diseases can be effectively controlled.

These 4 agents have a number of common features. Infection frequently occurs in utero or in the young calf, usually leading to life-long infection, with no effective treatment. These persistently infected animals usually appear normal for much of their life, but shed and transmit the agent to their progeny and/or other cattle in their environment. Some of these persistently infected cattle will develop clinical signs of disease, which can lead to their death or the death of their offspring. Lab testing is required to identify these subclinically infected cattle. As a result of these common features, similarities in their control exist, leading to their discussion together in this paper.⁶

The extent of control efforts for infectious diseases is usually directly proportional to the perceived impacts, both at the national level, but also at the farm level. While clinically affected cattle with these agents have fairly clear productivity costs associated with their

condition, even subclinically infected animals can suffer significant productivity losses. Direct productivity losses include reduced milk production, mortality, weight loss, premature culling, growth retardation, reproductive loss and treatment costs. There have been estimates of the economic impacts of various infectious diseases in other countries.¹ In Canada, we have recently conducted a systematic economic assessment of the impact of these 4 diseases.² Total annual direct costs for an average, infected, 50 cow herd were: JD \$2,472; BVD \$2,421; neosporosis \$2,304; EBL \$806. The breakdown of these direct costs, along with a list of other indirect costs is summarized in Table I.

Strict biosecurity measures can prevent introduction of these diseases to farms. These are discussed by Jim Cullor.³ Control efforts for infected farms include the following categories: identification of infection levels; reducing the reservoir of agent in the farm environment; eliminating agent transmission, and enhancing resistance to infection, as provided in Table II. Identification of infected cattle requires careful consideration of the purpose of testing, the target group, and the quality and cost of the tests available in order to develop a testing strategy that is appropriate for a particular disease. Table III provides information to assist in this process. Written details of control strategies for these 4 diseases cannot be provided in a brief proceedings paper such as this, but will be summarized in the presentation, clarifying these two tables.

Observational^{5,7} and simulation⁴ studies are evidence that without an active disease control program, the extent and costs of these infections are likely to rise among infected herds and the industry as a whole.

Abstract

Les infections causées par *Neospora caninum*, *Mycobacterium avium* subspecies *paratuberculosis*, le virus de la diarrhée virale bovine, et le virus de la leucémie bovine sont fréquentes presque partout dans le monde. La biosécurité peut prévenir l'introduction de ces maladies dans les fermes. Cependant, les fermes infectées ont des pertes directes et indirectes de productivité, nécessitant une série de mesures de contrôle pour éliminer la transmission.

Selected References (abbreviated to meet space requirements)

1. Bennett R, Christiansen K, Clifton-Hadley R. Preliminary estimates of the direct costs associated with endemic diseases of livestock in Great Britain. *Prev Vet Med* 1999; 39:155-171.
2. Chi J, VanLeeuwen JA, Weersink A, Keefe GP. Direct production losses and treatment costs from bovine viral diarrhoea virus, bovine leukosis virus, *Mycobacterium avium* subspecies *paratuberculosis*, and *Neospora caninum*. *Prev Vet Med* 2002; 55(2):137-153.
3. Cullor J. Applied biosecurity for dairy farms. Proceedings 23rd World Buiatrics Congress 2004.
4. Groenendaal H, Nielen M, Jalvingh AW, Horst SH, Galligan DT, Hesselink JW. A simulation of Johnne's disease control. *Prev Vet Med* 2002; 54:225-245.
5. Keefe GP, VanLeeuwen JA. Neospora then and then and now: prevalence of *Neospora caninum* in 1979, 1989, and 1998. *Can Vet J* 2000; 41:864-866.

6. Smith B. Large Animal Internal Medicine: Diseases of Horses, Cattle, Sheep, and Goats. C. V. Mosby Company, St. Louis, Missouri, USA. 1996.
7. VanLeeuwen JA, Keefe GP, Tremblay R, Power C, Wichtel JJ. Seroprevalence of infection with Johne's Disease, Enzootic Bovine Leukosis, and Bovine Viral Diarrhea in Maritime dairy cattle. Can Vet J 2001; 42:193-198.
8. World Trade Organization. Final Act of the 1986-1994 Uruguay Round of trade negotiations. http://www.wto.org/english/docs_e/legal_e/ursum_e.htm . 1994.

Table I. Conservative annual costs (CDN\$) of each disease in positive herds (50 cows)

Costs	BVDV	BLV	MAP	NC
Direct Production Losses (L)				
1. Milk yield	0?	0?	355	0?
2. Premature culling/reduced cull value	1,025	0?	1,330	408
3. Mortality	935	775	263	0
4. Abortion & reproductive loss	406	0	514	1,774
Total Direct Production Losses	2,366	775	2462	2,182
Direct Treatment Costs (T)				
1. Veterinary services	32.2	18.6	6.3	72.0
2. Medication cost	19.6	11.3	3.8	43.8
3. Extra labour	3.4	2.0	0.66	7.6
Total Direct Treatment Costs	55.2	31.9	10.8	123.4
Total Direct Herd-Level Costs (L+T)	2,422	807	2,473	2,305
Indirect Costs (hard to quantify)				
Loss of sales to export market	*	*	*	*
Loss of sales to AI industry	*	*	*	
Loss of sales to ET industry		*?	*	*?
Loss of consumer confidence?		?	*?	?
Opportunity costs of lab testing	*	*	*	*

Table II. Major aspects to controlling spread of infection within infected herds

Control Measures	BVDV	BLV	MAP	NC
I. Identifying Infection Levels (problem extent)				
Lab testing to identify infected live animals	**	**	*	**
Lab testing to identify infected dead animals	**	*	*?	
Lab testing to identify infected fetuses	**			**
II. Reducing Reservoir of Agent on Farm				
Canid access to feed/fetus/placenta control				**
Wildlife access to cattle manure and calves			*	
Segregation of all clinically affected cattle	**		**	
Culling of persistently infected cattle (if feasible)	**	**	**	*
III. Eliminating Transmission Pathways				
Blood products transfer minimization	**	**		
Selective colostrum administration or heat-treat		*	**	
Selective milk administration or heat-treat		*	**	
Hygiene/bedding – reduce fecal-oral transfer	**		**	
Special calf management in maternity pen		*	**	
Fly control – integrated pest management		*	*?	
Rat control – integrated pest management			*?	
Feed/water hygiene, handling and access control			*	*
Selective breeding – not test-positives (if feasible)		*	*	**
Recipient selection for embryo transfer		**	*	**
Population density in barn		*		
IV. Bolster Resistance Against Infection				
Vaccination	**	?	*?	*?

Table III. Recommended tests for identification of infected animals

Testing	BVDV	BLV	MAP	NC
I. Group live animal testing				
Pooled fecal culture			**	
Pooled serum testing for antibodies	*	*		*
Pooled blood testing for antigen	**	*		
Bulk milk testing for antibodies	*	*	*?	*
Bulk milk testing for antigen	**	*	*?	
II. Individual live animal testing				
Fecal culture			**	
Serum testing for antibodies	**	**	*	**
Blood testing for antigen	**	*		
Milk testing for antibodies	*	*	*?	*
Milk testing for antigen	**	*		
Immunohistochemistry	**			
III. Individual animal post-mortem testing				
Culture of ileum or ileocecal lymph nodes			**	
Immunohistochemistry	**			**
Virus Isolation	**	**		