

A BAMN Publication

BIOSECURITY ON DAIRIES



This guide is published by the Bovine Alliance on Management and Nutrition (BAMN), which is composed of representatives from AABP (American Association of Bovine Practitioners), ADSA (American Dairy Science Association), AFIA (American Feed Industry Association), and USDA (United States Department of Agriculture). BAMN's charge is to assist the cattle industry with management practices designed to control infectious disease.

INTRODUCTION TO BIOSECURITY

While there are many ways to prevent and control cattle disease, management is increasingly recognized as a key factor. Biosecurity is one management strategy that producers can view as insurance from disease. Implementing biosecurity practices on a dairy can increase profitability by reducing clinical disease and improving production efficiency. Controlling disease will reduce risk with minimal cost.

BIOSECURITY RISK ANALYSIS SCHEME

To plan an effective biosecurity program, a risk analysis scheme is needed. This scheme has 3 stages:

- 1) **Risk assessment** helps identify what problems exist, determines how large the problem is and how likely a problem can occur in the future.
- 2) **Risk management** is the design and implementation of a prevention plan.
- 3) **Risk communication** is explaining the plan to the management team, suppliers and customers to ensure buy-in and implementation.

The objective of this paper is to discuss the steps in the risk assessment stage.

RISK ASSESSMENT

A goal for most dairy producers is to profitably and sustainably produce high quality, safe milk and meat products. Several factors can lead to chemical (pesticides, antibiotics, and other drugs) or infectious contaminants, lowering the quality or safety of milk and meat. Some of these risk factors include new animal introductions, people, feed, water, manure, farm equipment and tools, drugs or environmental sources. Through a concerted effort, the public health risk from chemical agents has been greatly reduced. However, the risk of foodborne diseases of microbial origin, such as *E. coli* 0157, *Salmonella spp.* and *Listeria* can still be reduced. Identifying risk factors for diseases is important to allow you to better control treatment costs and animal losses. It is also important to ensure that a safe product is always sold to market.

Are you a registered herd that sells cattle, semen and embryos to other dairies throughout the country?

Do your animals have fence line contact with other animals, your neighbors animals or with wildlife?

Do deer, pigeons, dogs, rats or other animals have access to the dairy?

Are you a commercial dairy that buys replacement animals from the sale ring or do you buy directly from dairies where you know the health status of their cattle?

Do you sell to a raw milk fluid plant or to a powder/cheese plant that pasteurizes their milk?

The answer to each of these questions determines where you may have market risks or how diseases may enter or leave your herd.

For infectious diseases on dairy operations, risk assessment should include the following 4 steps:

- 1) **Identifying what products are sold** from the dairy now and what will be in the future. Sales will likely include milk and beef (from cull cows and calves) and can include sale of semen, embryos, and replacement heifers.
- 2) **Identifying and prioritizing the risk of infection** or disease outbreak and the consequence of the disease relative to the dairy's goals.
- 3) **Evaluating how diseases are introduced** to the dairy.
- 4) **Evaluating ways to implement a biosecurity program** that meets the specific goals of your dairy.

STEP I: Identify products and their value:

For example, dairy operations selling semen or embryos are much more concerned about bovine leukosis (BLV) and bluetongue because of international trade restrictions for these diseases. For commercial dairies, diseases resulting in production losses or premature culling (contagious mastitis, Johne's disease, BVD, *Salmonella spp.*) take higher priority.

STEP II: Identify and prioritize risk:

Four high risk infectious diseases for dairy operations are the following: *Mycobacterium paratuberculosis* (Johne's disease), Bovine Virus Diarrhea (BVD), *Salmonella spp.* species, and contagious mastitis. These and other key dairy-related diseases, were recently ranked by importance to the U.S. dairy industry (Table 1).

Table 1. Key dairy health conditions prioritized by production loss, human health risk (zoonotic potential), and international trade¹

Disease/Pathogen	Production Loss	Zoonotic Potential	International Trade (OIE List ²)
Mastitis	+++		+
<i>Salmonella spp.</i>	+	++	+
Johne's disease	++	?	+ (List B)
Bovine viral diarrhea	++		+
Reproductive diseases	++		
Lameness	+++		
Metabolic disease	+++		
<i>Cryptosporidium parvum</i>	+	++	
<i>Campylobacter jejuni</i>		++	
<i>Mycobacterium bovis</i>		+	+ (List B)
Bovine leukosis virus	+		+ (List B)
<i>Brucella abortus</i>		+	+ (List B)
BSE		?	+ (List B)
Bluetongue			+ (List A)
Vesicular stomatitis	+		+ (List A)

¹ Relative ranking with +++ being more important than ++ or +
² OIE = Office International des Epizooties, with representation from member countries, which has designated lists of transmissible diseases based on the potential for spread and economic or public health consequences. List A diseases have the potential for very serious and rapid spread and for serious socioeconomic or public health consequences, and List B diseases are considered to have socioeconomic or public health consequences within countries, but are less serious in nature than List A diseases.

(Modified from S. Wells. 1998. J. Dairy Sc. 81: 3029-3035)

STEP III: How do diseases enter the dairy:

Evaluating how diseases are introduced to the dairy differs for each disease. Ways that *Staphylococcus aureus*, Johne's disease, BVD and *Salmonella spp.* are spread are presented in Table 2.

Table 2. Transmission of key bovine pathogens

	<i>Staphylococcus aureus</i>	Johne's disease	BVD	<i>Salmonella spp.</i>
Transmission via:				
Fecal-oral		X	X	X
Nasal secretions/saliva	?		X	X
Milk	X	X	X	X
In utero		X	X	X
Sexual			X	
Incubation period	Days-months	Years	5-10 days	1-4 days
Duration of clinical disease	Days-years	Weeks-months	2 weeks	1-7 days
Duration of shedding	Days-years	Months-years	10-14 days	Weeks-months
Survival in environment	?	Months-years	Up to 14 days	Months
Growth in environment	Yes?	No	No	Yes

STEP IV: How to implement a dairy specific plan for disease control:

Table 3 shows important ways that contagious mastitis (*Staphylococcus aureus*), Johne's, BVD and *Salmonella spp.* move from one dairy to another (between-herd transmission) or spread within a single dairy (within-herd transmission). Both within herd and between-herd transmission needs to be considered for a control program to work. For instance, the introduction or return of cattle is an important risk factor for all four of these diseases. While isolation or quarantine of newly arriving cattle (purchased or reintroduced) is beneficial for preventing introduction of most BVD, *Salmonella spp.*, and contagious mastitis into the dairy herd, it is not very helpful for preventing Johne's disease.

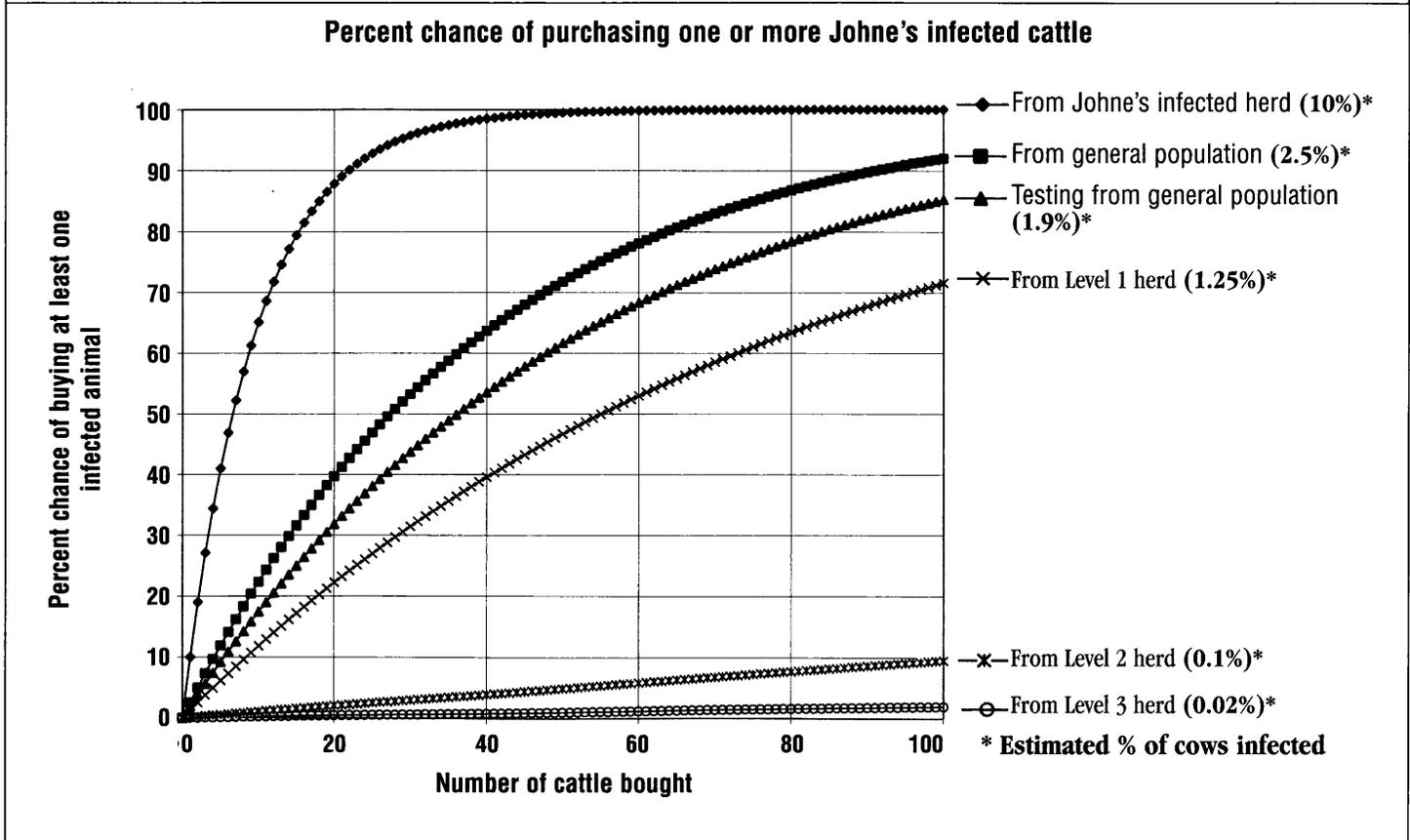
Table 3. Control of important disease on dairy farms.

	<i>Staphylococcus aureus</i>	Johne's	BVD	<i>Salmonella spp.</i>
KEY BETWEEN-HERD RISK FACTORS				
1. Bringing new cattle to a herd	X	X	X	X
2. Failure to quarantine cattle			X	X
3. Failure to require disease testing before introducing cattle	X	X	X	X
4. Failure to require vaccination before introducing cattle			X	
5. Allowing cattle to return from fairs and shows	X		X	X
6. Allowing other animal contact with cows, feeds, or water		?	X	X
7. Spread through people, vehicles, or equipment	X	X	X	X
KEY WITHIN-HERD RISK FACTORS				
1. Using multiple cow maternity housing		X		X
2. Using calving area for sick cows	X	X		X
3. Failure to separate sick from healthy cows	X	X	X	X
4. Using manure-handling equipment to mix feed or feed cows		X		X
5. Manure-contaminated drinking water		X		X
6. Feeding contaminated feeds		X		X
7. Feeding unpasteurized whole milk, waste milk or colostrum to calves.	X	X	X	X
8. Animal contact with cows, feed, or water		X		X
9. Failure to vaccinate			X	
10. Allowing spread via people, vehicles, or equipment	X	X	X	X
11. Teat dip, dry cow treatment, and udder hygiene	X			

When considering biosecurity measures, it is important to determine the costs and benefits of management changes being considered. One might consider the use of various management practices by others in the industry, especially those of similar herd size. One source for this information is from the USDA National Animal Health Monitoring System (NAHMS), which in 1996 conducted a national dairy cattle health study. Results can be located on their webpage at <http://www.aphis.usda.gov/vs/ceah/cahm> under dairy.

Considering the health status of purchased cattle and of the herd of origin is one way to reduce the risk of introducing disease on farm. For Johne's disease, preventing the spread of this disease will have limited benefit if you continually reintroduce infected cattle with purchased cattle.

Figure 1. The probability of purchasing one or more cows infected with the agent of Johne's disease as increasing numbers of cattle are purchased from various sources.



An example of the risk of introducing Johne's disease to a herd by the number of cattle introduced from different sources is shown in Figure 1. As expected, the risk of introducing the disease on a farm increases greatly as the level of infection in purchased cattle increases. The probability estimates of introducing infected cattle are generated from the U.S. Voluntary Johne's Disease Herd Status Program for Cattle (details can be located at <http://www.usaha.org/reports98/r98js2.html>). Estimated prevalence of infection from Johne's positive herds (10%), general population (2.5%), testing from the general population of dairy cows and removing ELISA test positive cattle (1.9%), Level 1 Herd Status Program (1.25%), Level 2 Herd Status Program (0.1%) and Level 3 Herd Status Program (0.02%). Adapted from David Smith, University of Nebraska, Lincoln.

In summary, effective biosecurity is not a "one-size-fits-all" proposition. It is important for each dairy enterprise to undertake a risk analysis process for the farm, and use it to design and implement the appropriate management plan. The complexity of the plan depends upon the disease pathogen and level of risk reduction desired. Effective steps in disease control include the following:

1. Determining the critical goals and products of the dairy.
2. Identifying and prioritizing key diseases on each operation.
3. Evaluating risks for transmission of diseases on each operation.
4. Evaluating changes needed to implement a disease control (biosecurity) program.

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