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Biosecurity Risk Assessment of the Fairchild Dairy Nutrition Research Center

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Honors Thesis

Biosecurity Risk Assessment of the Fairchild Dairy Nutrition Research Center

Definition

Biosecurity is a system of management practices used to protect animals from infectious agents externally or internally. The management of risks related to infectious agents arriving from locations off the dairy farm fall under external biosecurity whereas the management of risks related to infectious agents that are already present on the premises is characterized as internal biosecurity. The latter is usually associated with the transmission of infectious agents from older animals to younger ones.

Introduction

The Fairchild Dairy Nutrition Research Center (DNRC) is part of the New Hampshire Agricultural Experiment Station and the College of Life Sciences and Agriculture at the University of New Hampshire. Each year about 3,000 people visit the Fairchild Center not including over 10 classes of students, faculty, staff and researchers. This amount of traffic invariably leads to various transmissions of infectious and non-infectious agents that could be fatal to the animals at the Fairchild Dairy Nutrition Research Center and to the surrounding communities. Effective biosecurity practices are vital to the Fairchild Dairy Nutrition Research Center.

Biosecurity Risk Assessments are used to determine specific areas that might be lacking in protection for all parties involved. The Risk Assessment of the Fairchild Center included numerous visits with Jon Whitehouse, the manager, as well as with Dr. Dean Elder, Animal Resource Officer.

Low Risk Assessments

As you enter the facility, the initial risk is low. Transmission can occur in many areas of transportation. Any car or truck entering or leaving the property could act as a vector for pathogens specifically on the tires. The specific vehicles to be concerned most about are the milk truck, manure truck, and feed truck. These vehicles usually visit multiple farms every day and could therefore carry many pathogens to and from the Fairchild Center. Presently, every time the milk is picked up, the milk tank is sanitized to prevent bacterial growth within the tank and any bacteria that might have been transferred from the truck to the tank during emptying. The manure truck does not come into direct contact with the animals but there could still be a risk.

Any feed that is commercially bought and delivered to the Fairchild Center, is not in direct contact with the herd. Most feed is self contained and packaged and is inspected before using ruling out feed that might be contaminated. Blood meal and minerals fall under this category.

If any Mostly Mixed Grass silage (**MMG silage**) that is grown and produced on the property could also act a vector when stored in the silos and fermented. The silo environment is optimal for the growth of most pathogens. For every load that is packed at the Fairchild Center, a sample is taken and analyzed for nutrient contents. This can also act as a means for screening the MMG silage just using observational methods such as sight and smell. Some fungi found in fermented feed, *Aspergillus* spp. and *Penicillium* spp. can invade grain after harvest and produce mycotoxins of which can be carcinogenic or immunosuppressant. These mycotoxins have been

detected in milk before, although the transmission is not completely understood. (orriss) If not properly packed for storage, it provides animals with the opportunity to feed.

As MMG silage is slowly emptied into the hoppers, another means of contamination is present. Each hopper is open at all times providing an opportunity for bacterial growth and providing an ideal feed source for wildlife. Many birds will come to know the overhead rafters above the hoppers as their home, eating and defecating in the hoppers. The feed is then directly dumped into the data ranger providing another area of contamination. Due to the constant use of the hoppers as well as the data ranger, it is continuously checked for abnormalities but there is no current cleaning procedure to sanitize or decontaminate these specific areas.

When the feed is mixed and distributed from the data ranger to the feed bunks, risk is generally low due to a few rules set forth by the management. There are separate shovels, and brooms for feed and manure that are clearly marked. Staff is not allowed to walk in the feed bunks preventing fecal to oral contact from the staff to the cow.

The risk assessment of feed-borne pathogens is low due to the knowledge of where the feed is originally grown or produced and the methods of distributing it to the herd. Following a thermal death curve for predicted pasteurization related organisms can decrease the risk (Gay)

Town water is the main source for the Fairchild Center. Weekly reports are distributed to consumers providing them with results of water testing. As long as the results are negative, the risk is low. The main water main and pipe lines must be routinely checked for damage as water is a very fast method of transmission. As the water enters the facility, there are a variety of methods to which it reaches each individual cow. In the main barn, automatic waters expose a small amount of water as the cow drinks. The water bowl itself provides an excellent surface for

bacterial growth as well as a perch for small birds that carry pathogens internally and externally. In the dry barn and heifer barn the automatic waters are larger containers to provide more water for multiple cows. The surface area is therefore larger for numerous birds to perch. Each calf in the calf barn has a water bucket that is cleaned out multiple times a week.

The risk assessment of water-borne pathogens is low as the town water is responsible providing clean water to people and animals.

Flies are another potential vector during the warmer months. Flies are known for transmitting many diseases such as West Nile and Eastern Equine Encephalitis both of which have not been shown to present a risk to dairy cattle but flies have been known to transmit Myiases to dairy cattle and sometimes humans producing maggots in feces. (Merck) The fans are turned on at the Fairchild Center during the warmer months providing adequate circulation and an inopportune environment for flies to settle in. In extreme cases, insecticide might be used. Dry cows that are pasteurized have a slightly higher risk of infection via flies.

High Risk Assessments

People are of a higher risk at the Fairchild Center due to the constant increased traffic compared to other dairy facilities. A visitor from the nearby community present a lower risk to biosafety compared to the dairy management student who originally comes from a farm. Each person carries bacteria on their shoes, clothing and skin. Each of which generally comes into contact with the herd either directly or indirectly. Direct contact is a significant risk due to fecal to oral transmission specifically E. Coli 157.

Vikon foot scrub and boot scrubbers are located at various entries and exits for personal use as well as hand sanitizers. If desired, plastic boot covers are available. On the main door to

the lobby and the heifer barn, there are signs indicating some general rules for visitors to follow. The signs should be updated with specific locations that visitors are not allowed to enter such as the feed bunks.

Certain areas of the Fairchild Center are off-limits to visitors designated by a chain or a gate blocking the entryway. These areas include the milking parlor, and calf feed prep room, as well as aisles directly behind the cows. The latter is most important to protect the public from getting physically hurt but also to minimize the amount of contact they have with manure which contains bacteria, ammonia and will eventually ferment producing methane. The rumen microorganisms produce 400-600g of methane a day that is removed from the body via the breath. Generally the public is allowed to walk in the center aisle placing them in direct contact with an excessive amount of methane. Due to this factor, it is very important to have an efficient ventilation system; ie open to the air. In the Fairchild Center, the main barn has windows along both sides as well as two open doors that increase the amount of air flow therefore diluting the methane as it is deposited into the air.

Other High Risk Assessments

A closed dairy facility has lower risks than a semi-closed and an open facility. A herd is considered closed when it doesn't: buy any genetics or livestock, commingle stock, buy feeds of any animal origin, have any wildlife exposure, have any vermin, have any neighbors with livestock, hire livestock haulers or take livestock to fairs or shows. If a herd is truly closed, then the biosecurity risk assessments are all extremely low. (GEY)

At the Fairchild Dairy Nutrition Research Center, the facility is considered semi-closed. In the last 5 years, a small herd of Jerseys Cows and Holsteins were purchased for research

purposes. Ideally new animals should be quarantined for two weeks before introducing them to the herd. If the facility they were housed in prior had multiple cases of clostridium, it could be introduced into your herd. In addition to quarantine, the animals should be tested for diseases that are specifically contagious such as Bovine Viral Diarrhea, Johne's disease and Bovine Leukosis. Quarantine requires a separate facility to house the animals as well as a separate containment area for waste. The Fairchild center is not equipped to fully quarantine new animals. The general protocol consists of housing them in a maternity pen for two weeks. This allows the animals to acclimate to the environment while the tests are run. Animals bought from a local dairy present a lower risk than animals that were shipped to an auction with other animals. When assessing the risk of a replacement herd it is necessary to know where the animal presented from.

The Fairchild Center uses artificial insemination for all its breeding purposes such as Accelerated Genetics. When purchasing any form of genetics from an outside source, it is imperative the company is credited with high quality and can present the data on each bull source.

In addition to purchasing genetics, the Fairchild Center also purchases blood meal, a protein supplement derived from pig's blood. This presents one of the highest risks as these animals are raised off the property in different facilities exposed to many other pathogens. When these animals go to slaughter they are thoroughly inspected by federal regulations.

Although most of the herd is not grazed, during the summer months, the dry cows are permitted to graze throughout the day. This presents a risk against the herd's health because of the extra exposure to wildlife. The field is surrounded by an electric fence to keep the cows enclosed but does not prohibit wildlife. In addition to defending the herd against physical

attacks from wildlife, it is important to remember the wildlife can act as a vector for pathogenic agents such as Leptospirosis through infected urine. Tick diseases also present a risk for the dairy herd as they are generally very costly to treat.

The Fairchild Dairy Center is not devoid of vermin – rats, birds, flies. To allow for better air flow, the windows are generally open permitting birds and flies free access. Each can act as vectors for many diseases including West Nile Virus, and salmonella. Woodchucks, groundhogs, gophers are persistently burrowing near the entry way to the barn via the feed alley and the heifer barn. As they burrow and breed, not only do their wastes present a risk but their future litters can too.

Generally, any animals hauled by other livestock trailers are leaving the property permanently therefore the only risk presented is by the truck itself driving onto the property. There are other dairy facilities in close proximity, one of them being the UNH Organic Dairy Facility which follows most of the same protocols as the Fairchild.

Various dairy shows are held on campus with UNH-owned cows. Due to lack of space, the shows are held inside the indoor Equine arena. Although the horses and cows do not have direct contact, the facility is not fully sterilized before or after use. The building itself is a vector regardless of the species type.

Prevention

Many infectious diseases are transmitted via contact with contaminated feces, urine, blood or by-products. A good vaccination program, as part of a biosecurity plan can be used for preventative care for many infectious diseases on a dairy farm. The Fairchild Center currently vaccinates against many infectious diseases.

Calves are vaccinated with Barguard 99 to prevent E. Coli based diarrhea and Calf Guard that prevents against Bovine Rotavirus and Coronavirus.

INFECTIOUS DISEASES definitions and description

Bovine Rotavirus, Coronavirus, and Bovine Virus Diarrhea

Calf – barguard 99 for E. Coli and calf guard for bovine rotavirus and coronavirus (diarrhea), brucella vaccine,

2 shots for booster : virus shield 6 + L5 Somnus for IBR, PI3, BRSV, Cytopathic and noncytopathic BVD Type 1, noncytopathic BVD Type 2, Haemophilus somnus and the 5 most common strains of leptospirosis.

Cow – virus shield 6 + L5 Somnus when they dry off (once a year after the first 2)

Jvac at dry off for E. coli mastitis for coliform mastitis

What we do now as a preventative for human transmission

- Virkon foot scrub, and boot brushers
- Hand sanitizer
- Chained off areas behind cows
- Signs: do not walk in feed bunk

What we do now as a preventative for cow transmission

- Copper sulfate foot bath
- Iodine teat pre and post dip
- Ivamentic for Mange

BIRDS

Animals can carry infectious agents from farm to farm but birds travel at a faster rate than most animals giving them a higher risk value. Not only do they carry disease, but they cause destruction to the property, increase feed and medical cost and overall discomfort to the cows housed in that facility.

In most dairy facilities a flood of various birds move in and out all throughout the year but generally stay during the winter months. At any given time you might find starlings, pigeons, and sparrows nesting in places like the rafters, cupulas, feed bunks, fresh bedding, manure pit and feed barn. Birds are very adaptive and resourceful animals. They are also great communicators and recruit other birds.

Impact of Birds

Birds excrete urine and feces in one package in order to conserve water. Due to this fact, instead of secreting urea in urine, their feces contain uric acid. Uric Acid is a corrosive agent.

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**Animal Diseases of Public
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