



Water Borne Pathogens

Introduction

Water-borne pathogens are organisms capable of causing disease that may be transmitted via water and acquired through ingestion, bathing, or by other means. These parasites and bacteria are generally found in animal and human feces and can cause clinical infections in low doses. Some common types of pathogens can include: Giardia, Cryptosporidium parvum, Listeria, Salmonella, and Escherichia coli (E. coli). Pathogens are generally spread through fecal contact or the ingestion of contaminated food or water sources. These pathogens can easily be transmitted to humans, livestock, and pets if infected individuals are not handled properly. If measures are not taken, pathogens can easily contaminate surface water resources where they are not easily treated with standard water treatment processes.

Environmental Concerns

Giardia and Cryptosporidium parvum are protozoan pathogens that pose a risk for water quality and human health. These pathogens can cause gastrointestinal ailments which can be fatal to those with weaker immune systems. Giardia cysts and Cryptosporidium parvum oocysts can survive in the environment outside a host animal for variable amounts of time under the right moisture and temperature conditions. If viable cysts are shed into manure and then the environment it could contaminate drinking water supplies through runoff or seepage into groundwater. Contamination of water sources could also occur a number of days or weeks after pathogens are shed from the animal. Once these pathogens are allowed to contaminate water resources, they cannot easily be removed as they are resistant to most disinfectants. The only method of water treatment that will remove Giardia and Cryptosporidium parvum is filtration. Other Bacterial pathogens, such as E. coli, can also be shed



from the host animal through manure. If these pathogens contaminate drinking water sources, they are killed by chlorination and usually controlled. However, some private or community wells may be not chlorinated and should be tested regularly for E. coli to prevent outbreaks. It is important for farms to use best management practices to

prevent the reproduction of pathogens and reduce their transport to surface and ground water resources.

For More Information:

[USDA-NRCS Cryptosporidium and Giardia](#)

[Cornell University Cooperative Extension – Manure Pathogens](#)

[USDA-NRCS – Waterborne Pathogens in Agricultural Watersheds](#)

Potential Economic Benefits

Preventing and/or containing outbreaks of pathogens will not only be beneficial to the farm operation, but will also be beneficial to the whole community. On the farmstead, maintaining biosecurity and vaccination protocols will reduce the spread of diseases, animal health problems, and animal deaths. These protocols will ensure that the herd is healthy and more resistant to diseases. A healthier herd results in lower veterinary costs, as well as, lower costs associated with mortality disposal. Keeping a healthy herd also impacts a wider community by reducing the risk of diseases or pathogens spreading and contaminating water supplies. By protecting drinking water sources against pathogen contamination, costs for water treatment and maintaining safe water quality will be reduced.



Summary of Best Management Practices

Prevent pathogens from coming onto the farm by restricting the transport of manure from other animal facilities.

- Require all farm visitors and workers to clean their boots or wear plastic boot coverings
- Restrict movement of vehicles around livestock facilities
- Protect feed and water sources from fecal contamination by livestock, rodents, pets, or human sewage

Reduce cross-contamination among animals.

- Prevent contact between calves during feeding or handling
- Clean and dry feeding and watering equipment thoroughly between calves
- Thoroughly clean housing facilities between calves
- Reduce the potential for contaminated runoff to enter areas used to house young animals
- Restrict access by calves to fields that have received manure applications within the last year

Restrict movement of contaminated feces into watercourses to reduce the risk of surface and groundwater contamination by bacterial protozoan pathogens.

- Prevent runoff from calf housing, barnyards, and manure storage areas
- Treat any runoff from calf housing with an appropriate system of BMP's
- Store manure from young stock separately from the rest of the herd
- Apply manure from young calves to areas that are not hydrologically sensitive
- Compost calf manure to temperatures above 140°F to kill pathogens.
- Incorporate manure into soil so it is exposed to freeze-thaw cycles to reduce the viability of pathogens

Use NRCS approved best management practices to minimize contamination.

- Implement practices to manage manure as part of a Comprehensive Nutrient Management Plan

For More Information:

[NRCS Conservation Practices](#)

[NRCS Pathogen Management Standard \(783\)](#)

[Cornell University Cooperative Extension – Best Management Practices to Prevent Manure Pathogen Movement to Water](#)



Summary of Regulations

State Regulations

[NYS Department of Environmental Conservation CAFO Permit](#)

Federal Regulations

[EPA General Information on CAFOs](#)

[EPA Surface Water Treatment Act](#)

Background Information for Worksheets

Is the farm participating in any health/bio-security program?

Farms should utilize biosecurity protocols for newly acquired livestock and farm visitors. Biosecurity protocols including, visitor restrictions and quarantine protocols, will help prevent the spread of infectious diseases that might be introduced by the new animals or visitors. Farm operations should also maintain a well-managed health program which includes veterinarian consultations regarding vaccination protocols. Keeping vaccinations up to date will help to maintain a healthy herd and prevent the contraction of infectious diseases. If biosecurity protocols are not used for new animals or farm visitors, it is doubly important to have a health and vaccination program to protect herd health. If some type of health/vaccination or biosecurity program is not in place this could place great risk on herd health and increase the probability of the spread of infectious diseases. If the herd is infected, this could lead to food or water supplies becoming contaminated and further spreading of the disease.



For More Information:

[New York State Cattle Health Assurance Program – Best Management Practices](#)

[New York State Cattle Health Assurance Program - Veterinary Certification](#)
[Cornell Sheep Program – Health Management](#)

How is young animal housing managed between occupancies?

Young animal housing should be steam cleaned to kill any and all existing pathogens. The flooring should also be cleaned and air dried for two weeks between occupancies. If the floor cannot be dried for two weeks, then it should at least be completely dried before reoccupation. An alternate option is to move the housing to a dry area that has been exposed to 4 full days of sunlight. Having significant sun exposure will help to kill any existing pathogens in the area. If the housing cannot be moved, a new surface should be applied to the calving areas. If young animal housing is not washed or disinfected in between occupancies the risk of infectious diseases being spread from one animal to another increases. If the housing is left vacant and allowed to dry for a minimum of two weeks, pathogens can still exist outside a host animal for periods of time. This means that the risk of transmitting diseases may remain high.

For More Information:

[Calving Ease: Disinfecting to Improve Calf Health Part 1](#)

[Calving Ease: Disinfecting to Improve Calf Health Part 2](#)

Background Information for Worksheets

Are young animals and bedding kept clean?

Keeping young animals and bedding clean is extremely important to prevent the propagation of dangerous pathogens. It is important to keep all bedding clean and dry which will help maintain clean coats. When young animals are moved, all bedding should be changed before new animals are moved in. These practices will prevent pathogens from spreading from one animal to another. It is important to keep bedding from becoming too damp and to keep manure from becoming caked on animals' coats. If the bedding is consistently damp, the wetness associated with buildup of manure and urine may lower the animal's resistance to diseases and promote survival of pathogens. Additionally, when manure is allowed stain or accumulate on the coat, a young animal trying to clean its coat through licking may ingest parasites and become infected through oral contact. Calves that are clean and dry are also able to maintain body temperature more efficiently especially during cold weather.



Are feeding supplies for young animals clean?

All feeding and watering implements should be cleaned with hot water and soap between feedings and following any exposure to manure. If possible, each calf should have its own individual feeding bucket to prevent cross contamination among animals. However, because individual buckets can be costly a reasonable alternative is to feed younger animals first and wash buckets in between feedings. Older calves may be more likely to be infected than younger animals and feeding younger animals first will help to reduce the spread of illness. Always work from youngest to oldest leaving sick and treated animals for last to prevent the spread of any pathogens to the most susceptible animals. It is also important to avoid feeding young animals in groups as this can encourage the transmission of pathogens through oral or fecal contact.



For More Information:

[Calving Ease - Disinfecting to Improve Calf Health Part I](#)

[Calving Ease - Disinfecting to Improve Calf Health Part 2](#)

Are young animal housing facilities well ventilated?

It is very important to have animal housing that is well ventilated. Providing constant fresh air will help remove harmful airborne organisms, eliminate odors (i.e. ammonia), and remove excess moisture and heat. The air inside the housing should be similar to that of the outside air. Maintaining proper humidity and temperature through ventilation will improve and sustain calf health.



For More Information:

[Hoard's Dairyman – Top Five Considerations for Superior Calf Housing](#)

[Calving Ease - Needed Good Air Part I](#)

[Calving Ease - Needed Good Air Part 2](#)

[Calving Ease - Good Air = Good Health](#)

[Cornell University Cooperative Extension – Role of Facility Design and Ventilation on Calf Health](#)

Background Information for Worksheets

How is purchased stock handled on the farm?

If livestock is purchased, it should be kept isolated from the rest of the herd for a minimum of four weeks. Anything less than four weeks can result in the spread of dangerous pathogens. In most cases, older animals do not exhibit visible symptoms of pathogen infection, so there is no easy way to determine if an animal is infected. However, the quarantine period provides enough time for blood tests and fecal smears to be performed. Infectious pathogens can easily be spread from one farm to another if precautions are not taken. Ideally, no livestock should be purchased from outside sources. However, sometimes this is unavoidable, and can be done safely by properly isolating the new livestock and maintaining vaccination protocols.



For More Information:

[NYS CHAP - BMPs for the Prevention of Entry of Disease onto Livestock Operations](#)

How is young animal health monitored?

In order to prevent the spread of diseases and catch illness early on, young animals should be monitored regularly and inspected for signs of illness. The animals should be visually inspected daily and routine vet checks should be performed. Although routine vet checks can be costly, it is vital to the farm operation to protect their investments and livelihood with regular inspections and checkups. If animals are not regularly inspected and veterinarians are only called for obvious signs of illness this could result in an increase in young animal mortality.

For More Information:

[Calving Ease - Early Detection of Sick Pre-weaned Calves](#)

[Calving Ease - Monitoring for Profitability](#)

[Cornell Cooperative Extension – Early Identification of Sick Calves Important to Their Survival and Future Milk Production](#)

Are sick calves separated and handled last?

Any sick calf should be separated from the herd and handled last. Keeping them quarantined and feeding them last will prevent the cross contamination and spread of contagious bacteria or viruses.

Is scours a common problem among animals on the farm?

If scours is a common problem among animals on the farm, this is a sign that pathogens are present, the animals are becoming infected, and spreading pathogens among themselves. If severe cases of scours exist, this usually signifies a multi-system infection; a combination of rotavirus (scours) and Giardia or Cryptosporidium parvum. It is important to keep serious cases from developing because this can cause serious dehydration and even death in animals. Every loss of life impacts future profits on the farm. To prevent scours outbreaks, proper housing conditions should be maintained, health monitoring and vaccination protocols should be followed and sick animals should be separated as soon as an illness is detected.



For More Information:

[Cornell Cooperative Extension – Calf Diseases and Prevention](#)

Background Information for Worksheets

Are pets and pests (especially rodents) present in the calf housing area?

Pets and pests can be carriers and spreaders of pathogens and parasites. Certain pests such as mice and rats are carriers of fleas, ticks, plague, and can spread existing pathogens found in manure to other animals and throughout the farm. Cats are known carriers of ring worm and are commonly found in and around barns. As cats interact with young animals and adult animals alike they can easily spread pathogens and diseases from one to the next. Cats can also defecate in feed supplies spreading their own pathogens to livestock. Dogs are known to consume manure, which could be contaminated. By doing so, they can become infected and further spread pathogens around the farmstead. Pets and pests should be kept out of calf housing areas if at all possible. The likelihood of pathogens being spread throughout the farm increases, as well as, the chances of water supplies becoming contaminated greatly increases.

Are pets allowed to move freely around and off the farm?

If pets are allowed to move freely around and off the farm they could act as vehicles for pathogen transportation. Pets can pick up pathogens through ingestion or fecal contact and spread them across the farmstead, infecting livestock and contaminating water supplies. If pets travel off the farm, they could pick up pathogens from outside sources and introduce them to on farm livestock. It is important to try to keep pets on the farm and away from the animals as much as possible. This will reduce the spread of infectious pathogens and prevent the introduction of new pathogens to the livestock.



Is surface water allowed to enter or flow through calf housing facilities?

Surface water should not be allowed to enter or flow through calf housing facilities. It can mix with infected manure and contaminate water resources. All surface water should be diverted away from young animal housing in order to keep clean water clean. Any runoff from the housing area should to be contained or directed to a collection. If runoff from the housing area is not directed to a collection it should be diverted to a vegetated treatment area that meets NRCS standard and specifications. At a minimum, if no vegetated treatment area exists, runoff from the calf housing area should flow through more than 100 ft. of permanent sod. Runoff should not appear to reach any watercourse.

For More Information:

[Cornell University Cooperative Extension – Potential Routes for Pathogen Transport to Water](#)

How is manure from young animals handled and stored?

Manure from young animals needs to be included in the farm manure management plan. A specific management practice needs to be in place to properly deal with young animal manure. Completely composting the manure or putting it through an anaerobic digester and land applying according to a nutrient management plan are appropriate solutions. Young animal manure can also be mixed with adult animal manure and stored in an appropriate storage facility until it can be land applied. If the mixed manure cannot be stored it should be land applied immediately according to a nutrient management plan.



For More Information:

[Cornell Cooperative Extension – Benefits of Anaerobic Digestion of Manure in Reducing Pathogens](#)

Background Information for Worksheets

Is untreated young animal manure spread on land that will be used for pasturing or production of hay within one year after spreading?

Certain pathogens can exist in the environment outside a host animal for extended periods of time. Spreading untreated young animal manure on land that will be used for pasturing or production of hay can increase the risk of transmission through oral contact or consumption. Young animal manure should be treated before spreading on such areas or spreading on these areas should be avoided.

Are young animals allowed to graze on land that has had untreated manure applied to it within a year?

Untreated manure may contain infectious pathogens that can live outside a host animal for long periods of time in certain weather conditions. If young animals were allowed to graze on land that has had untreated manure applied to it, they could have been exposed to the infectious pathogens. Care should be taken to avoid grazing animals on land that has had untreated manure applied to it.

Are young animals allowed to graze on pastures containing septic system leachate?

Septic system leachate contains infectious pathogens that can spread to young animals and potentially cause illness or death. To prevent infection, young animals should not be allowed to graze on pastures containing septic system leachate.



Does livestock have access to surface water sources?

Livestock should not have access to surface water sources. Allowing livestock to have unlimited access to surface water sources promotes pathogen contamination. Livestock can contaminate the water through defecation or oral contact, and pathogens can be spread from one animal to another or could contaminate other water sources that may be used for drinking water. If possible, livestock should be completely restricted from all surface water sources to eliminate all risk of pathogen contamination.

For More Information:

[Cornell University Cooperative Extension – Grazing Management for Water Quality Protection](#)

Is there any nose to nose contact between pre-weaned calves?

When calves are able to have nose to nose contact with one or more other calves, this can perpetuate the spread of dangerous pathogens. Young calves will often lick and suckle on each other which can allow them to transmit pathogens through oral contact. Young animals should not have any contact with other animals. If this is unavoidable, animals should only have contact with one to two neighbors. Young livestock should not be able to have complete access to other animals and pre-weaned calves should be kept out of group housing. Reducing the amount of contact each young animal has with other animals can reduce the spread of pathogens which can cause serious illness and potentially death.

For More Information:

[Cornell University Cooperative Extension – Newborn Housing for Dairy Calves](#)

Is calf feed allowed to mix with manure?

The infectious stage of pathogens is often shed from the animal in its manure. If calf feed is allowed to mix with manure, it can become contaminated. Calves will then be exposed to the pathogens during feedings. Care should be taken during colostrum harvesting, milk harvesting, and milk replacer mixing to avoid contamination. Equipment used for feeding should also be cleaned and sanitized properly between feedings and whenever it has been soiled to avoid pathogen contamination.

SUMMARY

AEM Tier 2 Assessments document environmental stewardship and establish benchmark conditions on the farm. They also identify resource concerns and areas of opportunity. The AEM Tier 2 worksheets also help to further establish baseline data that can be used to prioritize issues for Tier 3 planning.

Tier 2 Assessments should be completed on-site with the farmer. When the initial assessment is completed, appropriate feedback in the form of an AEM Tier 2 Worksheet Summary should be provided to the farmer. The summary should include an overall level of concern for the worksheet, explanation of the overall ranking, a list and description of items of greatest concern, as well as, documentation of what is being done well and what areas need improvement. After the evaluation is complete, the farm should be given a ranking which will determine their priority to advance to the AEM Tier 3 planning phase. Appropriate ranking categories that could be used are: High, Medium, or Low Priority. A ranking procedure that has been approved by your local AEM Team should be used to make the ranking determinations.

