AEM Tier 2 Worksheet
Water-Borne Pathogens

Glossary

Cryptosporidiosis: A diarrheal illness of varying severity caused by a microscopic intestinal parasitic protozoan, Cryptosporidium. It is a common cause of diarrhea worldwide and can be a serious health threat to infants and individuals with immune system deficiencies.

Cyst: An environmentally-resistant stage of Giardia.

Escherichia coli (E. coli): A bacterial species that lives in the intestinal tract of multiple hosts and is shed in feces. E. coli 0157 differs from other normal intestinal E. coli strains because it carries several toxin-producing genes capable of affecting humans. It can cause illness ranging from bloody diarrhea to kidney failure in humans. It causes no apparent illness in other host species and is only transiently carried in the intestines of most hosts. E. coli 0157 may proliferate in the environment under favorable conditions.

Hydrologically Sensitive Area: Land area with a high potential for transporting pollutants to surface or ground waters.

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Background

Giardia and *Cryptosporidium parvum (C. parvum)* are two protozoal parasites found in animal and human feces that can cause infection and occasionally illness in humans, livestock and pets. Bacteria, such as *Escherichia coli 0157 (E. Coli 0157)*, are also found in feces and manure and have the potential to cause illness in humans, but are less commonly encountered than the protozoan parasites. Infants and individuals with immune system deficiencies are at greatest risk for both protozoal and bacterial infection. Infection occurs after ingestion of contaminated food or water. Poor hygiene practices following handling of infected individuals (animals or humans) can also result in transmission of these organisms to humans. Humans infected with these pathogens can potentially infect animals through fecal contact or through contamination of animal watering sources with septic runoff or overflow. Intestinal viruses, which have been strongly implicated in a number of waterborne disease outbreaks, are considered to be host-specific and farms are not considered to be a source of infection for humans unless human septic sludge is present.

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Agricultural Water Quality Principle:

The farm operator should employ management practices to provide multiple barriers to the introduction, replication and survival of pathogens in domestic livestock and their transport to surface and groundwater resources.

Glossary continued …

NYSCHAP: New York State Cattle Health Assurance Program. A voluntary cattle health program in which livestock producers, their veterinarians and NYS Field Veterinarians develop farm-specific plans to prevent the introduction and spread of infectious disease.

Oocyst: The environmentally-resistant stages of Cryptosporidium.

Protozoa: A group of microscopic single-celled parasites which include the Giardia and Cryptosporidium genera. Infected hosts shed cysts (Giardia) or oocysts (Cryptosporidium) into feces. Cysts and oocysts are capable of surviving for months in the environment, especially under cool and moist conditions. Protozoa do not proliferate outside of their hosts.

Runoff: The portion of rain, snowmelt or irrigation water that leaves the field over the land surface.

Vegetated Filter Area: An area of grass sod, meeting NRCS Standard NY-393a, for removing sediment, organic matter, nutrients and other pollutants from barnyard runoff and other wastewater.

Waterbody: A lake, reservoir, pond, river, continuously-flowing stream, continuously-flowing spring, wetland, estuary or bay.

Watercourse: Water flowing over a non-vegetated channel to a waterbody.

Background Continued…

Surface water supplies are considered to be most susceptible to contamination by protozoan and bacterial pathogens. Chlorination and other standard water treatment processes are ineffective in the control of *C. parvum*, but are effective in killing most bacteria. Approved, specific water filtration practices are required to remove *Giardia* cysts and *C. parvum* oocysts from water. Many communities with filtration capabilities rely on unfiltered water sources as their back-up water supply. Poorly-managed filtration operations can result in outbreaks of parasitic illness.

Private or community wells may not require chlorination, but these wells should be tested regularly for coliform to avoid health risks. Dry conditions that deplete the aquifer or extremely wet conditions can result in rapid contamination of wells. Under
these conditions, wells should be re-tested for coliform or chlorinated as a preventative measure.

On farms, feces from animals six months and younger are the most likely source of *C. parvum* and *Giardia*. *C. parvum* is limited to animals less than 30 days old. *Giardia* has been detected primarily, but not exclusively, in animals younger than 6 months of age. Calves can shed *C. parvum* and *Giardia* even when they appear to be healthy. Surface runoff from calf and young heifer housing and exercise lots or land receiving manure applications poses a potential risk to water supplies.

E. coli 0157 has been found in free-ranging deer, birds, flies, sheep, dogs, humans, horses and cattle. On-farm pathogen management must focus on preventing fecal contamination of livestock feed and water, preventing gross contamination of surface water by manure, and protection of wellheads, sink holes and other direct links to ground water.

The multiplication and spread of parasitic pathogens can be controlled through a **three-barrier approach**. This will also benefit the farm operation through improved calf health and performance.

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Background Continued…

The **first barrier** involves reducing the potential for pathogens to enter the farm from outside sources. Parasites can come onto the farm through:

- the introduction of infected animals;
- the transport of infected manure onto the farm on clothing, boots, or equipment; or
- pets, rodents, and other animals can transport contaminated manure from other farms.

The **second barrier** is to minimize cross-contamination among animals and amplification of infection on the farm. Parasite movement and multiplication on the farm can be minimized by:

- keeping calf-raising areas clean and
- ensuring that all feeds and feeding utensils are clean.

The **third barrier** is to restrict movement of contaminated feces into watercourses by:

- preventing runoff from calf housing, exercise lots, and manure storage areas; and
- applying manure from calves to non-hydrologically sensitive areas.

AEM Tier 2 Worksheet: Water-Borne Pathogens		**Potential Concern**		
Factors Needing Assessment	Lower 1	2	3	Higher 4
Is the farm participating in the NYSCHAP program?	Enrolled in a core and environmental pathogen module.	Enrolled in core and other enteric pathogen module(s).	Enrolled in core module only.	Not enrolled in NYSCHAP.
How is calf housing managed between calves?	Calf housing is steam-cleaned AND flooring or calf housing is cleaned and air-dried for 2 weeks between calves. **OR** Calf pens are moved to a location where the base has been exposed to 4 full days of sun drying.	Calf housing is pressure washed and air-dried for 2 weeks between calves AND floors of calf housing are cleaned. **OR** New surfaces are applied to gravel-floored calving areas.	Calf housing is not washed. **OR** Flooring of calf hutches is not dried or rotated between calves. **OR** New surfaces are not applied to gravel-floored calving areas.	Calf housing is not washed **AND** Flooring of calf hutches is not dried or rotated between calves.
Are calves and bedding kept clean?	All calves have clean coats and all calf bedding is clean and dry. **AND** All bedding is changed between animals.	Most of the calves have clean coats and most of the calf bedding is clean and dry. Your knees may get damp if you kneel in the pens. **AND** All bedding is changed between animals.	Some calves have manure stains or cakes manure on their coats and some manure is present in bedding. Your knees get wet if you kneel on the bedding. **OR** Bedding is not changed between animals.	Most calves have manure stains or caked manure on their coats and manure is present in bedding. Your knees get wet and dirty if you kneel on the bedding. **AND** Bedding is not changed between animals.
Are calf feeding supplies clean?	All feed and watering buckets are cleaned and dried between feedings. Each calf has its own individual feed utensils or bucket. **AND** Feed is not allowed to mix with manure on the ground.	Feed and watering buckets are cleaned between feedings. Feeding buckets are shared, but youngest calves are fed first. **AND** Feed is not allowed to mix with manure on the ground.	Feed and watering buckets are not cleaned between feedings. **OR** Oldest calves are fed first. **OR** Feed is allowed to mix with manure on the ground.	Feed and watering buckets are not cleaned between feedings. **AND** Oldest calves are fed first. **AND** Feed is allowed to mix with manure on the ground.

AEM Tier 2 Worksheet: **Water-Borne Pathogens** **Barrier 3: Restrict Movement of Manure into Watercourses**	**Potential Concern**			
Factors Needing Assessment:	Lower 1	2	3	Higher 4
Is surface water allowed to enter or flow through calf housing facilities:	All surface water is diverted away from calf housing facilities **AND** runoff from calf housing area is contained or diverted to storage.	Surface water is not contaminated with manure **AND** there is at least a 200 ft. permanent vegetation filter area between calf housing facility and any watercourse. Runoff is contained by berms.	Surface water is contaminated with manure **AND** a 100-199 ft. permanent vegetation filter area is maintained between calf housing facilities and any watercourse.	Surface water is contaminated with manure **AND** less than 100 ft. permanent vegetation filter area is maintained between housing facility and surface watercourse.
How is manure from calves under 6 months handled and stored?	Calf manure is mixed with the rest of herd manure **AND** completely composted at an appropriate site.	Calf manure is mixed with the rest of herd manure AND stored at least 6 months in an appropriate storage facility. **OR** Calf manure is handled separately from the rest of herd manure **AND** completely composted at an appropriate site.	Calf manure is mixed with the rest of herd manure **AND** stored less than 6 months.	Calf manure is handled separately **AND** stored less than 6 months.
How is manure from calves under 6 months old land-applied?	Calf manure is completely composted prior to land application **AND** calf manure is not spread on frozen or snow-covered ground or on areas prone to flooding or when hydrologically sensitive.	Calf manure is not spread on frozen or snow-covered ground, or on areas prone to flooding, or when hydrologically sensitive.		Calf manure is sometimes applied to land areas subject to flooding, runoff, leaching or movement into tile drains.

NYSCHAP Related Questions: To be assessed in more detail by the NYSCHAP Program

Barrier 1: Prevent Entry to Farm

1. Are people working with calves knowledgeable about calf care and biosecurity controls?
   Do calves have frequent contact with outsiders who are not familiar with biosecurity controls?

Barrier 2: Containment of Animal-to-Animal Spread on the Farm

1. Is calf production on farm seasonal or continuous?
   If calf raising on the farm is continuous, are calves rotated across locations in order to allow previously used areas to be thoroughly cleaned and sun-dried prior to receiving new calves?

2. Are calf housing facilities well ventilated?
   Does the air in the facilities smell of ammonia or is the air humid?

3. Is scours a common problem among calves on the farm?
   Are sick calves separated and handled last?

4. Are calves handled from youngest to oldest?
   Do calves have contact with other calf manure or with adult cow manure spread by handler's boots, clothing, equipment or runoff?

5. Are calf feeds and feeding utensils stored in a clean, secure room and not exposed to dirty clothing, rodents, flies, birds, or pets?

6. Are pets and pests (especially rodents) present in the calf housing area?
   Are pets allowed to move freely around and off the farm?

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NYSCHAP Related Questions Continued…

Barrier 3: Restrict Movement of Manure into Watercourses and Well Protection

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

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

3. Do livestock have access to streams, creeks, rivers, or lakes?

4. Are non-chlorinated water supplies serving the herd regularly tested for coliform bacteria and specifically tested during droughts or after extreme rainfall events?

5. Are young calves allowed to graze on pastures containing septic system leachate?