



## AEM Tier 2 Worksheet

# Water-borne Pathogens

### Glossary

**Coliform:** Bacteria whose presence in drinking water is an indicator of the possibility of pathogen contamination.

**Cryptosporidiosis:** A diarrheal illness of varying severity caused by an 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.

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

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### Background

Water-borne pathogens can include protozoal parasites such as *Giardia* and *Cryptosporidium parvum* (*C. parvum*); and bacteria such as *Listeria*, *Salmonella*, *Escherichia coli* 0157:H7 (*E. Coli* 0157:H7) which can be found in animal and human feces that can cause infection and occasionally illness in human, livestock and pets. 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. Those infected with these pathogens can potentially infect others through fecal contact or through contamination of water. 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 sewage is present. Surface water supplies are considered to be most susceptible to contamination by protozoan and bacterial pathogens. Chlorination and other standard water treatment processes are generally ineffective in the control of *C. parvum*, but are effective in killing most bacteria. Approved, micro 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.

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### AEM Principle:

Farms should use management practices that provide multiple barriers to the introduction, replication and survival of pathogens in domestic livestock and that reduce 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 through the use of Best Management Practices.

**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.

**Vegetated Treatment Area:** An area of grass sod, meeting NRCS Standard NY-635, for removing sediment, organic matter, nutrients and other pollutants from calf hutch areas and other heavy use areas.

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

**Young Animal:** For this worksheet, young animals are defined as follows:

- Dairy calves – under 6 months
- Beef calves – under 6 months
- Horses – under 12 months
- Sheep – under 6 months
- Pigs – under 3 months

## Background Continued...

Private or community wells may not require chlorination, but these wells should be properly built, maintained and tested regularly for coliform and nitrates to avoid health risks. If a water test is positive for coliform, further testing for fecal coliform and *E. coli* will be critical to determine the safety of the well water. Extremely wet conditions can result in rapid contamination of wells. Poorly constructed or neglected wells, wells with a history of contamination, and wells in areas with a direct connection between surface waters and groundwater are most vulnerable to contamination (for example, wells in gravel valleys or in karst landscapes). Under these conditions, wells should be further evaluated for proper installation and maintenance and frequently tested for coliform and nitrates. County health departments or private water testing firms can often provide guidance on evaluating and testing private wells.

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

Pathogenic bacteria have been found in wildlife, insects, humans, and domestic animals. On-farm pathogen management focuses 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 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 by implementing bio-security practices for:

- incoming animals;
- transport on clothes, boots or equipment;
- preventing contamination of water sources;
- reducing exposure to pets, rodents, wildlife, and other animals, which 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 young animal housing areas clean;
- separating equipment and driveways used for feeding from those used for manure management;
- maintaining herd health and animal comfort;
- ensuring that all feeds, feeding utensils, and waterers are clean; and
- implementing a herd vaccination program, identification and isolation of sick animals and treatment protocols with your herd vet.

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

- preventing runoff from young housing facilities, exercise lots, and manure storage areas;
- applying manure in accordance with a nutrient management plan; and
- treatment of manure to reduce pathogen numbers.

AEM Tier 2 Worksheet: Water-Borne Pathogens		Potential Concern		
Factors Needing Assessment	Lower 1	2	3	Higher 4
<b>Is the farm participating in any health/bio-security programs?</b>	<p>Livestock health is managed with consultation from an attending veterinarian for health and vaccination protocols.</p> <p style="text-align: center;"><b>AND</b></p> <p>The farm utilizes bio-security protocols for farm visitors and newly acquired livestock.</p>	<p>Livestock health is managed with consultation from an attending veterinarian for health and vaccination protocols.</p>	<p>The farm utilizes bio-security protocols for farm visitors and newly acquired livestock.</p>	<p>Health and vaccination protocols with a veterinarian are not regularly implemented.</p> <p style="text-align: center;"><b>AND</b></p> <p>Bio-security protocols for farm visitors and newly acquired livestock are not followed.</p>
<b>How is young animal housing managed between occupancies?</b>	<p>Young animal housing is steam-cleaned.</p> <p style="text-align: center;"><b>AND</b></p> <p>Flooring is cleaned and air-dried for 2 weeks between occupancies.</p> <p style="text-align: center;"><b>OR</b></p> <p>Housing is moved to a location where the base has been exposed to 4 full days of sun drying.</p>	<p>Young animal housing is steam-cleaned.</p> <p style="text-align: center;"><b>AND</b></p> <p>Flooring is cleaned and air-dried.</p> <p style="text-align: center;"><b>OR</b></p> <p>New surfaces are applied to gravel-floored calving areas.</p>	<p>Young animal housing is left vacant and allowed to dry for a minimum of two weeks, but not washed or disinfected.</p>	<p>Young animal housing is not washed, rotated or left vacant between animals.</p>
<b>Are young animals and bedding kept clean?</b>	<p>All young animals have clean coats and all bedding is clean and dry.</p> <p style="text-align: center;"><b>AND</b></p> <p>All bedding is changed between animals.</p>	<p>Most of the young animals have clean coats and most of the bedding is clean and dry. Your knees may get damp if you kneel in the pens.</p> <p style="text-align: center;"><b>AND</b></p> <p>All bedding is changed between animals.</p>	<p>Some young animals have manure stains or caked manure on their coats and some manure is present in bedding. Your knees get wet if you kneel on the bedding.</p> <p style="text-align: center;"><b>OR</b></p> <p>Bedding is not changed between animals.</p>	<p>Most young animals 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.</p> <p style="text-align: center;"><b>AND</b></p> <p>Bedding is not changed between animals.</p>

AEM Tier 2 Worksheet: Water-Borne Pathogens		Potential Concern			
Factors Needing Assessment	Lower 1	2	3	Higher 4	
Are feeding supplies for young animals clean?	Young are fed individually; all feed and watering buckets are cleaned and dried between feedings. Each animal has its own individual bucket.	Young are fed individually. Feed and watering buckets are rinsed between feedings.	Young are fed in groups, but youngest animals are fed first.  <b>AND</b> Feed and watering buckets are cleaned between feedings.	Young are fed in groups with no regard to age.  <b>AND</b> Feed and watering buckets are not cleaned between feedings.	
Are young animal housing facilities well ventilated?	Air inside the housing facility is similar to that of the outside air.		Air feels humid and there is a slight smell of ammonia	Air has a heavy ammonia smell.	
How is purchased stock handled on the farm?	No livestock from outside sources are added.	Purchased livestock is kept isolated for at least four weeks prior to integrating with other animals.	Purchased livestock is kept isolated for less than four weeks before being integrated with other animals.	Purchased livestock is immediately integrated with other animals.	
How is young animal health monitored?	Animals are visually inspected daily and routine vet checks are performed.	Routine vet checks are performed.	Animals are regularly inspected. Vet checks are performed only on sick animals.	Animals are not regularly inspected. Veterinarians are called only for obvious signs of illness.	
Are sick calves separated and handled last?					
Is scours a common problem among young animals on the farm?					
Are pets and pests (especially rodents) present in the calf housing area?					
Are pets allowed to move freely around and off the farm?					

AEM Tier 2 Worksheet: Water-Borne Pathogens		<b>Potential Concern</b>			
Factors Needing Assessment	<b>Lower 1</b>	<b>2</b>	<b>3</b>	<b>Higher 4</b>	
<b>Is surface water allowed to enter or flow through calf housing facilities?</b>	All surface water is diverted away from young animal housing facilities. <b>AND</b> Runoff from housing area is contained or diverted to storage.	Outside surface water is diverted. <b>AND</b> A Vegetated Treatment Area meeting NRCS standard 635 for calf hutch areas is maintained.	Runoff from calf housing flows more than 100 ft. through permanent sod vegetation and does not appear to reach any watercourse.	Surface water is contaminated with manure. <b>AND</b> Less than 100 ft. permanent vegetation is maintained between housing facility and surface watercourse.	
<b>How is manure from young animals handled and stored?</b>	Manure is completely composted at an appropriate site. <b>OR</b> Manure goes to an anaerobic digester. <b>AND</b> Applied according to a nutrient management plan.	Manure is mixed with adult animal manure and stored in an appropriate storage facility. <b>AND</b> Applied according to a nutrient management plan.	Manure is mixed with adult animal manure. <b>AND</b> Stored in an appropriate storage facility. <b>OR</b> Applied according to a nutrient management plan.	No specific management practice applied to young animal manure.	
<b>Is untreated young animal manure spread on land that will be used for pasturing or production of hay within one year after spreading?</b>					
<b>Are young animals allowed to graze on land that has had untreated manure applied to it within a year?</b>					
<b>Are young animals allowed to graze on pastures containing septic system leachate?</b>					
<b>Does livestock have access to surface water sources?</b>	Livestock has no access to surface water sources.		Livestock has limited access to surface water sources.	Livestock has unlimited access to surface water sources.	

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<b>Factors Needing Assessment</b>	<b>Lower 1</b>	<b>2</b>	<b>3</b>	<b>Higher 4</b>
<b>Additional Questions for Dairy Calves</b>				
<b>Is there any nose-to-nose contact between pre-weaned calves?</b>	No animal to animal contact.	Animals have contact with one to two neighbor animals.		Animals have complete access to other calves. Pre-weaned calves are in group housing.
<b>Is calf feed allowed to mix with manure?</b> (Through poor colostrums harvesting practices, poor milk/milk replacer harvesting/mixing practices, unclean equipment, feeding overages.)				
<p>Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect <b>soil, water, air, plants, animals, energy, greenhouse gases, people, and economics</b> can result in more effective plans and additional benefits to farms and communities both now and into the future.</p> <p><b>Additional Comments:</b></p>				