Technical Support Document for the Draft Sixth Contaminant Candidate List (CCL 6) - Microbial Contaminants

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List of Abbreviations and Acronyms

AIDS	Acquired immunodeficiency syndrome
AMR	Antimicrobial resistance
ARGs	Antibiotic Resistance Genes
ASTM	American Society for Testing and Materials
CAS RN	Chemical Abstracts Service Registry Number
CCL	Contaminant Candidate List
CCL 1	EPA's First Contaminant Candidate List
CCL 2	EPA's Second Contaminant Candidate List
CCL 3	EPA's Third Contaminant Candidate List
CCL 4	EPA's Fourth Contaminant Candidate List
CCL 5	EPA's Fifth Contaminant Candidate List
CCL 6	EPA's Sixth Contaminant Candidate List
CDC	Centers for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIS	Contaminant Information Sheet
CNS	Central Nervous System
CSTE	Council of State and Territorial Epidemiologists
DBP	Disinfection byproducts
DTXSID	DSSTox substance identifier
EPA	Environmental Protection Agency
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FLA	Free-living amoeba
FR	Federal Register
GAE	Granulomatous amebic encephalitis
GLASS	Global Antimicrobial Resistance Surveillance System
GWR	Ground Water Rule
HIV	Human immunodeficiency virus
HUS	Hemorrhagic uremic syndrome
MAC	Mycobacterium avium complex
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MCM	Manual of Clinical Microbiology

MMWR	Morbidity and Mortality Weekly Reports
NARMS	National Antimicrobial Resistance Monitoring System for Enteric Bacteria
NDWAC	National Drinking Water Advisory Council
NORS	National Outbreak Reporting System
NPDWR	National Primary Drinking Water Regulation
NRC	National Research Council
NTM	Nontuberculous mycobacteria
PAM	Primary amoebic meningoencephalitis
PCCL	Preliminary Contaminant Candidate List
PCCL 6	Preliminary Sixth Contaminant Candidate List
PCR	Polymerase chain reaction
PFAS	Per- and polyfluoroalkyl substances
PWS	Public Water System
SAB	Science Advisory Board
SDWA	Safe Drinking Water Act
SM	Standard Methods
SWTR	Surface Water Treatment Rule
TSD	Technical Support Document
UCMR	Unregulated Contaminant Monitoring Rule
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WBDO	Waterborne Disease Outbreak
WBDOSS	Waterborne Disease and Outbreak Surveillance System
WHO	World Health Organization

Chapter 1. Introduction

1.1 Background

Section 1412(b)(1)(B)(i) of the Safe Drinking Water Act (SDWA), as amended in 1996, requires the United States Environmental Protection Agency (USEPA) to publish a list of contaminants that are currently not subject to any proposed or promulgated national primary drinking water regulations (NPDWRs), but are known or anticipated to occur in public water systems (PWSs). This list is known as the Contaminant Candidate List (CCL). Contaminants listed on the CCL may require future regulation under the SDWA. The EPA is required to publish the CCL every five years.

The SDWA directs the Agency to consider health effects and occurrence information for unregulated contaminants to identify those contaminants that present the greatest public health concern related to exposure from drinking water. The statute further directs the EPA to take into consideration the effect of contaminants upon subgroups that comprise a meaningful portion of the general population (such as infants, children, pregnant women, the elderly, and individuals with a history of serious illness or other subpopulations) that are identifiable as being at greater risk of adverse health effects due to exposure to contaminants in drinking water than the general population.

The unregulated contaminants considered for listing shall include, but not be limited to, hazardous substances identified in section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and substances registered as pesticides under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as well as other relevant data sources. The statute requires the EPA to consult with the scientific community, including the Science Advisory Board (SAB) and to provide notice and opportunity for public comment.

In a regulatory action separate from the CCL, SDWA Section 1412(b)(1)(B)(ii) directs the EPA to make regulatory determinations on at least five of the contaminants from the CCL every five years. Section 1412(b)(1)(A) of the SDWA specifies that the EPA shall regulate a contaminant if the EPA Administrator determines the following:

- The contaminant may have an adverse effect on the health of persons;
- The contaminant is known to occur or there is a substantial likelihood that the contaminant will occur in PWSs with a frequency and at levels of public health concern; and
- In the sole judgment of the Administrator, regulation of such contaminant presents meaningful opportunity for health risk reduction for persons served by PWSs.

The CCL itself does not pose a burden or place requirements on the states or PWSs. Rather, the CCL identifies contaminants that serve as a list to be considered for research and data collection efforts, such as for the Unregulated Contaminant Monitoring Rule (UCMR). Only after additional data and information are collected are contaminants considered for regulatory determination and rulemaking under the SDWA.

Consistent with Executive Order 14303 "Restoring Gold Standard Science," and guidance from the Office of Science and Technology Policy, the CCL 6 has adhered to the proactive approach outlined therein to ensure that science generated and used throughout the process is transparent, withstands scrutiny, fosters cross disciplinary collaboration, and remains free from bias or undue influence (Executive Office of the President, 2025); USEPA, 2026a).

Prior to this cycle of CCL, the EPA had completed five previous cycles of CCLs since 1996 that are briefly described as follows:

- The EPA published the First Contaminant Candidate List (CCL 1) on March 2, 1998 (63 FR 10274, USEPA, 1998a). The CCL 1 was developed based on recommendations by the National Drinking Water Advisory Council (NDWAC) and reviewed by technical experts. It contained 50 chemicals and 10 microbial contaminants/groups.

- The EPA published the Second Contaminant Candidate List (CCL 2) on February 24, 2005 (70 FR 9071, USEPA, 2005). The EPA carried forward the 51 chemical and microbial contaminants from the CCL 1 to CCL 2 that did not have regulatory determinations.

- The EPA published the Third Contaminant Candidate List (CCL 3) on October 8, 2009 (74 FR 51850, USEPA, 2009a). In developing the CCL 3, the EPA implemented an improved, stepwise process that built on the previous CCL process and was based on expert input and recommendations from the National Academy of Sciences' National Research Council (NRC), NDWAC, and the SAB. The CCL 3 contained 104 chemicals or chemical groups and 12 microbial contaminants.

- The EPA published the Fourth Contaminant Candidate List (CCL 4) on November 17, 2016 (81 FR 81099, USEPA, 2016). The EPA carried forward the chemical and microbial contaminants from the CCL 3 that did not have regulatory determinations to the CCL 4. The Final CCL 4 contained 97 chemicals contaminants/groups and 12 microbial contaminants. All contaminants listed on the Final CCL 4 were carried forward from the CCL 3, along with two additional public nominations.

- The EPA published the Fifth Contaminant Candidate List (CCL 5) on November 14, 2022 (87 FR 68060, USEPA 2022). The Final CCL 5 included 66 chemicals, three chemical groups (cyanotoxins, disinfection byproducts (DBPs), and per- and polyfluoroalkyl substances (PFAS)), and 12 microbial contaminants.

1.2 Overview of the CCL 6 Development Process

The methodology for developing the Sixth Contaminant Candidate List (CCL 6) is based on the existing, three-step framework used for developing past CCLs (i.e. CCL 3, CCL 4, and CCL 5). The process for the CCL microbial contaminants follows the same three overarching steps as the CCL chemical contaminants of building the universe, screening the universe, and classification. However, the process differs for the microbial contaminants (from the chemical contaminants) due to differences in origin, nature of the contaminants, and the potential adverse health effects.

As a result of these differences, different data sources are used for the microbial contaminants, and the availability of data can be limited.

The CCL framework involves three steps:

1. Building the Universe
2. Screening
3. Classification

Step 1 involves building a broad universe of all microbial contaminants called the CCL Microbial Universe. The microbial universe is compiled of microbial contaminants known to potentially cause disease in humans. The CCL Microbial Universe is further developed each cycle of CCL with newly identified microbial contaminants identified through literature searches, public nominations and/or expert input.

Step 2 involves screening the universe of microbial contaminants to identify the microbial contaminants that should be further evaluated. The contaminants in the CCL Microbial Universe that screen through the criteria are placed on the Preliminary CCL (PCCL) for further evaluation.

Step 3 involves selecting contaminants for the CCL based on the pathogen's occurrence in drinking water and potential health risks.

A simplified illustration of the CCL development framework for contaminants is shown in **Figure *1***.

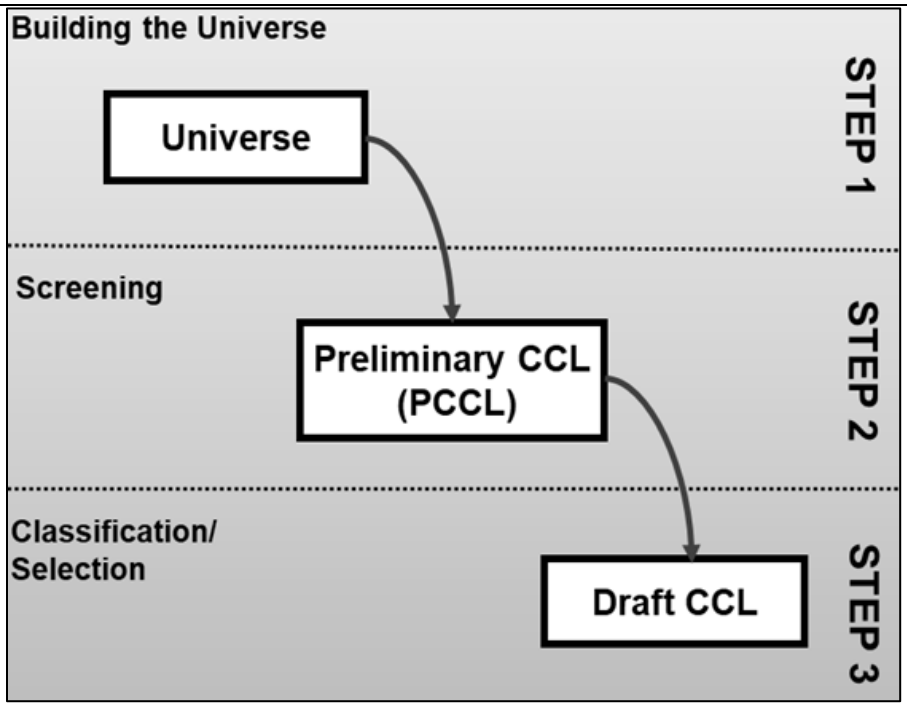

Figure 1. CCL Development Framework

This Technical Support Document (TSD) describes in detail the process used to develop the draft CCL 6 for microbial contaminants. This document is organized into eight chapters:

- Chapter 1 provides background information on the CCL process and an overview of the CCL 6 development process.
- Chapters 2, 3, and 4 describe in detail CCL steps 1, 2, and 3, respectively.
- Chapter 5 provides detail of the microbial contaminants selected for the draft CCL 6.
- Chapter 6 describes the data that is available for the draft CCL 6 contaminants.
- Chapter 7 details the data needs and data gaps for microbial contaminants.
- Chapter 8 describes the data sources used to develop the draft CCL 6 microbial contaminants.

The companion documents to the draft CCL 6 Microbial TSD include the following:

- Technical Support Document for the Draft Sixth Contaminant Candidate List (CCL 6) – Chemical Contaminants (USEPA, 2026b).
- Technical Support Document for the Draft Sixth Contaminant Candidate List (CCL 6) – Contaminant Information Sheets (CISs) (USEPA, 2026c).

All three technical support documents are accessible via the EPA docket (Docket ID No. EPA-HQ-OW-2022-0946) at https://www.regulations.gov.

Chapter 2. Building the Microbial Universe

2.1 Overview

The purpose of Step 1 of the CCL 6 development process, building the universe, is to construct a broad universe of potential drinking water microbial contaminants. The CCL Microbial Universe is defined as known organisms known or suspected to cause human disease.

During the CCL 3, the EPA followed the NDWAC's recommendation to use Taylor et al.'s (Taylor, Latham, & Woolhouse, 2001) list and literature searches as the starting point for the CCL Microbial Universe (NDWAC, 2004). The Agency then added organisms to the Taylor et al. (Taylor, Latham, & Woolhouse, 2001) list, with input from subject matter experts and data collected through a literature search. The CCL 3 Microbial Universe listed 1,425 microbial contaminants. These microbes remained in the CCL 4 Microbial Universe and were further built upon for the CCL 5 Microbial Universe with a literature search and input from subject matter experts. Changes to nomenclature were made as necessary (in most cases combining two species into one organism group), which brought the CCL 5 Universe to consist of 1,435 microbes.

For CCL 6, a literature search was conducted to identify any newly identified microbial contaminants to add to the previously established microbial universe. The search for new microbes (bacteria, viruses, protozoa, helminths, and fungi) consisted of using a variety of search engines and search key words. Sources for searches included Web of Science, the National Center for Biotechnology Information, Google and Google Scholar. Searches were conducted for information on newly identified microbes published between December 2019 (the cut-off date used for CCL 5's literature search) and May 2023. As a result of a literature search, 13 newly identified microbial contaminants or species were added to the CCL 6 Microbial Universe. In addition, three organisms (*Geothrix fermentans, Vermamoeba vermiformis,* and Human metapneumovirus) were also added by subject matter expert input. Updates to nomenclature were made as necessary, bringing the CCL 6 Microbial Universe to consist of over 1,450 microbial contaminants. Table 1 lists the microbial organisms added to the CCL Microbial Universe for CCL 6. The full CCL 6 Microbial Universe is presented in Appendix B of this document.

Table 1. Microbial Contaminants Added to the Microbial Universe for CCL 6

Microbial Name	Type of Microorganism	Reference
Blastomyces helicus	Fungi	(Friedman & Schwartz, 2019)
Blastomyces percursus	Fungi	(Friedman & Schwartz, 2019)
Borrelia miyamotoi	Bacteria	(Medical Xpress, 2022)
Candida auris	Fungi	(Bruno, et al., 2020)
Cryptococcus gattii	Fungi	(Lam, et al., 2019)
Emergomyces spp.	Fungi	(Friedman & Schwartz, 2019)

Microbial Name	Type of Microorganism	Reference
Enterobacter chuandaensis	Bacteria	(Wu, Wei, Feng, & Zong, 2019)
Enterobacter huaxiensis	Bacteria	(Wu, Wei, Feng, & Zong, 2019)
Geothrix fermentans	Bacteria	(Coates, Ellis, Gaw, & Lovley, 1999)
Human metapneumovirus	Virus	(Van den Hoogen, et al., 2001)
Klebsiella variicola	Bacteria	(Rodríguez-Medina, Barrios-Camacho, Duran-Bedolla, & Garza-Ramos, 2019)
Legionella bononiensis	Bacteria	(Girolamini, et al., 2022)
Mycobacterium paraintracellulare	Bacteria	(Akram & Attia, 2023)
Scedosporium aurantiacum	Fungi	(Kaur, et al., 2019)
Sporothrix brasiliensis	Fungi	(Etchecopaz, et al., 2021)
Vermamoeba vermiformis	Protozoa	(Delafont, Rodier, Maisonneuve, & Cateau, 2018)

2.2 Public Nominations

On February 17, 2023, the EPA published a request for public nominations of unregulated chemical and microbial contaminants to be considered for possible inclusion on the CCL 6 (88 FR 10316, USEPA, 2023). In accordance with the SDWA, which directs the EPA to consider health effects and occurrence information when deciding whether to place contaminants on the CCL, the EPA asked that nominations include responses to the following questions:

1. What is the nominated contaminant's name, CAS Registry Number (CAS RN) or DSSTox substance identifier (DTXSID), and/or common synonym (if applicable)? Note—please do not nominate a contaminant already subject to the National Primary Drinking Water Regulations (NPDWRs) (see the current list at *https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations*).

2. What are the data you believe support the conclusion that the nominated contaminant is known or anticipated to occur in public water systems? For example, provide information that shows measured occurrence of the contaminant in drinking water, measured occurrence in sources of drinking water that provide water to public drinking water systems, measured occurrence in other water types (*i.e.,* ambient water (rivers, lakes, or streams) groundwater, wastewater, stormwater, or urban runoff) or provide information that shows the contaminant is released in the environment or is manufactured in large quantities and has the potential for contaminating sources of public drinking water. Please provide the source of the information with complete citations for published information (*i.e.,* author(s), title, journal, and date) and/or contact information for the primary investigator. Additionally, please provide original supporting or supplemental

information files relevant to the published information (*i.e.,* data tables, data sets, or data files, etc.).

3. What new health effects data are available which you believe supports the conclusion that a contaminant may have an adverse effect on the health of humans? For example, provide information that shows the contaminant may have an adverse health effect on the general population or that the contaminant is potentially harmful to subgroups that comprise a meaningful portion of the population (such as children, pregnant women, the elderly, individuals with a history of serious illness, individuals living in disadvantaged communities with known occurrence of emerging contaminants in their public water systems, or others). Please provide the source of this information with complete citations for published information (*i.e.,* author(s), title, journal, and date) and/or contact information for the primary investigator. Additionally, please provide original supporting or supplemental information files relevant to the published information (*i.e.,* data tables, data sets, or data files, etc.).

Nominations were received via the EPA docket (Docket ID No. EPA-HQ-OW-2022-0946) on the Federal eRulemaking Portal (http://www.regulations.gov) and were also accepted by mail or hand delivery. The EPA compiled and reviewed the information to identify the contaminants nominated and any supporting data submitted that could supplement data gathered by the EPA to inform the selection of the draft CCL 6.

2.2.1 Summary of Public Nominations for Microbial Contaminants

The EPA received six public nominations for five unique microbial contaminants for CCL 6, as shown in Table 2. The EPA received two nominations for *Legionella pneumophilia* and one nomination for each following microbial contaminants: *Pseudomonas aeruginosa*, *Listeria monocytogenes,* nontuberculous mycobacteria (NTM), and a group of pathogenic waterborne mycobacteria that includes *Mycobacterium avium, Mycobacterium abscessus, Mycobacterium fortuitum, Mycobacterium gordonae, Mycobacterium mucogenicum, Mycobacterium chelonae, Mycobacterium kansasii, Mycobacterium xenopi, and Mycobacterium intracellulare*.

Table 2. Publicly Nominated Microbial Contaminants

Microbial Name	Type of Microorganism
Legionella pneumophila	Bacteria
Pseudomonas aeruginosa	Bacteria
Nontuberculous mycobacteria (NTM)	Bacteria
Pathogenic waterborne mycobacteria	Bacteria
Listeria monocytogenes	Bacteria

Publicly nominated chemical contaminants are discussed in the Technical Support Document for the Draft Sixth Candidate List (CCL 6) – Chemical Contaminants (USEPA, 2026b). All submission letters for public nominations can be viewed on the CCL 6 docket (Docket ID No. EPA-HQ-OW-2022-0946) at https://www.regulations.gov.

2.2.2 Consideration of Publicly Nominated Microbes for the PCCL

The EPA reviewed the nominated microbial contaminants and the supporting information provided by nominators to determine if any new contaminants and/or data that were provided had not been previously evaluated to inform selection for the draft CCL 6. There were no unknown contaminants nominated for CCL 6, and the data sources provided were either already included as CCL source or did not meet all four assessment factors (relevance, redundancy, retrievability, and completeness). Different from previous cycles of CCL, for CCL 6, all the publicly nominated microbial contaminants were added directly to the Preliminary CCL 6 (PCCL 6) for further evaluation of their occurrence in water and potential health risks. This change in protocol for the CCL microbes is to better align in similarity with the CCL chemical contaminant process. Appendix A: List of CCL 6 Microbial Nominations shows the microbial contaminants that were nominated for CCL 6, along with the number of nominators and any supporting information provided as a part of the nomination.

Chapter 3. Screening the Microbial Universe to a PCCL

3.1 Overview

The purpose of Step 2 of the CCL 6 development process, screening, is to screen the microbial universe for inclusion on the PCCL 6, leading to further evaluation and the potential listing on the draft CCL 6. The screening criteria for microbial contaminants consists of 12 criteria, which were developed based upon epidemiology, geographical distribution, and biological properties in the host and in the environment. The screening criteria were recommended by NDWAC and amended by the EPA microbiology workgroup following external peer review. The screening criteria were developed to be exclusionary, in that, if a pathogen meets one of the criteria the pathogen is excluded from moving on to the PCCL. All pathogens that screen through the criteria (hence not excluded under any screening criteria) are moved to the PCCL. However, any pathogen documented to cause disease transmitted through drinking water, regardless of the screening criteria, is considered for the PCCL. Since the development of the microbial screening criteria during the CCL 3, the screening criteria have been used for subsequent CCLs, including for CCL 6.

3.2 CCL Microbial Screening Criteria

The 12 exclusionary screening criteria are used to evaluate the five microbial groups (bacteria, viruses, fungi, helminths, and protozoa) that make up the microbial universe. However, each criterion does not necessarily apply to every microbial group due to the fundamental differences of the groups. For example, criterion 5 (microbiome indigenous to the gastrointestinal tract, skin, and mucous membranes) was not used to evaluate viruses and helminths in the microbial universe. This is because viruses and helminths do not have a commensal relationship with a human host and are not considered a part of normal human microbiome (Davis, 1996). Criteria that were not used are greyed out in their respective columns in the screening table presented in Appendix B: The CCL 6 Microbial Universe.

The screening criteria exclude those pathogens whose biological properties are incompatible with water transmission by ingestion, inhalation, or dermal contact, and those pathogens that are typically introduced from sources other than drinking water. The EPA has restricted the PCCL to pathogens associated with source water and recreational water only if the source water was also utilized for drinking water (e.g., swimming pools, hot tubs). Pathogens that are known to be associated with source water, recreational water, or treated drinking water are considered candidates for selection on the PCCL.

During the CCL 5, as a response to a past SAB comment that Criterion 9 of the screening criteria was too restrictive, the EPA expanded Criterion 9 to additionally consider pathogens with evidence of drinking water-related nosocomial infection(s). This expansion recognized a growing concern for microbial contaminants within distribution systems, building water systems, and biofilms. For past CCLs, microorganisms that had outbreaks but no evidence of a contaminated PWS distribution system as their cause were screened out. Thus, outbreaks, which were attributable to recreational water or were occurring due to nosocomial exposure of drinking

water contaminated post-delivery, were not sufficient to place a microorganism on the PCCL unless the drinking water was shown to be contaminated.

For CCL 6, the EPA conducted literature reviews to re-evaluate the 12 screening criteria for applicability to microbes and found no evidence to change or alter the criteria that was used for the previous CCL cycle, CCL 5. Table 3 lists the 12 microbial screening criteria with more detail provided for each criterion in the following section of this document.

Table 3. The Microbial Exclusion Screening Criteria

Criterion 1: Anaerobes.
Criterion 2: Obligate intracellular or fastidious pathogens.
Criterion 3: Transmitted by contact with blood or body fluids.
Criterion 4: Transmitted by vectors.
Criterion 5: Microbiome indigenous to the gastrointestinal tract, skin and mucous membranes.
Criterion 6: Transmitted solely by respiratory secretions.
Criterion 7: Life cycle incompatible with drinking water transmission.
Criterion 8: Drinking water-related transmission is not implicated.
Criterion 9: Natural habitat is in the environment without epidemiological evidence of drinking water-related disease and without evidence of drinking water-related nosocomial infection.
Criterion 10: Not endemic to North America.
Criterion 11: Represented by a pathogen for the entire genus or species (that are closely related).
Criterion 12: Current taxonomy changed from taxonomy used in Universe.

3.2.1 CCL Microbial Screening Criteria Descriptions

Criterion 1: Anaerobes

In general, anaerobes are microorganisms that do not grow in the presence of oxygen. Obligate anaerobes are organisms that exclusively rely on anaerobic metabolism (fermentation) to grow and survive and would likely not survive in water that is oxygenated. However, there are some anaerobic organisms that can tolerate the presence of oxygen. In addition, biofilms are ubiquitous in water distribution systems and may provide small zones of anaerobic niches on pipe surfaces (Fish, Osborn, & Boxall, 2016); (Paul, Ochoa, Pechaud, Liu, & Liné, 2012), and drinking water distribution systems and premise plumbing can experience low oxygen

concentrations under conditions such as high-water age and low water use, the influences of these niches on the microbial communities have not been thoroughly explored. In addition, some anaerobes are spore forming and have some evidence of taking dormant form in oxygenated environments allowing survival in biofilms. However, despite these situations, the EPA has found that the literature lacks evidence supporting anaerobes being able to infect humans via drinking water and therefore supports their exclusion from PCCL. Examples of anaerobes that are screened out based on the application of this screening criterion include members of the bacterial genera *Actinomyces, Bacteroides, Clostridium, Eubacterium, Fusobacterium, and Prevotella*, among others.

Criterion 2: Obligate intracellular or fastidious pathogens

Obligate intracellular or fastidious pathogens rely upon their host to provide essential nutrients and growth factors that are not present in the environment, hence these pathogens cannot survive outside their hosts. Many fastidious or obligate intracellular pathogens have a narrow temperature and pH range due to host adaptation, and they cannot survive the wide range of temperatures and pH common in ambient environments. Examples of fastidious or obligate intracellular pathogens that were screened out included members of the genera *Chlamydophila*, *Mycoplasma*, and *Orientia* (Carroll et al., 2023). This criterion is only applicable to bacteria since all viruses are obligate intracellular pathogens. Hence, if a bacterium in the microbial universe is obligate intracellular pathogen or fastidious pathogen, it will be screened out from moving onto the PCCL.

Criterion 3: Pathogens transmitted by direct or indirect contact with blood or body fluids

Pathogens that rely on transmission via direct or indirect contact with contaminated blood or body fluids (including sexually transmitted diseases) are usually highly host adapted and are unable to survive for significant periods of time away from a host. These pathogens do not survive under ambient environmental conditions and are not transmitted by the fecal-oral route (either by direct contact with feces or indirect contact with contaminated drinking water). Examples of pathogens transmitted by blood or body fluids include the etiologic agents of gonorrhea and syphilis, *Chlamydia*, herpes virus, human immunodeficiency virus, and hepatitis virus B, C, D and G (Carroll et al., 2023).

Criterion 4: Pathogens transmitted by vectors

Pathogens transmitted by vectors, such as arthropods and rodents, depend upon either insect or other bites, or close contact with rodents, and these pathogens are not transmitted by contact with drinking water. Mosquitoes, ticks, and fleas are the most common vectors of arthropod-borne diseases (Krause, 2003). The genera that include vector-borne pathogens are *Babesia, Borrelia, Brugia, Dirofilaria, Ehrlichia, Leishmania, Plasmodium, Trypanosoma, Rickettsia* (Carroll et al., 2023).

Criterion 5: Microbiome indigenous to the gastrointestinal tract, skin, and mucous membranes

The human body is colonized with a rich and commensal microbiome (Finegold, Sutter, & Mathisen, 1983); (Drasar & Barrow, 1985); (Isenberg & D'Amato, 1995). Some microbes that colonize the human body are transitory, while others are part of the continuing normal flora of the body. Microbes comprising normal flora have a characteristic ecological niche, but sometimes conditions permit their access to areas of the body where they may exhibit pathogenic potential resulting in infection and disease. Infections with normally innocuous microbes are called opportunistic infections, because of their ability to exploit host conditions that may periodically predispose them to disease. Exposure to normal flora microbes is continuous throughout life, and because the populations of normal flora microbes exceed the number of these microbes present in drinking water by many orders of magnitude, drinking water represents an improbable source of infection and disease. Examples of normal flora include members of the genera *Capnocytophaga, Corynebacterium, Staphylococcus, Streptococcus,* and several yeasts (Carroll et al., 2023).

Criterion 6: Pathogens transmitted solely by respiratory secretions

Pathogens causing respiratory disease are typically transmitted by direct contact with respiratory secretions either by inhalation of aerosols, by direct person-to-person contact, or by contact with fomites. Drinking water is an unlikely mode of transmission because the number of pathogens in respiratory secretions and the continuity of exposure to respiratory secretions far exceed exposure through drinking water (Bennet and Brachman, 2007). Examples of pathogens transmitted by respiratory secretions include the etiologic agents of tuberculosis, diphtheria, whooping cough, measles, rubella, and influenza (Knipe & Howley, 2007); (Mandell, Bennett, & Dolin, 2005); (Carroll et al., 2023).

Criterion 7: Pathogens whose life cycle is incompatible with drinking water transmission

Some pathogens are adapted to a single route of transmission, being specifically adapted to survive in a unique ecological niche, and cannot withstand any alteration of conditions to which they are adapted. For example, rabies virus, *Dientamoeba fragilis, Enterobius vermicularis*, and many helminths remain in the microbial CCL 6 Universe upon application of this criterion (Ashford & Crewe, 2003); (Carroll et al., 2023).

Criterion 8: Pathogens where drinking water-related transmission is not implicated

Some pathogens cause such rare occurrences of disease that only a few cases have been reported in medical literature, and these rare occurrences of disease present limited opportunity to protect public health from drinking water exposure (Acha & Szyfres, 2001); (Knipe & Howley, 2007); (Wormser & Stratton, 2007); (Mandell, Bennett, & Dolin, 2005). Some pathogens are associated with direct transmission from animals to humans, or other transmission routes that do not involve drinking water (Acha & Szyfres, 2001); (Krauss, et al., 2003); (Howard, 2002). Examples of pathogens that remain in the microbial CCL universe after application of this criterion are

Leptospira, *Listeria*, *Nosema*, and the etiologic agents of several zoonotic virus infections (Knipe & Howley, 2007); (Carroll et al., 2023).

Criterion 9: Natural habitat is in the environment without epidemiological evidence of drinking water-related disease and without evidence of drinking water-related nosocomial infection

The environment is teeming with microorganisms, at varying concentrations, and humans are in constant contact with these microorganisms throughout their lives. Microorganisms naturally present in the environment are not considered a threat to public health as a result of drinking water exposure unless epidemiological evidence demonstrates a potential for water-related disease. Thus, outbreaks occurring must be attributable to a contaminated drinking water system (Wenzel, 2003). *Gordonia, Nocardia*, and most fungi were excluded from the PCCL based on this criterion (Carroll et al., 2023); (Howard, 2002).

Criterion 10: Pathogens not endemic to North America

Some pathogens have an exclusive geographical distribution and are not naturally present in North America (Ashford & Crewe, 2003); (Wormser & Stratton, 2007); (Palmer, Soulsby, & Simpson, 1998). Only pathogens endemic to North America have the potential to contaminate U.S. drinking water. After the application of this criterion, several helminths such as most *Diphyllobothrium* and *Paragonimus* species and several viruses such as the hemorrhagic fever viruses and poxviruses screen out and do not move forward onto the PCCL.

Criterion 11: A genus and species or serotype may be chosen to represent a group of closely related organisms

Advancements in genotyping techniques have resulted in the identification of many serotypes/genotypes of pathogenic species. The differences between serotype /genotypes of a pathogenic species may be very subtle for disease manifestation. Similarly, closely related species of a pathogenic genera are generally known to elicit similar pathology and disease outcome. For example, most enteric viruses provoke similar pathological events. The EPA has designated certain pathogens to represent a group based on all the serotypes within a group sharing essential biological properties in common with the group. Pathogens that represent other pathogens in their group are the following: *Aliarcobacter butzleri, Campylobacter jejuni, Helicobacter pylori, Legionella pneumophila, Salmonella enterica, Shigella sonnei,* Adenovirus, Astrovirus, Enterovirus, Microsporidia, and *Entamoeba histolytica.* For example, human adenovirus A, human adenovirus B, human adenovirus C, human adenovirus D, human adenovirus E, and human adenovirus F could be consolidated to human adenovirus.

Criterion 12: Current taxonomy changed from taxonomy used in Universe

Advancements in molecular methods have significantly impacted the classical taxonomy and nomenclature of pathogens. As a result, some microbes have been reclassified and renamed based on the similarities and differences in genetic information and organization as new information has been reported. Original taxonomic classifications were based upon the

phenotypic characteristics of microorganisms, but these classifications are being revised as updates in genotypic information has become available. Under this criterion in CCL 5, the genera *Fluoribacter* and *Tatlockia* were combined with the genus *Legionella* for screening purposes. This criterion was not applied to any contaminants in the CCL 6 Microbial Universe.

3.3 Application of the Screening Criteria to the Microbial Universe

Every pathogen in the CCL Microbial Universe is screened through the microbial screening criteria. All pathogens that pass through all 12 screening criteria are moved to the PCCL. As the pathogens in the universe are screened through the 12 criteria, a pathogen needs to only meet one criterion to be excluded from moving to the PCCL. Some pathogens may meet multiple criteria, however, because the pathogens are evaluated through the screening criteria sequentially, the criteria that the pathogen meets first will exclude the pathogen from further evaluation of the remaining screening criteria and it will not move to the PCCL. For example, if a pathogen could be excluded based on meeting Criterion 3 and 7, the pathogen will be screened out based on meeting Criterion 3 and will not be further evaluated to see if any other criterion is met; the pathogen will be excluded based on the first criterion that is met.

Those pathogens not excluded by at least one of the ten screening criteria, or consolidated under Criteria 11 or 12, pass on to the PCCL. Pathogens failing to screen through to the PCCL will remain in the microbial universe until epidemiological surveillance data or nominations processes support their reevaluation. Table 4 summarizes the screening results for the CCL 6 Universe and Appendix B: The CCL 6 Microbial Universe provides the screening results for each individual microbial contaminants in the CCL 6 Microbial Universe.

Table 4. Summary of Screening the Microbial CCL 6 Universe

Pathogen Class	Total Universe Count	Number of Microbes Excluded by Each Screening Criterion												Total Screened Onto PCCL
		1	2	3	4	5	6	7	8	9	10	11	12	
Bacteria	**552**	120	15	9	41	121	7	0	29	147	2	35	0	17
Viruses	**227**	0	0	28	104	0	23	1	20	0	36	8	0	7
Protozoa	**67**	0	0	1	29	3	0	4	6	7	0	6	0	8
Helminths	**286**	0	0	0	25	0	0	105	0	0	156	0	0	0
Fungi	**321**	0	0	0	0	12	3	0	0	302	0	0	0	4
Total	**1,453**	120	15	38	199	136	32	110	55	456	194	49	0	**36**

Based upon this screening exercise conducted on 1,453 pathogens in the CCL 6 Microbial Universe, 1,417 pathogens were excluded from consideration while 36 pathogens passed on to the PCCL 6. Table 5 lists the 36 PCCL 6 microbial contaminants.

Table 5. PCCL 6 Microbial Contaminants

Microbial Name	Type of Microorganism
Acanthamoeba spp.	Protozoa
Acinetobacter baumannii	Bacteria
Adenovirus	Virus
Aeromonas hydrophila	Bacteria
Aliarcobacter butzleri	Bacteria
Aspergillus fumigatus	Fungi
Astrovirus	Virus
Balamuthia mandrillaris	Protozoa
Blastocystis hominis	Protozoa
Human Caliciviruses	Virus
Campylobacter jejuni	Bacteria
Comamonas testosteroni	Bacteria
Cyclospora cayetanensis	Protozoa
Entamoeba histolytica	Protozoa
Enterovirus	Virus
Escherichia coli O157	Bacteria
Exophiala jeanselmei	Fungi
Fusarium solani	Fungi
Helicobacter pylori	Bacteria
Hepatitis A	Virus
Hepatitis E	Virus
Cystoisopora belli	Protozoa
*Legionella pneumophila**	Bacteria
*Listeria monocytogenes**	Bacteria
Microsporidia	Fungi
Naegleria fowleri	Protozoa
Pantoea agglomerans	Bacteria
Pathogenic Waterborne Mycobacteria*	Bacteria
Plesiomonas shigelloides	Bacteria
*Pseudomonas aeruginosa**	Bacteria
Rotavirus	Virus
Salmonella enterica	Bacteria

Microbial Name	Type of Microorganism
Shigella sonnei	Bacteria
Toxoplasma gondii	Protozoa
Vibrio cholerae	Bacteria
Yersinia enterocolitica	Bacteria

*Publicly Nominated

Chapter 4. Evaluating the PCCL Microbial Contaminants

This section describes the scoring process developed (in CCL 3) and used for the CCL microbial contaminants, and explains the elements included in the microbial Contaminant Information Sheets (CISs). The EPA developed the CCL protocols and scoring process for microbial contaminants in part from recommendations of the NRC and NDWAC, and two external workshops (USEPA, 2009b).

The PCCL microbial contaminants are evaluated for their occurrence in water and their ability to cause adverse health effects in humans. Pathogens on the PCCL are scored using a scoring system to assign a numerical value to each pathogen based upon their occurrence and potential health risks. Each microbe was scored using the scoring protocols for Waterborne Disease Outbreaks (WBDOs), occurrence in water, and potential health risks (both for the general and sensitive populations). These three scores from each of the scoring protocols are used to calculate a total score for a PCCL contaminant. Data collected during CCL 3, CCL 4, and CCL 5 were not removed from consideration and remain on the CISs. The CCL 6 microbial CISs are presented in Appendix E: Microbial Contaminants Information Sheets (CISs). If new data were available, the data were added to the CIS and scores were adjusted as necessary.

4.1 Waterborne Disease Outbreak Protocol

Recognition of pathogens causing waterborne disease outbreaks (WBDOs) is important to the CCL process. WBDOs are documented by public health officials and provide direct evidence of exposure to pathogens in water through the manifestation of adverse health effects. For a WBDO to occur, an infective dose must be present in water and a susceptible person must be exposed, resulting in clinical manifestations of disease. The CCL WBDO protocol uses the Centers for Disease Control and Prevention's (CDC) definition of waterborne disease outbreak of two or more people linked epidemiologically by time, location of exposure to water, and type of illness, and the epidemiologic evidence implicates water as the probable source of illness (CDC, 2025a). The CDC excludes single cases of illness from the WBDO definition, except for single cases of *Naegleria fowleri* and *Vibrio cholerae* infection. For CCL 6, the EPA also included single cases of granulomatous amebic encephalitis (GAE) in this exception, counting single cases of GAE illness as an outbreak due to the high fatality rate of the disease for susceptible sensitive populations.

Because water-related illness may also occur in the absence of recognized outbreaks, the process is broadened to include recreational water exposures and other exposures if the source is traced to a public drinking water system. Recreational water settings include swimming pools, wading

pools, splash pads, spas, waterslides, and interactive fountains. Non-drinking water sources were excluded from consideration under the CCL.

According to the WBDO protocol the EPA used in CCL 6, a pathogen is scored by the occurrence(s) of reported WBDOs reported to CDC's National Outbreak Reporting System (NORS). As was done in CCL 5, CCL 6 used NORS as the primary data source for a pathogen's WBDO data. Since 1971, the CDC, the EPA, and the Council of State and Territorial Epidemiologists (CSTE) have maintained a collaborative surveillance system for collecting and periodically reporting data related to WBDO occurrence and causes. In 2009, the CDC launched NORS to improve the quality, quantity, and availability of WBDO data submitted to the Waterborne Disease and Outbreak Surveillance System (WBDOSS). Public health officials in the United States voluntarily report waterborne disease outbreak data associated with recreational water, drinking water, other, and unknown types of exposures to water to NORS.

Under the WBDO protocol, a pathogen with two or more reported WBDOs within the CCL 6 timeframe is given the highest score. Under the WBDO protocol, pathogens with only one reported WBDO with the CCL 6 timeframe, or have ever caused a WBDO in the past, or have caused WBDOs outside the U.S. are also scored. WBDOs outside the U.S. were scored when information was available from peer-reviewed publications since they are not reported in NORS.

Although WBDO data is a useful tool supporting the determination of microbial occurrence and exposure routes, there are limitations of reported WBDO data. Due to the voluntary nature of reporting outbreaks, many WBDOs may be unaccounted. There are many possible circumstances that could explain underreporting of WBDOs. For example, some people may not seek health care for their illnesses. For those people that do seek health care, laboratory testing may not be performed, and the cause of illness may not be identified. Even when a specific diagnosis/pathogen is identified, healthcare providers might not report the illness to public health agencies. In addition, surveillance, investigation, and reporting capacity vary across states and localities. Furthermore, there are multiple routes of exposure for many pathogens, in addition to the drinking water pathway, some pathogens can be transmitted through food, person-to-person contact, or animal-to-person contact. Therefore, it can be difficult to explicitly link illness from exposure through drinking water.

For CCL 6, the EPA used outbreak data reported to NORS from the years 2013 to 2021. This timeframe was used to align with the occurrence data used and evaluated for the CCL 6 chemical contaminants.

The EPA scored WBDOs available for any PCCL microbial contaminants using a five-level hierarchy ranging from "never caused a WBDO" (score of 1) to "two or more documented WBDOs in the U.S." (score of 5) in the timeframe specified (Table 6).

Table 6. Waterborne Disease Outbreak (WBDO) Scoring Protocol

Category	Score
Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	5

Category	Score
Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	4
Has caused documented WBDOs at any time in the U.S.	3
Has caused documented WBDOs in countries other than the U.S.	2
Has never caused WBDOs in any country, but has been epidemiologically associated with water-related disease	1

4.2 Occurrence Protocol

The scoring process also evaluates the occurrence of a pathogen in drinking water and source water. The occurrence is the direct detection of microbes using cultural, immunochemical, or molecular detection of pathogens in drinking water documented by peer-related journals under the CCL Occurrence Protocol. Occurrence characterizes pathogen introduction, survival, and distribution in the environment. Occurrence implies that pathogens are present in water and that they may be capable of surviving and moving through water to cause illness in persons exposed to drinking water by ingestion, inhalation, or dermal contact.

Pathogen occurrence is considered broadly to include treated drinking water, and all waters using a drinking water source for recreational purposes, groundwater, and surface water bodies. This attribute does not characterize the extent to which a pathogen's occurrence poses a public health threat from drinking water exposure. Occurrence was scored on a three-level hierarchy ranging from “not detected in the U.S.” (score of 1), “detected in source water in the U.S.” (score of 2) to “detected in drinking water in the U.S.” (score of 3)(Table 7).

Table 7. Occurrence Scoring Protocol

Category	Score
Detected in drinking water in the U.S.	3
Detected in source water in the U.S.	2
Not detected in the U.S.	1

4.3 Health Risk Protocol

The health risk scoring protocol evaluates the potential extent of illness manifested from the pathogen from drinking water exposure. The severity of disease manifestations produced by a pathogen is evaluated across a range of potential endpoints. Pathogens may produce a range of illness from asymptomatic infection to severe illness. The seven-level hierarchy developed for this protocol begins with mild, self-limiting illness (score of 1) and progresses to illness causing

death (score of 7). The protocol scored the representative or more common clinical presentation for the specific pathogen for the population category under consideration, rather than the extremes. The contaminants' scores are based on data from recent clinical microbiology manuals (Carroll et al. 2019; Carroll et al., 2023).

To obtain a representative characterization of health risk in all populations, the EPA evaluated separately the general population and four sensitive sub-populations (i.e. children, elderly, pregnant women, and persons with chronic diseases[1]) as to the common clinical presentation of illness for that sub-population.

The EPA uses the general population health risk score and the highest score among the four sensitive sub-populations health risk score to calculate an overall health risk score, as described later in this document. Table 8 shows the health risk scoring protocol for general and sensitive sub-populations.

Table 8. Health Risk Scoring Protocol

Outcome Category	Score
Does the organism cause significant mortality (> 1/1,000 cases)?	7
Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long term hospitalization (> 1 week)	6
Does the illness result in long term or permanent dysfunction or disability (i.e., sequelae)?	5
Does the illness require short term hospitalization (< 1 week)?	4
Does the illness require physician intervention?	3
Is the illness self-limiting (without requiring medical intervention)?	2
Does the illness result in mild symptoms with minimal or no impact on daily activities?	1

[1] Chronic diseases are defined broadly as conditions that last one year or more and require ongoing medical attention or limit activities of daily living or both, such as heart disease, cancer, and diabetes (CDC, n.d.) (https://www.cdc.gov/chronicdisease/about/index.htm).

4.4 Combining Protocol Scores

The EPA uses the three attribute scoring protocols of waterborne disease outbreaks, occurrence and health risks to score and relatively rank the PCCL contaminants. After each PCCL contaminant is scored using the three protocols, the three scores are then used to calculate a total score for the microbial contaminant to help determine ranking of the PCCL contaminants. To calculate a pathogen's total score, the highest score between the WBDO and the occurrence protocol scores is used for the overall occurrence score and is added to the calculated health risk score. The calculated health risk score is calculated from adding the general population health score to the highest sensitive sub-population health score and multiplied by 5/14 to normalize the score to the occurrence score. The formula for the pathogen score is as follows:

Equation 1: Formula for Pathogen's Total Score

$$\text{Pathogen Total Score} = \text{Highest Score between WBDO and Occurrence} + \left(\left(\text{General Population Score + Highest Sensitive Population} \right) \times 5/14 \right)$$

The EPA normalized the health risk score so that occurrence score and health risk score have equal value in determining the ranking of the pathogen. The highest possible score for occurrence is 5 and the highest possible health risk score is 14. To normalize this imbalance in the calculated total score, the health risk score is multiplied by 5⁄14.

The PCCL 6 contaminants' scores can be found in their CISs. The CISs that had been developed for CCL 5 were updated for each PCCL 6 contaminant using updated data sources and literature searches covering the time between the CCL 5 and the draft CCL 6, and new CIS sheets were developed for those microbes not previously included. The references in the CISs were also updated to reflect information that became available after the EPA published the final CCL 5. Scores were based on new and previous data available for each CCL 6 contaminant. The CIS tables present the total scores for each of the data types under consideration and a brief description of the data used to assign those scores with their respective references. For more information on the CISs, see Appendix E: Microbial Contaminant Information Sheets (CISs).

4.5 PCCL 6 Total Score Results

The total score for a pathogen is calculated by adding their higher occurrence score to the pathogen's calculated health risk score, equal weighting of a pathogen's occurrence and potential health risks. A pathogen's total score is used for relative ranking and to identify top priority pathogens.

Table 9. Scores and Ranking of PCCL 6 Microbial Contaminants

Ranking	Microbial Name	WBDO	Occurrence	Health[1]	Total score
1	*Naegleria fowleri*	5	3	5.0	10.0
2	*Balamuthia mandrillaris*	4	3	4.6	8.6
3	*Legionella pneumophila*	5	3	3.6	8.6
4	*Pathogenic Waterborne Mycobacteria*	5	3	3.6	8.6
5	*Acanthamoeba spp.*	5	3	3.2	8.2
6	*Pseudomonas aeruginosa*	5	3	3.2	8.2
7	*Escherichia coli O157*	5	3	3.2	8.2
8	*Campylobacter jejuni*	5	3	2.9	7.9
9	*Helicobacter pylori*	1	3	4.3	7.3
10	*Caliciviruses*	5	3	2.1	7.1
11	*Enterovirus*	2	3	3.6	6.6
12	*Aspergillus fumigatus*	1	3	3.2	6.2
13	*Hepatitis A*	3	2	3.2	6.2
14	*Listeria monocytogenes*	1	3	3.2	6.2
15	*Adenovirus*	2	3	2.9	5.9
16	*Fusarium solani*	1	3	2.9	5.9
17	*Shigella sonnei*	4	3	1.8	5.8
18	*Hepatitis E*	2	1	3.5	5.6
19	*Acinetobacter baumannii*	2	3	2.5	5.5
20	*Cyclospora cayetanensis*	3	3	2.5	5.5
21	*Pantoea agglomerans*	3	3	2.5	5.5
22	*Toxoplasma gondii*	2	1	3.2	5.2
23	*Aliarcobacter butzleri*	3	3	2.1	5.1
24	*Entamoeba histolytica*	3	3	2.1	5.1

Ranking	Microbial Name	WBDO	Occurrence	Health[1]	Total score
25	*Exophiala jeanselmei*	1	3	2.1	5.1
26	*Rotavirus*	3	3	2.1	5.1
27	*Vibrio cholerae*	3	3	2.1	5.1
28	*Plesiomonas shigelloides*	3	3	1.8	4.8
29	*Salmonella enterica*	3	3	1.8	4.8
30	*Comamonas testosteroni*	1	2	2.5	4.5
31	*Aeromonas hydrophila*	1	3	1.4	4.4
32	*Yersinia enterocolitica*	3	3	1.4	4.4
33	*Blastocystis hominis*	3	1	0.7	3.7
34	*Astrovirus*	2	2	1.4	3.4
35	*Microsporidia*	1	2	1.4	3.4
36	*Cystoisospora belli*	2	1	1.0	3.1

[1] Health Score is calculated health score. Calculated health score =General population health score + highest sensitive subpopulation health score and multiplied by 5/14.

Chapter 5. The Draft CCL 6 Microbial Contaminants

5.1 Selecting the Draft CCL 6 Microbial Contaminants

In selecting contaminants for CCL listing, the EPA aims to meet the intent of the SDWA and the need to focus Agency resources on pathogens to provide the most effective opportunities to advance public health protection. Approaches for past CCL selections for microbial contaminants have included using the ranking of the total scores or using recommendations from subject matter expert panels or a combination of both approaches. For CCL 5, the EPA used the ranking of pathogen's total scores and recommendations from expert panels to select the microbial contaminants for listing. For the selection of contaminants to list on the draft CCL 6, the EPA put more emphasis on the occurrence of recent waterborne disease outbreaks rather than the total score for a pathogen to better prioritize the microbial contaminants of greatest concern to public health. Therefore, the PCCL 6 contaminants with one or more reported WBDO(s) that occurred in a U.S. PWS during the timeframe evaluated for CCL 6, were selected for the draft CCL 6. Using this approach, nine microbial contaminants are selected for the draft CCL 6 (Table 10).

The EPA decided to list only those contaminants with WBDOs with confirmed versus suspected etiologies. *Shigella sonnei,* had one reported WBDO within the CCL 6 timeframe, but was excluded from the draft CCL 6 because it was suspected, but not known, cause of the outbreak.

The nine microbial contaminants selected for the draft CCL 6, are also among the top scoring/ranking pathogens of the PCCL 6 contaminants.

Table 10. Microbial Contaminants Listed on the Draft CCL 6

Microbial Name	Type of Microorganism	Potential Health Risk(s)
Acanthamoeba spp.	Protozoa	Granulomatous amoebic encephalitis (GAE)
Balamuthia mandrillaris	Protozoa	Granulomatous amoebic encephalitis (GAE)
Human Caliciviruses	Virus	Mild self-limiting gastrointestinal illness
Campylobacter jejuni	Bacteria	Mild self-limiting gastrointestinal illness
Escherichia coli O157	Bacteria	Gastrointestinal illness and kidney failure
Legionella pneumophila	Bacteria	Legionellosis (Pontiac fever and Legionnaire's Disease)
Naegleria fowleri	Protozoa	Primary amoebic meningoencephalitis (PAM)
Pathogenic Waterborne Mycobacteria	Bacteria	Lung infection in those with underlying lung disease and disseminated infection in the severely immunocompromised
Pseudomonas aeruginosa	Bacteria	Pneumonia, infections in the blood, or other parts of the body after surgery

5.2 Supplemental Support for the Draft CCL 6 Microbial Contaminants

In addition to the information provided in the CISs found in Appendix E: Microbial Contaminant Informations Sheets (CISs) of this document, this section provides supplemental information for each of nine microbial contaminants listed on the draft CCL 6. Supplemental information includes the contaminant's background, potential health risks, occurrence in drinking water, and existing analytical methods.

5.2.1 *Acanthamoeba spp.*

5.2.1.1 Background

Acanthamoeba is a genus containing more than 30 species of free-living amoeba (FLA) that can be found worldwide in soil and in many types of water including: saltwater, freshwater, drinking water systems, swimming pools, and bottled water (USEPA, 2003; Haston et al., 2024; CDC,

2024a). The species known to infect humans include *A. byersi, A. castellanii, A. culbertsoni, A. hatchetti, A. healyi, A. astroonyxix, A. divionensis, A. palestinensis, and A. polyphaga* (USEPA, 2003; CDC, 2024a). The full range of pathogenic species within the *Acanthamoeba* genus is not known because species level identification is not typically performed on *Acanthamoeba* cases (CDC, 2024a).

Acanthamoeba have two stages to their life cycle: the trophozoite, which is the active stage, and the cyst, or protective, dormant form. Cysts may remain viable for many years and when exposed to a food source and can return to the trophozoite form.

5.2.1.2 Health risks

Acanthamoeba can cause severe infections of the eye, skin, lungs, and central nervous system (CNS). *Acanthamoeba* is commonly known to cause keratitis, an infection of the eye, but can also cause rare but more severe infections such as granulomatous amoebic encephalitis (GAE), an infection of the CNS.

Acanthamoeba can cause disease when the amoeba enters the body through the eyes, broken skin, or respiratory tract (CDC, 2024a). GAE is caused when the amoeba enters the body and spreads to the brain causing inflammation and granulomatous lesions. Potential routes of exposure for GAE include using non-sterile tap water for nasal irrigation or direct contact with an open wound. *Acanthamoeba* is considered an opportunistic pathogen, and persons at the highest risk of infection include those with a weakened immune system (CDC, 2024a).

5.2.1.3 Occurrence in Drinking Water

Within the timeframe examined for CCL 6 (2013-2021), one *Acanthamoeba* outbreak was reported to CDC's NORS that resulted in two illnesses (no hospitalizations or deaths reported) from use of treated recreational water (CDC, 2023). In addition, Haston et al. (2024) reported multiple cases of GAE caused by *Acanthamoeba* from 1994-2022 with some cases reporting use of tap water for nasal irrigation before becoming ill with GAE. All cases of GAE reported by Haston et al. involved immunocompromised individuals.

In addition with the potential to cause illness itself, *Acanthamoeba* can serve as a host for other pathogens. Bacteria such as *Legionella pneumophila*, *Mycobacterium*, *Shigella*, *Salmonella*, *Yersinia*, *Vibrio cholerae*, and *Escherichia coli*, and viruses such as Adenovirus, Coxsackievirus, Poliovirus, and *Mimivirus*, and protozoa such as *Cryptosporidium* have been reported to be found in *Acanthamoeba* (Lass et al., 2017). As a host, *Acanthamoeba* provides protection from environmental stresses for other microorganisms, thus enabling their survival and persistence in a water system. Microorganisms can also multiply inside the amoeba, increasing in numbers and potential for pathogenicity (Rayamajhee et al., 2022).

5.2.2 *Balamuthia mandrillaris*

5.2.2.1 Background

Balamuthia mandrillaris (*B. mandrillaris*) is a free-living amoeba that can live in water, soil, or dust, and can cause rare, but serious infections in humans and other animals. There have been

more than 200 cases of *B. mandrillaris* infections recorded worldwide since 1990 (Takei et al., 2018). In the United States, many cases have been reported in southwestern states (CDC, 2024a).

5.2.2.2 Health risks

B. mandrillaris can cause serious infections, and like *Acanthamoeba,* is also capable of causing GAE, a serious infection of the central nervous system with mortality rates of over 98% (CDC 2025b; Matin et al., 2008; Takei et al., 2018; Piper et al., 2018). *B. mandrillaris* infections can occur through inhalation or through direct contact with a break in the skin such as a wound. *Balamuthia* can infect anyone, including healthy people. However, some people in the United States who have been infected have had weakened immune systems from either diabetes, HIV/AIDS, immunosuppressive drug, cancer, or solid organ transplantation (CDC, 2025b).

5.2.2.3 Occurrence in Drinking Water

Piper et al. (2018) reported the first case of *B. mandrillaris* brain infection suspected from the use of non-sterile tap water that was used for nasal irrigation.

5.2.3 Human Caliciviruses

5.2.3.1 Background

Caliciviridae is a family of genetically diverse RNA viruses that are distributed globally and infect a wide range of hosts. The most clinically important viruses in this family are the noroviruses, which are a major cause of viral gastrointestinal disease in humans worldwide (Chandran and Gibson, 2024). Disease caused by human caliciviruses is generally self-limiting, but may cause severe disease in certain circumstances, such as with individuals with weakened immune systems (Carroll et al., 2023).

5.2.3.2 Health risks

Human caliciviruses can cause acute gastroenteritis, an inflammation of the stomach or intestines that may include vomiting, abdominal cramps, diarrhea, headache and fever. Among the human caliciviruses, norovirus is the leading cause of calicivirus morbidity in the U.S. (Carroll et al., 2023). All populations are susceptible to norovirus infection. Norovirus is transmitted through direct contact with an infected host or indirectly through contact with fecal material or other materials (i.e. food, water, and surfaces) contaminated with feces. Contamination of raw foods can occur through irrigation with water contaminated water, shellfish harvested from contaminated beds, or from contamination during food preparation from ill food handlers (Carroll et al., 2023).

5.2.3.3 Occurrence in Drinking Water

Human noroviruses have been detected in various water sources, including surface water (i.e., lakes and rivers), groundwater, tap water, seawater, marine water, and wastewater (Chandran and Gibson, 2024). Waterborne transmission of caliciviruses has occurred primarily in non-community water supplies and results primarily from failure to treat, treatment failure, or distribution system deficiencies. There is little evidence to suggest that treated, properly operated and maintained public water supplies pose a public health risk of calicivirus contamination resulting in waterborne disease outbreaks.

5.2.4 *Campylobacter jejuni*

5.2.4.1 Background

Campylobacter jejuni (*C. jejuni)* is the species of *Campylobacter* bacteria that is most frequently associated with human disease. *C. jejuni* has a worldwide distribution and is normally found in the intestinal tract of domestic and wild animals, including cattle, poultry, and birds. *C. jejuni* can be transmitted through cross contamination or consumption of raw or undercooked poultry and other foods, interactions with animals, or by drinking contaminated water. Foodborne outbreaks are usually attributed to contaminated poultry or raw milk or other dairy products. Waterborne outbreaks result from manure, sewage, or septage contamination of water supplies, or from contamination of water storage tanks with bird or animal feces (Carroll et al., 2023).

5.2.4.2 Health risks

C. jejuni infection can cause campylobacteriosis, a diarrheal illness (CDC, 2024b). Campylobacteriosis is acute gastroenteritis characterized by acute onset of fever, abdominal cramping, and diarrhea. Duration is usually several days to more than one week. Symptoms are usually self-limiting, but relapses may occur. Death attributable to *C. jejuni* infection is uncommon (Carroll et al., 2023), most people fully recover within 7 days (CDC, 2024b).

5.2.4.3 Occurrence in Drinking Water

Surface water may become contaminated by discharge of untreated sewage or animal manure or bird droppings contaminated with *C. jejuni*. Waterborne transmission results primarily from untreated groundwater systems, treatment deficiencies or distribution system deficiencies in public water supplies (Carroll et al., 2023).

5.2.5 *Escherichia coli O157*

5.2.5.1 Background

Escherichia coli (E.coli) O157 is a serotype of the bacterium *Escherichia coli* that produces a hemorrhagic enterotoxin and is normally found in the intestinal tract of cattle and deer. *E. coli* O157:H7 is the most recognized serotype but other serotypes are also pathogenic to humans. Those most at risk for severe health outcomes from *E. coli* O157 are children (who are less than six years old), the elderly, and people with weakened immune systems (Carroll et al., 2023).

5.2.5.2 Health risks

Escherichia coli (*E.coli*) O157 can cause severe bloody diarrhea, abdominal cramps, and hemolytic uremic syndrome (HUS). *E. coli* O157:H7 produces toxins that can cause hemolytic uremic syndrome (HUS) and can lead to kidney failure. Those most at risk for severe health outcomes from *E. coli* O157 are children (who are less than six years old), the elderly, and people with weakened immune systems (i.e., people who have cancer, HIV/AIDS, or had a

transplant). Greater than 4% of cases, usually among children under six years of age or in the elderly, may progress to hemorrhagic uremic syndrome (HUS) (Carroll et al., 2023).

5.2.5.3 Occurrence in Drinking Water

Surface water may become contaminated with *E. coli* O157 from manure runoff or sewage discharge. Ground water may become contaminated with *E. coli* O157 from septic systems or infiltration of contaminated surface water or faulty well construction. Drinking water may become contaminated with *E. coli* O157 from sewer cross connections or leaky sewer pipes adjacent to water mains.

Waterborne transmission results primarily from swimming in contaminated lakes, pools, or water parks. Transmission from consumption of water and has been associated with treatment failure, distribution failure, or untreated drinking water.

5.2.6 *Legionella pneumophila*

5.2.6.1 Background

Legionella is a genus of bacteria that are ubiquitous in natural aquatic environments and can be found in ground water as well as in fresh and marine surface waters (Carroll et al., 2023). *Legionella* are aerobic gram-negative rods associated with respiratory infections. Over 60 *Legionella* species have been identified, 18 of which have been linked to pneumonia infections in humans. However, *Legionella pneumophila (L. pneumophila)* is the most common known cause of reported drinking water-associated outbreaks in the United States and has been identified as a leading cause of human legionellosis. *L. pneumophila* and has been listed on the CCL 3, the CCL 4 and the CCL 5.

5.2.6.2 Health risks

L. pneumophila causes legionellosis. Legionellosis is two distinctive clinical syndromes resulting from inhalation/aspiration of aerosols containing Legionella bacteria: an acute potentially fatal bacterial pneumonia (Legionnaires' disease) and a self-limited influenza-like illness (Pontiac Fever). Both community-acquired and nosocomial legionellosis can occur. Approximately 1,000-2,000 cases of legionellosis are reported to CDC each year.

5.2.6.3 Occurrence in Drinking Water

Legionella bacteria are widespread in the environment and have been found to occur in ground and surface water, plumbing fixtures, hot water tanks, warm water spas, and cooling towers. *Legionella* is believed to evolved a symbiotic relationship with free-living amoeba, and amoebic motility facilitate their movement through the environment and colonization of domestic and industrial water systems. Colonization of hot water systems in hospitals has resulted in numerous nosocomial outbreaks. Community acquired cases are typically associated with cooling towers or untreated well water exposures. While drinking water is frequently implicated in outbreaks of legionellosis, most occurrences result from distal contamination points that are not under the jurisdiction of the water utility (Carroll et al., 2023).

5.2.7 *Naegleria fowleri*

5.2.7.1 Background

Naegleria fowleri (N. fowleri) is a free-living thermophilic amoeba found in warm freshwaters (i.e., rivers, lakes), hot springs, and soil. *Naegleria fowleri* can inhabit surface water and ground water and can also persist in drinking water that contains little or no disinfectant residual, including drinking water distribution systems, premise plumbing, cisterns, roof top collection vessels (e.g., rainwater tanks), treated aquatic venues (e.g., pools, hot tubs, and water playgrounds), and decorative water fountains.

5.2.7.2 Health Risks

N. fowleri enter the body through the nose usually from swimming and/or diving in freshwater bodies. They migrate up the optic nerve to the brain where they cause primary amoebic meningoencephalitis (PAM), which is a fulminate disease with abrupt onset in previously healthy individuals. Symptoms include severe headache, spiking fever, stiff neck, and photophobia, and patients become comatose and die within 3 to 10 days of onset. Treatment is usually unsuccessful and only a few patients are known to have survived the disease (Carroll, et al., 2023). Although infection from *N. fowleri* is rare, the mortality rate of PAM is greater than 90 percent (Baig & Khan, 2014).

5.2.7.3 Occurrence in Drinking Water

There have been cases of PAM linked to domestic water supplies (Cope, et al., 2015). In 2011, two people were infected after performing nasal irrigation using contaminated tap water, and in 2013, a child was infected by contaminated tap water used on a backyard slip-n-slide (Carroll, et al., 2023). From 2020 to 2023, there was three occurrences of splash pad–associated PAM due to inadequately disinfected water.

5.2.8 Pathogenic Waterborne Mycobacteria

(*Mycobacterium avium, Mycobacterium fortuitum; Mycobacterium gordonae; Mycobacterium mucogenicum; Mycobacterium chelonae; Mycobacterium kansasii; Mycobacterium xenopi; Mycobacterium intracellulare, Mycobacterium abscessus*)

5.2.8.1 Background

Mycobacteria are bacteria usually found in association with water habitats such as lakes, rivers, wet soil and tap water as well as other environmental sources. Using molecular techniques, nearly 200 mycobacterial species have been described. Many species within the genus *Mycobacterium* are pathogens and can be waterborne, including numerous species of environmental mycobacteria called non-tuberculous mycobacteria (NTM) which include *Mycobacterium avium (MAC)* and others (Carroll, et al., 2023).

5.2.8.2 Health risks

Most commonly immunocompetent patients develop a slowly evolving cavitary disease that resembles tuberculosis. The disease occurs typically in white men 45-60 years of age, who are heavy smokers, abuse alcohol, and may have preexisting lung disease. Other symptoms of infection associated with the general population include pulmonary disease, lymphadenitis, and post-traumatic wound infection. Elderly non-smoking females can develop “Lady Windermere’s

syndrome" which has been associated with significant morbidity and mortality. Before the prevalence of AIDS, the most common presentation of MAC infection was pulmonary disease, i.e., tuberculosis-like infiltrates, nodular bronchiectasis, solitary nodules, and diffuse infiltrates in immunocompromised patients. Patients with AIDS may present with disseminated or focal infections, including bacteremia. Focal infections commonly involve the lungs or the gastrointestinal tract and, occasionally, the peripheral lymph nodes (Carroll et al., 2023).

5.2.8.3 Occurrence in Drinking Water

Environmental mycobacteria have been recovered from ponds, lakes, rivers, bogs, swamps, brackish water, sea water, and wastewater (Falkinham, Nichols, Bartram, Dufour, & Portaels, 2004). Soil is a significant reservoir, and mycobacteria may be introduced into drinking water distribution systems during construction, intrusion events, or maintenance. Mycobacteria can enter the distribution system from plant breakthrough, leaky pipes, valves, joints and seals, cross-connections, backflows, improper treatment of materials, maintenance activities, and inadequate distribution system security (Vaerewijck Wallender, Ailes, Yoder, Roberts, & Brunkard, 2014).

Colonization of hot water systems in hospitals has resulted in numerous nosocomial outbreaks. Community acquired cases are typically associated with cooling tower or untreated well water exposures (Carroll, et al., 2023).

5.2.9 *Pseudomonas aeruginosa*

5.2.9.1 Background

Pseudomonas aeruginosa (*P. aeruginosa*) is ubiquitous in the environment and can be found in water, soil, plants, animals, and food. *Pseudomonas* species are an opportunistic pathogen that can grow in the distribution system (World Health Organization (WHO), 2011). *P. aeruginosa* causes a range of infections but does not usually cause serious disease in healthy individuals. Any type of human tissue compromised by illness or injury, such as burn or surgical wounds, is susceptible to infection by *P. aeruginosa* (Carroll et al., 2023).

5.2.9.2 Health risks

This bacterium may cause lesions, septicemia, or meningitis (World Health Organization (WHO), 2011). *Pseudomonas* has caused severe infections in people who are immunosuppressed or immunocompromised and in those with underlying diseases. Infections typically present as bacteremia in immunocompromised individuals; as pneumonia in cystic fibrosis patients; as community-acquired ear and pneumonia infections; and as hospital-acquired outbreaks caused by contaminated solutions or devices. Water is the source of infection in all four of these types of infections (Falkinham III, Hilborn, Arduino, Pruden, & Edwards, 2015).

5.2.9.3 Occurrence in Drinking Water

Tap water has been documented as a potential source of infection from *P. aeruginosa* in hospital and healthcare settings and in swimming pools and hot tubs that have not been adequately treated (WHO, 2011). The role of tap water as the source of *P. aeruginosa* disease has been established through direct contact with water and aerosols, aspiration, indirect transfer from moist environmental surfaces, or from the hands of healthcare workers.

5.3 Organisms Covered by Existing Regulations

According to Section 1412(b)(1) of the 1996 SDWA Amendments, the EPA must select CCL contaminants that "at the time of publication, are not subject to any proposed or promulgated national primary drinking water regulation..." In promulgating regulations for contaminants in drinking water, the EPA can set either a legal limit (maximum contaminant level (MCL)) and require monitoring for the contaminant in drinking water or, for those contaminants that are difficult to measure, the EPA can establish a treatment technique requirement. The Surface Water Treatment Rule (54 FR 27486, (USEPA, 1989)) established maximum contaminant level goals (MCLGs) of zero for *Legionella*, *Giardia*, and viruses because any amount of exposure to these contaminants represents some public health risk. Since measuring disease-causing microbes in drinking water was not considered to be feasible at the time of the development of the Surface Water Treatment Rule (SWTR), the EPA established treatment technique requirements for these contaminants. The purpose of subsequent treatment technique requirements (Interim Enhanced Surface Water Treatment Rule (63 FR 69478, (USEPA, 1998b)), Long Term 1 Surface Water Treatment Rule (67 FR 1813, (USEPA, 2002)), and the Long Term 2 Surface Water Treatment Rule (71 FR 654, (USEPA, 2006a)), which included an MCLG of zero for *Cryptosporidium*, is to reduce disease incidence associated with *Cryptosporidium* and other pathogenic microorganisms in drinking water. These rules apply to all public water systems that use surface water or ground water under the direct influence of surface water.

The Ground Water Rule (GWR) (71 FR 65573, (USEPA, 2006b)) set treatment technique requirements to control for viruses (and pathogenic bacteria) because it was not feasible to monitor for viruses (or pathogenic bacteria) in drinking water. Under the GWR, if systems detect total coliforms in the distribution system, they are required to monitor for a fecal indicator (*E. coli*, coliphage, or enterococci) in the source water. If fecal contamination is found in the source water, the system must take remedial action to address contamination.

The EPA included specific viruses and *Legionella pneumophila* on the PCCL even though they have broad category MCLGs and treatment technique requirements. Viruses and *Legionella* include a wide range of taxa for which there is less information on health effects and treatment information. The available information for different viral taxa (e.g. dose response and treatment data) was very limited when setting the treatment technique requirements for surface and ground water systems. Also, different viral taxa have been implicated in various waterborne disease outbreaks in distribution systems for which the EPA did not have dose response or treatment data for when promulgating its treatment technique requirements. The EPA considered *Legionella* and specific viruses in CCL even though they are regulated under the SWTR. The EPA proposes to specifically list *Legionella pneumophila*, the primary pathogenic bacterium in the *Legionella* genus, on the draft CCL 6 because it has been identified in numerous WBDOs and is the most common cause of reported drinking water-associated outbreaks in the U.S. and leading causes of hospitalizations and deaths from waterborne diseases in the United States (Gerdes, et al., 2014), making it a public health concern.

Cryptosporidium and *Giardia* have established MCLGs and a substantial amount of associated research regarding health effects and sensitivity to various treatment control measures. Therefore, they are excluded from the PCCL and not considered for listing on the CCL.

5.4 Listing Outcomes for the Nominated Microbial Contaminants

All microbial nominations for the CCL 6, except for *Listeria monocytogenes* are listed on the draft CCL 6. Nontuberculous mycobacteria (NTM) was not listed explicitly as NTM, but is covered/represented by pathogenic waterborne mycobacteria group listing.

Chapter 6. Data Availability for Draft CCL 6 Microbial Contaminants

The EPA provides the initial assessment of the current data availability of microbial contaminants listed on the draft CCL 6 in Table 11. Microbial contaminants are categorized depending on availability of their occurrence, availability of a health assessment and availability of a drinking water method.

Table 11. Data Availability for Draft CCL 6 Microbial Contaminants

Microbial Name	Best Available Occurrence Data	Qualifying Health Assessment	Drinking Water Analytical Method[1]
Acanthamoeba spp.	Finished, Non-national Drinking Water	Yes	No
Balamuthia mandrillaris	Finished, Non-national Drinking Water	No	No
Calicivirus (Norovirus)	Finished, Non-national Drinking Water	No	No/Yes
Campylobacter jejuni	Finished, Non-national Drinking Water	No	No
Escherichia coli O157	Finished, Non-national Drinking Water	No	No
Legionella pneumophila	Finished, Non-national Drinking Water	Yes	Yes
Naegleria fowleri	Finished, Non-national Drinking Water	No	Yes
Pathogenic Waterborne Mycobacteria	Finished, Non-national Drinking Water	Yes	No
Pseudomonas aeruginosa	Finished, Non-national Drinking Water	No	Yes

[1]Widely available and used analytical method for drinking water

Chapter 7. Data Needs and Gaps

7.1. Antimicrobial Resistance (AMR)

Antimicrobial resistance (AMR) refers to the inability of antibiotics or antifungals to treat life-threatening infections caused by bacteria or fungus. AMR is an increasing global public health concern. The CDC estimates more than 2.8 million antibiotic resistant infections occur in the United States each year. Murray et al. (2022) has estimated that bacterial AMR was directly responsible for 1.27 million deaths and contributed to 4.95 million deaths in 2019 globally. Naghavi et al (Naghavi, et al., 2024) has forecasted that 10 million people could die annually from AMR by the year 2050. Studies have shown that environmental matrices are integral to the spread of antibiotic resistance. The role that drinking water contributes to the growing problem of AMRis unknown.

Studies have shown antibiotic resistance genes (ARGs), the segments of DNA that enable microorganisms to survive exposure to antimicrobial agents that would normally inhibit or kill them, can be found in both treated and untreated water supplies, stemming from a variety of sources including wastewater discharge, agricultural runoff, and urban pollution.

As bacteria containing ARGs enter aquatic environments, they can persist and spread, even surviving conventional water treatment processes. This highlights the potential for ARGs to reach consumers through drinking water, posing a risk of promoting antibiotic-resistant infections.

The EPA evaluated the possibility of using antibiotic susceptibility as an exclusion criterion, and/or antibiotic resistance as scoring consideration for microbes as part of the review process for the development of the previous CCL cycle, CCL 5. Each microbe on the CCL was evaluated for its specific antibiotic resistance and mortality rate. The results of the literature search show that antibiotic resistance cannot be used as an exclusion criterion or scoring consideration for microbes in the CCL process. There was too much variability among individual microbes and across all microbial groups to determine a criterion that would effectively apply to the universe of microbes and therefore was not reconsidered as a part of the screening criterion or scoring in CCL 6.

Studies on tap water have found increased resistance to some antibiotics in cultured bacteria. Typically, studies focus on culturing the bacteria themselves rather than detection of the genes that select for resistance. However, there are limited studies that look for ARGs and some studies suggest these genes should be considered emerging contaminants. Although bacterial cells may be killed by traditional water treatment the effect on the genetic material is unclear. Xi et al. (2009) concluded that distribution systems may serve as a reservoir for the spread of ARGs to opportunistic pathogens found within the distributions system. Sanganyado and Gwenzi (Sanganyado & Gwenzi, 2019) found an increase in resistant bacteria after chlorine disinfection leading them to hypothesis that this type of disinfection may promote horizontal gene transfer from resistant environmental bacteria to pathogens.

Several bacteria on the PCCL have documented antibiotic resistance. For example, 53.4% of *E. coli* strains tested were resistant to the commonly used antibiotic amoxicillin (Pormohammad, Nasiri, & Azimi, 2019). Determining antibiotic resistance requires additional laboratory testing beyond standard public water system testing which does not indicate if a strain of bacteria found in the water is resistant. Determining in any given laboratory analysis that a bacterium is not antibiotic resistant does not predict its resistant state for the future. Because future resistance cannot be predicted no microbe could be excluded from the PCCL based on the determination that it is not resistant to antibiotics. Further, because antibiotics are not effective on viruses and because nearly all the bacteria on PCCL 6 have some documented level of resistance, using antibiotic resistance to increase a score would artificially place more bacteria (and/or fungi) than viruses on CCL.

For more information on AMR, please see the World Health Organization (WHO) Global Antimicrobial Resistance Surveillance System (GLASS) and the Centers for Disease Control and Prevention (CDC) National Antimicrobial Resistance Monitoring System for Enteric Bacteria (NARMS).

7.2 Analytical Methods

A widely available analytical method is defined as a method employing technology that is commonly used at numerous drinking water laboratories. These methods applicable to drinking water have been published by the EPA, Standard Methods (SM), and the American Society for Testing and Materials (ASTM), the United States Geological Survey (USGS) or other parties, including vendors. An analytical method is required to generate accurate occurrence in water data. The lack of methods and therefore occurrence data may result in a microbe scoring lower than others in the CCL protocol and thus not pass from the PCCL to the CCL. Table 11 shows which draft CCL 6 microbial contaminants have a widely available analytical method.

Although a widely available analytical method is not a prerequisite for listing on the CCL, it is a requirement for a future regulation under the Regulatory Determinations process that may establish a maximum contaminant level (MCL). If a widely available analytical method exists, the contaminant passes the Analytical Methods Availability Assessment.

Chapter 8. Microbial Data Sources for the Draft CCL 6

Multiple data sources were used to gather the information for the development of the draft CCL 6. The data sources used were evaluated by the EPA to ensure they were authoritative and appropriate.

The hierarchy of text-based resource materials begins with recently compiled authoritative reference books such as *Manual of Clinical Microbiology* (MCM), 13th Edition and *Field's Virology*, 5th Edition. Both two-volume reference books have become established as the leading authoritative reference sources in their respective fields. These references have evolved through multiple editions and both publications are considered reference standards to the scientific community for their scope and depth of coverage. They were edited by world-recognized authorities, and chapters were written by an international team of subject experts. *The Parasites of Homo sapiens*, second edition, is a comprehensive source for information on helminths. These and other compiled sources listed in the reference list provided the information for screening the pathogens in the microbial CCL 6 Universe.

Appendix B: The CCL 6 Microbial UniverseAppendix B: The CCL 6 Microbial Universe tabulates the screening decisions for the CCL 6 Microbial Universe and shows the screening reference used to support the decision. The web addresses/links provided are as narrow and specific as they can be, to identify the information related to the screening criterion used. Many pathogens could be screened by several criteria, however only one criterion is noted in the tabulation. Understanding the complete context and rationale for a screening decision often requires a review of the complete chapter.

For CCL 6 WBDOs, the primary source for scoring data was outbreak information pulled from CDC's NORS dashboard.

A literature search was done to add supplemental information in the preparation of the CISs, and to aid with scoring microbes on the PCCL. Below are descriptions of where each source was used in the CCL 6 process.

Universe

The CCL 6 Microbial Universe is defined as all known human pathogens. The literature used to identify these pathogens included Taylor et al. (Taylor, Latham, & Woolhouse, 2001) as a starting point during the CCL 3. For each subsequent CCL cycle, the microbial universe has been built upon with additional pathogens as a result of literature searches, subject matter expert input, and public nominations.

Screening to a PCCL

Text-based resource materials begin with recently compiled reference books such as The Manual of Clinical Microbiology (MCM), 13th Edition (Carroll, et al., 2023). These two-volume reference books have become established as the leading authoritative reference sources in its fields, have evolved through multiple editions, and are considered a reference standard to the scientific community for scope and depth of coverage. The Manual of Clinical Microbiology is edited by world-recognized authorities, and chapters are written by an international team of

subject experts. This served as the basis for microbial screening. Where obscure pathogens were not listed in these references, other compiled sources were sought and used. Primary publications were used to supplement compiled sources as necessary to support screening decisions for fungi added to the universe.

Several obscure pathogens on the Taylor list did not appear in compiled references used for the initial screening process. Web searches were conducted to identify authoritative online databases which could be used to document screening decisions, primarily for geographical distribution for helminths and environmental habitat of fungi. While it is possible these sources may contain updated information regarding nomenclature or classification, new data detailing a fundamental change in characteristics was not found.

Scoring / Final CCL

For health effects the data collected during the screening process from (Carroll, et al., 2023) was carried over into the scoring phase.

For occurrence, the primary source for scoring data was the Center for Disease Control (CDC) NORS dashboard. For the draft CCL 6 EPA used NORS summaries as the source for the WBDO scoring protocol. The summaries include data on outbreaks associated with drinking water, recreational water, water not intended for drinking (excluding recreational water), and water use of unknown intent. WBDOs are the documentation of occurrence of pathogens in drinking water by public health officials through adverse health effects in a population and are direct evidence of exposure.

For the revised WBDO protocol, a pathogen was scored as having a WBDO(s) in the U.S. only if that pathogen was listed in a CDC waterborne disease drinking water surveillance summary (i.e., in the NORS) during 1990 through 2021. A pathogen with multiple WBDOs (i.e. 2 or more), within 2013 through 2021, listed by CDC is given the highest score under this protocol.

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Appendix A: List of CCL 6 Microbial Nominations

Common Name	Nominator(s)	Health Risk Information Provided with Nomination	Occurrence Information Provided with Nomination	Additional Information Provided with Nomination	CCL Universe	PCCL 6
Legionella pneumophila[a]	IDEXX	Is considered the #1 waterborne pathogen in the United States		Benedict KM, Reses H, Vigar M, Roth DM, Roberts VA, Mattioli M, Cooley LA, Hilborn ES, Wade TJ, Fullerton KE, Yoder JS, Hill VR. Surveillance for waterborne disease outbreaks associated with drinking water—United States, 2013–2014. Morbidity and Mortality Weekly Report. 2017; 66:1216–1221 National Academy of Science, Engineering and Medicine (NASEM) Report Summary: Stronger Policies Needed to Protect the Public From Legionnaires' Disease; August 14, 2019, https://www.nationalacademies.org/news/2019/08/stronger-policies-needed-to-protect-the-public-from-legionnaires-disease Environmental Protection Agency, Office of Water, LEGIONELLA : DRINKING WATER FACT SHEET, September 2000 #4304, https://www.epa.gov/sites/default/files/2015-10/documents/legionella-factsheet.pdf Official Journal of the European Union; DIRECTIVE (EU) 2020/2184 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the quality of water intended for human consumption (recast); 16 December 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020L2184&from=EN	X	X

Common Name	Nominator(s)	Health Risk Information Provided with Nomination	Occurrence Information Provided with Nomination	Additional Information Provided with Nomination	CCL Universe	PCCL 6
Legionella pneumophila[a]	Dr. Water Consulting, LLC (Mark LeChevallier)	Nearly all fatalities due to waterborne outbreaks have been attributed to *L. pneumophila*.	CDC reports that *L. pneumophila* is the leading identified cause of waterborne outbreaks, accounting for more than half of all drinking water outbreaks.	National Academy of Science, Engineering and Medicine (NASEM) Report Summary: Stronger Policies Needed to Protect the Public From Legionnaires' Disease; August 14, 2019, https://www.nationalacademies.org/news/2019/08/stronger-policies-needed-to-protect-the-public-from-legionnaires-disease Benedict KM, Reses H, Vigar M, Roth DM, Roberts VA, Mattioli M, Cooley LA, Hilborn ES, Wade TJ, Fullerton KE, Yoder JS, Hill VR. Surveillance for waterborne disease outbreaks associated with drinking water—United States, 2013–2014. Morbidity and Mortality Weekly Report. 2017; 66:1216–1221		
Nontuberculous mycobacteria (NTM)	IDEXX	Can cause pulmonary infections but can also cause skin, soft tissue, and hospital acquired infections, especially in post operative patients.	NTM can be found in drinking water.	US EPA Office of Water, Office of Science and Technology, EPA-822-F-02-002; MYCOBACTERIA: DRINKING WATER FACT SHEET; March 2002, https://www.epa.gov/sites/default/files/2015-10/documents/mycobacteria-factsheet.pdf Dowdell K, Haig SJ, Caverly LJ, Shen Y, LiPuma JJ, Raskin L.; Nontuberculous mycobacteria in drinking water systems - the challenges of characterization and risk mitigation. Curr. Opin. Biotechnol. 2019 Jun;57:127-136. Benedict KM, Reses H, Vigar M, Roth DM, Roberts VA, Mattioli M, Cooley LA, Hilborn ES, Wade TJ, Fullerton KE, Yoder JS, Hill VR. Surveillance for waterborne disease outbreaks associated with drinking water—United States, 2013–2014. Morbidity and Mortality Weekly Report. 2017; 66:1216–1221	X	

Common Name	Nominator(s)	Health Risk Information Provided with Nomination	Occurrence Information Provided with Nomination	Additional Information Provided with Nomination	CCL Universe	PCCL 6
*Pathogenic Mycobacterium (including M. fortuitum; M. gordonae; M. mucogenicum; M. chelonae; M. kansasii; M. xenopi; M. intracellulare)**	Dr. Water Consulting, LLC (Mark LeChevallier)	EPA scientist M.J. Donohue (2016, 2018) reviewed clinical laboratory reports and found that clinical cases of mycobacteria increased from 8.2 per 100,000 persons in 1994 to 16 per 100,000 persons in 2014. Between 1994 and 2014 the rate implicating *M. abscesses-chelonae* group and *M. avium* complex increased by 322 and 149%, respectively.	King et al. (2016) detected *M. avium* and *M. intracellulare* in 36% of treated drinking water samples examined.	Donohue, M.J. 2018. Increasing nontuberculous mycobacteria reporting rates and species diversity identified in clinical laboratory reports. BMC Infectious Diseases 18:163. https://doi.org/10.1186/s12879-018-3043-7. King, D.N. 2016. Microbial pathogens in source and treated waters from drinking water treatment plants in the United States and implications for human health. Science of the Total Environment. 562: 987-995. https://doi.org/10.1016/j.scitotenv.2016.03.214	X	X
*Pseudomonas aeruginosa**	IDEXX		Particularly good at forming biofilms, which can then support and protect other waterborne organisms. Its growth in drinking water can cause problems with color, taste, odor, and turbidity if found to be in high numbers. *P. aeruginosa* are found in soil, water and on plants. This waterborne pathogen needs very little nutrition to survive so they can be present at many points in a water system.	Kristina D Mena, Charles P Gerba, Risk assessment of Pseudomonas aeruginosa in water, Rev Environ Contam. Toxicol. 2009; 201:71-115. https://pubmed.ncbi.nlm.nih.gov/19484589/ Vera Lúcia Mores Rall et. al., Pseudomonas aeruginosa in public water supply, Water Practice and Technology, Volume 14, Issue 3, September 2019. https://iwaponline.com/wpt/article/14/3/732/69476/Pseudomonas-aeruginosa-in-public-water-supply Benedict KM, Reses H, Vigar M, Roth DM, Roberts VA, Mattioli M, Cooley LA, Hilborn ES, Wade TJ, Fullerton KE, Yoder JS, Hill VR. Surveillance for waterborne disease outbreaks associated with drinking water—United States, 2013–2014. Morbidity and Mortality Weekly Report. 2017; 66:1216–1221	X	X
Listeria monocytogenes	Tadd Kaiser				X	X

*Draft CCL 6 microbial contaminant

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Appendix B: The CCL 6 Microbial Universe

Table B presents the CCL 6 Universe and the exclusion screening criteria used to keep a microbe in the universe. The source used for the exclusion criteria is listed in the reference column. Those microbes for which a source could not be found to support exclusion moved forward to the PCCL.

The CCL 6 Microbes Exclusion Screening Criteria:

1. Anaerobes.
2. Obligate intracellular fastidious pathogens.
3. Transmitted by contact with blood or body fluids.
4. Transmitted by vectors.
5. Microbiome indigenous to the gastrointestinal tract, skin and mucous membranes.
6. Transmitted solely by respiratory secretions.
7. Life cycle incompatible with drinking water transmission.
8. Drinking water-related transmission is not implicated.
9. Natural habitat is in the environment without epidemiological evidence of drinking water-related disease and without evidence of drinking water-related nosocomial infection.
10. Not endemic to North America.
11. Represented by a pathogen for the entire genus or species (that are closely related).
12. Current taxonomy changed from taxonomy used in Universe.

Table B: The CCL 6 Microbial Universe and Exclusion Criteria

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Abiotrophia defectiva					x									MCM-13, Ch 25, p 3
Absidia corymbifera									x					MCM-13, ch 124, p2
Acanthamoeba astronyxis														MCM-13, Ch 142, p3
Acanthamoeba spp.													*Acanthamoeba spp.*	USEPA, 2003
Acanthamoeba castellani														MCM-13, Ch 142, p3
Acanthamoeba culbertsoni														MCM-13, Ch 142, p3
Acanthamoeba hatchetti														MCM-13, Ch 142, p3
Acanthamoeba palestinensis									x					MCM-13, Ch 142, p3
Acanthamoeba polyphaga														MCM-13, Ch 142, p3
Acanthamoeba rhysodes									x					MCM-13, Ch 142, p3
Acanthocephalus rauschi							x							Ashford and Crewe, 2003
Achillurbainia nouveli										x				Ashford and Crewe, 2003
Achillurbainia recondita							x							Ashford and Crewe, 2003
Achromobacter piechaudii									x					MCM-13, Ch 47, p 3
Achromobacter xylosoxidans									x					MCM-13, Ch 47, p 3
Acidaminococcus fermentans	x													MCM-13, Ch 53 p 4
Acinetobacter baumannii													*Acinetobacter baumannii*	
Acinetobacter calcoaceticus									x					MCM-13, ch 46, p1
Acinetobacter haemolyticus									x					MCM-13, ch 46, p1

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Acinetobacter johnsonii									x					MCM-13, ch 46, p1
Acinetobacter junii									x					MCM-13, ch 46, p1
Acinetobacter lwoffii									x					MCM-13, ch 46, p1
Acinetobacter radioresistens									x					MCM-13, ch 46, p1
Acremonium kiliense									x					MCM-13, Ch 123, p16
Acremonium potronii									x					MCM-13, Ch 123, p16
Acremonium recifei									x					MCM-13, Ch 123, p16
Acremonium strictum									x					MCM-13, Ch 123, p16
Acrophialophora fusispora									x					MCM-13, ch 123, p8
Actinobacillus equuli			x											MCM-13, Ch 37, p3
Actinobacillus hominis			x											MCM-13, Ch 37, p3
Actinobacillus lignieresii			x											MCM-13, Ch 37, p3
Actinobacillus pleuropneumoniae			x											MCM-13, Ch 37, p3
Actinobacillus suis			x											MCM-13, Ch 37, p3
Actinobacillus ureae					x									MCM-13, Ch 46, p1
Actinomadura madurae									x					MCM-13, Ch 30
Actinomadura pelletieri									x					MCM-13, Ch 30
Actinomyces georgiae	x													MCM-13 Ch 54 p 5
Actinomyces gerencseriae	x													MCM-13 Ch 54 p 5
Actinomyces israelii	x													MCM-13 Ch 54 p 5
Actinomyces meyeri	x													MCM-13 Ch 54 p 5
Actinomyces naeslundii	x													MCM-13 Ch 54 p 5
Actinomyces neuii	x													MCM-13 Ch 54 p 5
Actinomyces odontolyticus	x													MCM-13 Ch 54 p 5
Actinomyces radingae	x													MCM-13 Ch 54 p 5
Actinomyces turicensis	x													MCM-13 Ch 54 p 5
Adenocephalus pacificus										x				Ashford and Crewe, 2003

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Aerococcus viridans									x					MCM-13, Ch 25, p 3
Aeromonas caviae									x					MCM-13, Ch 42, p2
Aeromonas hydrophila													*Aeromonas hydrophila*	
Aeromonas sobria									x					MCM-13, Ch 42, p2
Aeromonas veronii									x					MCM-13, Ch 42, p2
Aggregatibacter actinomycetemcomitans					x									MCM-13, Ch 37, p2
Aggregatibacter aphrophilus					x									MCM-13, Ch 37, p2
Alaria americana							x							Ashford and Crewe, 2003
Alaria marcianae							x							Ashford and Crewe, 2003
Alcaligenes odorans					x									MCM-13, Ch 47, p3
Aliarcobacter butzleri													*Aliarcobacter butzleri*	
Alloprevotella tannerae	x													MCM-13, Ch 56 p 5
Alloscardovia omnicolens					x									MCM-13, Ch 54, p10
Alternaria alternata									x					MCM-13, ch 127, p3
Alternaria caespitosa									x					Howard 2003 p. 575
Alternaria chlamydospora									x					MCM-13, Ch 127, p3
Alternaria dianthicola									x					MCM-13, Ch 127, p3
Alternaria infectoria									x					MCM-13, Ch 127, p3
Alternaria longipes									x					MCM-13, Ch 127, p3
Alternaria stemphyloides									x					https://drfungus.org/knowledge-base/alternaria/http://www.doctorfungus.org/thefungi/Alternaria.htm
Alternaria tenuissima									x					MCM-13, Ch 127, p3
Amphimerus pseudofelineus										x				Ashford and Crewe, 2003
Amycolatopsis orientalis									x					MCM-13, Ch 30, p8

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Anaplasma phagocytophilum				x										MCM-13, Ch 67, p3
Anatrichosoma cutaneum										x				Ashford and Crewe, 2003
Ancylostoma braziliense							x							Ashford and Crewe, 2003
Ancylostoma caninum										x				Ashford and Crewe, 2003
Ancylostoma ceylanicum										x				Ashford and Crewe, 2003
Ancylostoma duodenale							x							Ashford and Crewe, 2003
Ancylostoma malayanum										x				Ashford and Crewe, 2003
Andes virus										x				MCM-13, Ch 98, p2
Anisakis physeteris							x							Ashford and Crewe, 2003
Anisakis simplex							x							Ashford and Crewe, 2003
Aonchotheca philippinensis										x				Ashford and Crewe, 2003
Aphanoascus fulvescens									x					MCM-13, Ch 123, p15
Apoi virus				x										Field's Virology, 5th Ed., p. 1153-1158, 1206
Apophallus donicus							x							Ashford and Crewe, 2003
Apophysomyces elegans									x					MCM-13, Ch 124, p2
Arachnomyces nodosetosus									x					MCM-13, ch 123, p9
Arcanobacterium heamolyticum					x									MCM-13, Ch 29, p5
Arcobacter cryaerophilus											x			MCM-13, Ch 58, p3
Arthrinium phaeospermum									x					https://drfungus.org/knowledge-base/arthrinium/
Arthroderma uncinatum									x					MCM-13, Ch 126, p3
Arthrographis kelrae									x					Warris et al., 2001
Artyfechinostomum mehrai										x				Ashford and Crewe, 2003
Ascaris lumbricoides							x							Ashford and Crewe, 2003
Ascaris suum							x							Ashford and Crewe, 2003

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Ascocotyle sp.							x							Ashford and Crewe, 2003
Aspergillus candidus									x					MCM-13, Ch 122, p2
Aspergillus clavatus									x					MCM-13, Ch 122, p2
Aspergillus fisherianus									x					MCM-13, Ch 122, p2
Aspergillus flavipes									x					MCM-13, Ch 122, p2
Aspergillus flavus group									x					MCM-13, Ch 122, p2
Aspergillus fumigatus group													*Aspergillus fumigatus*	
Aspergillus glaucus									x					MCM-13, Ch 122, p2
Aspergillus nidulans group									x					MCM-13, Ch 122, p2
Aspergillus niger									x					MCM-13, Ch 122, p2
Aspergillus oryzae									x					MCM-13, Ch 122, p2
Aspergillus terreus group									x					MCM-13, Ch 122, p2
Aspergillus versicolor									x					MCM-13, Ch 122, p2
Aspergillus wentii									x					MCM-13, Ch 122, p2
Aureobasidium pullulans									x					MCM-13, Ch 127, p3
Australian bat lyssavirus				x										Field's Virology, 5th Ed., p. 1364
Australobilharzia terrigalensis										x				Ashford and Crewe, 2003
Babesia bovis				x										MCM-13, Ch 139, p1
Babesia divergens				x										MCM-13, Ch 139, p1
Babesia gibsoni				x										MCM-13, Ch 139, p1
Babesia microti				x										MCM-13, Ch 139, p1
Bacillus anthracis									x					MCM-13, Ch 27, p2
Bacillus cereus									x					MCM-13, Ch 27, p2
Bacillus circulans									x					MCM-13, Ch 27, p2
Bacillus coagulans									x					MCM-13, Ch 27, p2
Bacillus licheniformis									x					MCM-13, Ch 27, p2
Bacillus mycoides									x					MCM-13, Ch 27, p2
Bacillus pumilus									x					MCM-13, Ch 27, p2
Bacillus subtilis									x					MCM-13, Ch 27, p2

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Bacillus thuringiensis									x					MCM-13, Ch 27, p2
Bacteroides caccae	x													MCM-13, Ch 56 p 5
Bacteroides eggerthii	x													MCM-13, Ch 56 p 5
Bacteroides fragilis	x													MCM-13, Ch 56 p 5
Bacteroides galacturonicus	x													MCM-13, Ch 56 p 5
Bacteroides ovatus	x													MCM-13, Ch 56 p 5
Bacteroides pectinophilus	x													MCM-13, Ch 56 p 5
Bacteroides stercoris	x													MCM-13, Ch 56 p 5
Bacteroides thetaiotaomicron	x													MCM-13, Ch 56 p 5
Bacteroides uniformis	x													MCM-13, Ch 56 p 5
Bacteroides vulgatus	x													MCM-13, Ch 56 p 5
Bagaza virus				x										Field's Virology, 5th Ed., p. 1153-1158, 1199
Balamuthia mandrillaris								x					*Balamuthia mandrillaris*	MCM-13, Ch 142, p3
Balantidium coli														MCM-13, Ch 143, p2
Bangui virus				x										MCM-13, Ch 97; CDC
Banna virus				x										MCM-13, Ch 80, p2
Banzi virus				x										MCM-13, Ch 97; CDC
Barmah Forest virus				x										MCM-13, Ch 80, p9
Bartonella bacilliformis				x										MCM-13, Ch 61, p2
Bartonella elizabethae				x										MCM-13, Ch 61, p2
Bartonella henselae				x										MCM-13, Ch 61, p2
Bartonella quintana				x										MCM-13, Ch 61, p2
Basidiobolus ranarum									x					MCM-13, Ch 124, p1
Batken virus				x										Hao et al., 2022
Baylisascaris procyonis							x							Ashford and Crewe, 2003
Bayou virus				x										MCM-13, Ch 98, p2
Beauveria bassiana									x					MCM-13, ch 123, p8

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Bebaru virus				x										Field's Virology, 5th. Ed., p. 1024
Bergeyella zoohelcum					x									MCM-13, Ch 46, p16
Bertiella mucronata							x							Ashford and Crewe, 2003
Bertiella studeri										x				Ashford and Crewe, 2003
Bhanja virus				x										Matsuno et al
Bifidobacterium dentium	x													MCM-13 Ch 54 p 5
Bilharziella polonica										x				Ashford and Crewe, 2003
Bilophila wadsworthia	x													MCM-13, Ch 56, p 3
Bipolaris australiensis									x					MCM-13, ch 127, p1
BK virus			x											MCM-12
Black creek canal virus				x										MCM-13, Ch 98, p2
Blastocystis hominis													*Blastocystis hominis*	
Blastomyces dermatitidis									x					MCM-13, Ch 125, p1
*Blastomyces helicus**									x					MCM-13, Ch 125, p1
*Blastomyces percursus**									x					MCM-13, Ch 125, p1
Blautia producta	x													MCM-13, Ch 53 p 1
Bolbosoma sp.										x				Ashford and Crewe, 2003
Bordetella avium						x								MCM-13, Ch 47, p 3
Bordetella bronchiseptica						x								MCM-13, Ch 47, p 3
Bordetella parapertussis						x								MCM-13, Ch 47, p 3
Bordetella pertussis						x								MCM-13, Ch 47, p 3
Borna disease virus						x								Field's Virology, 5th Ed., p. 1835
Borrelia brasiliensis				x										MCM-13, Ch 61, p2
Borrelia burgdorferi				x										MCM-13, Ch 61, p2
Borrelia caucasica				x										MCM-13, Ch 61, p2
Borrelia crocidurae				x										MCM-13, Ch 61, p2
Borrelia duttonii				x										MCM-13, Ch 61, p2
Borrelia hermsii				x										MCM-13, Ch 61, p2
Borrelia hispanica				x										MCM-13, Ch 61, p2
Borrelia latyschewii				x										MCM-13, Ch 61, p2

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Borrelia mazzottii				x										MCM-13, Ch 61, p2
*Borrelia miyamotoi**				x										MCM-13, Ch 61, p2
Borrelia parkeri				x										MCM-13, Ch 61, p2
Borrelia persica				x										MCM-13, Ch 61, p2
Borrelia recurrentis				x										MCM-13, Ch 61, p2
Borrelia turicatae				x										MCM-13, Ch 61, p2
Borrelia venezuelensis				x										MCM-13, Ch 61, p2
Botryosphaeria subglobosa									x					https://www.gbif.org/species/2611527
Botrytsis cinerea						x								Hashimoto et al
Bovine Ephemeral Fever virus				x										Field's Virology, 5th Ed., p. 1367
Bovine Papular Stomatitis virus			x											Field's Virology, 5th Ed., p. 2948, 2955-2956, 2963
Bovine Spongiform Encephalopathy (BSE) agent										x				MCM-13, Ch 112, p1
Brevibacillus brevis									x					MCM-13, Ch 27, p1
Brevundimonas diminuta									x					MCM-13, Ch 45, p2
Brevundimonas vesicularis									x					MCM-13, Ch 45, p2
Brucella melitensis		x												MCM-13, Ch 49, p2
Brugia beaveri				x										Ashford and Crewe, 2003
Brugia guyanensis				x										Ashford and Crewe, 2003
Brugia malayi				x										Ashford and Crewe, 2003
Brugia pahangi				x										Ashford and Crewe, 2003
Brugia timori				x										Ashford and Crewe, 2003
Buffalopox virus								x						Field's Virology, 5th Ed. p. 2955-2956
Bunostomum phlebotomum							x							Ashford and Crewe, 2003
Bunyamwera virus				x										MCM-13, Ch 97, p2
Burkholderia cepacia									x					MCM-13, Ch 45, p1

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Burkholderia mallei										x				MCM-13, Ch 45, p1
Burkholderia pseudomallei									x					MCM-13, Ch 45, p1
Bussuquara virus				x										MCM-13, Ch 97, p2
Bwamba virus				x										MCM-13, Ch 80, p12
Byssochlamys spectabilis									x					MCM-13, Ch 123, p18
Calicivirus													Calicivirus/Norovirus	
California encephalitis virus				x										MCM-13, Ch 80, p13
Calodium hepaticum							x							Ashford and Crewe, 2003
Campylobacter coli											x			MCM-13, Ch 58, p4
Campylobacter concisus					x									MCM-13, Ch 58, p4
Campylobacter curvus					x									MCM-13, Ch 58, p4
Campylobacter fetus								x						MCM-13, Ch 58, p4
Campylobacter gracilis					x									MCM-13, Ch 58, p4
Campylobacter hyointestinalis								x						MCM-13, Ch 58, p4
Campylobacter jejuni													*Campylobacter jejuni*	
Campylobacter lari											x			MCM-13, Ch 58, p4
Campylobacter rectus					x									MCM-13, Ch 58, p4
Campylobacter sputorum								x						MCM-13, Ch 58, p4
Campylobacter upsaliensis								x						MCM-13, Ch 58, p4
Campylobacter ureolyticus	x													MCM-13, Ch 58, p4
Candida acidothermophilum									x					MCM-13, Ch 120, p3
Candida albicans									x					MCM-13, Ch 120, p3
*Candida auris**									x					MCM-13, Ch 120, p3
Candida catenulata									x					MCM-13, Ch 120, p3

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Candida famata									x					MCM-13, Ch 120, p3
Candida fimetaria var. fimetaria									x					MCM-13, Ch 120, p3
Candida glabrata					x									MCM-13, Ch 120, p3
Candida haemulonis									x					MCM-13, Ch 120, p3
Candida intermedia									x					https://drfungus.org/knowledge-base/candida/
Candida lodderae									x					MCM-13, Ch 120, p3
Candida mycoderma var. annulata									x					MCM-13, Ch 120, p3
Candida parapsilosis									x					MCM-13, Ch 120, p3
Candida tropicalis									x					MCM-13, Ch 120, p3
Candida zeylanoides									x					MCM-13, Ch 120, p2
Candiru virus complex				x										MCM-13, Ch 97
Capillaria plica							x							Basso et al.
Capnocytophaga canimorsus					x									MCM-13, Ch 37, p2
Capnocytophaga cynodegmi					x									MCM-13, Ch 37, p2
Capnocytophaga gingivalis					x									MCM-13, Ch 37, p2
Capnocytophaga ochracea					x									MCM-13, Ch 37, p2
Capnocytophaga sputigena					x									MCM-13, Ch 37, p2
Caraparu virus				x										MCM-13, Ch 97; CDC
Cardiobacterium hominis					x									MCM-13, Ch 37, p2
Carneocephallus brevicaea										x				Ashford and Crewe, 2003
Cathaemasia cabrerai										x				Ashford and Crewe, 2003
Catu virus				x										MCM-13, Ch 97; CDC
Cedecea davisae									x					MCM-13, Ch 40, p3
Cedecea lapagei									x					MCM-13, Ch 40, p3

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Cedecea neteri									x					MCM-13, Ch 40, p3
Cellulomonas turbata									x					MCM-13, Ch 29, p2
Cellulosimicrobium cellulans									x					MCM-13, Ch 29, p2
Centipeda periodontii	x													MCM-13 Ch 54 p 5
Centrocestus armatus										x				Ashford and Crewe, 2003
Centrocestus formosanus										x				Ashford and Crewe, 2003
Cephaliophora irregularis									x					https://drfungus.org/knowledge-base/cladophialophora-species/
Cercopithecine herpes virus 1								x						Field's Virology, 5th Ed., p. 2895-2897
Cerinosterus cyanescens									x					https://drfungus.org/knowledge-base/cerinosterus/http://www.doctorfungus.org/thefungi/Sporothrix.htm
Chaetomium atrobrunneum									x					MCM-13, Ch 123, p20
Chaetomium funicola									x					http://www.doctorfungus.org/thefungi/Chaetomium.htmhttp://www.drfungus.org/knowledge-base/Chaetomium/
Chaetomium globosum									x					MCM-13, Ch 123, p20
Chaetomium perpulchrum									x					https://drfungus.org/knowledge-base/chaetomium/
Chaetomium strumarium									x					MCM-13, Ch 123, p20
Chaetophoma dermo-unguis									x					https://drfungus.org/knowledge-base/synonyms/Chaetophoma/
Chandipura virus				x										MCM-13, Ch 80, p16
Changuinola virus				x										MCM-13, Ch 80, p2
Cheilospirura sp.										x				Ashford and Crewe, 2003
Chikungunya virus				x										MCM-13, Ch 97, p3
Chim virus				x										https://wwwn.cdc.gov/arbocat/VirusDetails.aspx?ID=110&SID=11

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Chlamydia trachomatis			x											MCM-13, Ch 65, p3
Chlamydoabsidia padenii									x					http://www.drfungus.org/knowledge-base/Chlamydoabsidia/
Chlamydophila pneumoniae		x												MCM-13, Ch 65, p6
Chlamydophila psittaci		x												MCM-13, Ch 65, p6
Chlorella protothecoides									x					http://pcp.oxfordjournals.org/cgi/content/abstract/9/1/87
Chromobacterium violaceum								x						MCM-13, Ch 37, p2
Chryseobacterium balustinum									x					MCM-13, Ch 46, p17
Chrysosporium zonatum									x					Arvanitidou et al., 1999
Citrobacter amalonaticus					x									MCM-13, Ch 40, p8
Citrobacter braakii					x									MCM-13, Ch 40, p8
Citrobacter farmeri					x									MCM-13, Ch 40, p8
Citrobacter freundii					x									MCM-13, Ch 40, p8
Citrobacter koseri					x									MCM-13, Ch 40, p8
Citrobacter rodentium					x									MCM-13, Ch 40, p8
Citrobacter sedlakii					x									MCM-13, Ch 40, p8
Citrobacter werkmanii					x									MCM-13, Ch 40, p8
Citrobacter youngae					x									MCM-13, Ch 40, p8
Cladophialophora arxii									x					MCM-13, Ch 127, p2
Cladophialophora bantiana									x					MCM-13, Ch 127, p2
Cladophialophora boppii									x					MCM-13, Ch 127, p2
Cladophialophora carrionii									x					MCM-13, Ch 127, p2
Cladophialophora devriesii									x					MCM-13, Ch 127, p2

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Cladorrhinum bulbillosum									x					http://uwadmnweb.uwyo.edu/botany/Soil%20Microfungal%20Collection/RMF%20collection%20(Rocky%20Mountain%20Fungi)partII.htm
Cladosporium cladosporioides									x					MCM-13, Ch 127, p2
Cladosporium elatum									x					http://www.drfungus.org/knowledge-base/Cladosporium/http://www.doctorfungus.org/thefungi/Cladosporium.htm
Cladosporium oxysporum									x					http://www.drfungus.org/knowledge-base/Cladosporium/
Cladosporium sphaerosphermum									x					MCM-13, Ch 127, p2
Clavispora lusitaniae									x					MCM-13, Ch 127, p2
Clinostomum complanatum										x				Ashford and Crewe, 2003
Clostridium baratii	x													MCM-13, Ch 55, p 1
Clostridium botulinum	x													MCM-13, Ch 55, p 1
Clostridium butyricum	x													MCM-13, Ch 55, p 1
Clostridium chauvoei	x													MCM-13, Ch 55, p 1
Clostridium fallax	x													MCM-13, Ch 55, p 1
Clostridium histolyticum	x													MCM-13, Ch 55, p 1
Clostridium novyi	x													MCM-13, Ch 55, p 1
Clostridium perfringens	x													MCM-13, Ch 55, p 1
Clostridium ramosum	x													MCM-13, Ch 55, p 1
Clostridium septicum	x													MCM-13, Ch 55, p 1
Clostridium sordellii	x													MCM-13, Ch 55, p 1
Clostridium sporogenes	x													MCM-13, Ch 55, p 1
Clostridium tertium	x													MCM-13, Ch 55, p 1
Clostridium tetani	x													MCM-13, Ch 55, p 1

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Clostridoides difficile	x													MCM-13, Ch 55, p 1
Coccidioides immitis									x					MCM-13, Ch 125, p1
Cochliobolus pallescens									x					Howard p. 584-586
Cokeromyces recurvartus									x					MCM-13, ch 124, p2
Colletotrichum coccodes									x					Howard 2003 p. 662-664
Colletotrichum gloeosporioides									x					Howard 2003 p. 662-664
Collinsella aerofaciens	x													MCM-13 Ch 54 p 5
Colorado tick fever virus				x										MCM-13, Ch 80, p7
Comamonas testosteroni													*Comamonas testosteroni*	
Conidiobolus coronatus									x					MCM-13, Ch 124, p1
Conidiobolus incongruus									x					MCM-13, Ch 124, p1
Conidiobolus lamprauges									x					Howard 2003 p. 133-137
Coniochaeta hoffmannii									x					MCM-13, Ch 123, p20
Coniochaeta mutabilis									x					MCM-13, ch 123, p8
Coniothyrium fuckelii									x					https://drfungus.org/knowledge-base/coniothyrium/http://www.doctorfungus.org/imageban/synonyms/Coniothyrium.htm
Contracaecum osculatum										x				Ashford and Crewe, 2003
Coprinopsis cinerea									x					MCM-13, Ch 124, p1
Corynebacterium afermentans					x									MCM-13, Ch 29, p6
Corynebacterium argentoratense					x									MCM-13, Ch 29, p6
Corynebacterium bovis					x									MCM-13, Ch 29, p6
Corynebacterium diphtheriae						x								MCM-13, Ch 29, p6
Corynebacterium jeikeium					x									MCM-13, Ch 29, p6

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Corynebacterium kutscheri					x									MCM-13, Ch 29, p6
Corynebacterium macginleyi					x									MCM-13, Ch 29, p6
Corynebacterium minutissimum					x									MCM-13, Ch 29, p6
Corynebacterium propinquum					x									MCM-13, Ch 29, p6
Corynebacterium pseudodiphthericum					x									MCM-13, Ch 29, p6
Corynebacterium pseudotuberculosis					x									MCM-13, Ch 29, p6
Corynebacterium striatum					x									MCM-13, Ch 29, p6
Corynebacterium ulcerans					x									MCM-13, Ch 29, p6
Corynebacterium urealyticum					x									MCM-13, Ch 29, p6
Corynebacterium xerosis					x									MCM-13, Ch 29, p6
Corynosoma strumosum							x							Ashford and Crewe, 2003
Cote d'Ivoire Ebola virus										x				Field's Virology, 5th. Ed., p. 619, 1411-1412, 1432-1434
Cowpox virus										x				MCM-13, Ch 110, p3
Coxiella burnetii		x												MCM-13, Ch 68, p1
Creutzfeld-Jokob Disease (CJD) agent								x						Field's Virology, 5th Ed., p. 443-444, 3077-3078
Crimea-Congo Haemorrhagic Fever Virus										x				MCM-13, Ch 80, p13
Cronobacter sakazakii									x					MCM-13, Ch 40, p7
*Cryptococcus gattii**									x					MCM-13, Ch 120, p3
Cryptococcus neoformans									x					MCM-13, Ch 120, p3
Cryptocotyle lingua										x				Ashford and Crewe, 2003

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Cryptosporidium parvum														
Cunninghamella bertholletiae									x					MCM-13, ch 124, p2
Curvularia brachyspora									x					Howard 2003 p. 584-586
Curvularia clavata									x					Howard 2003 p. 584-586
Curvularia geniculata									x					MCM-13, Ch 127, p4
Curvularia hawaiiensis									x					MCM-13, Ch 127, p4
Curvularia lunata									x					MCM-13, Ch 127, p4
Curvularia senegalensis									x					Howard 2003 p. 584-586
Curvularia spicifera									x					MCM-13, Ch 127, p4
Curvularia verucculosa									x					Howard p. 584-586
Cutibacterium acnes					x									MCM-13, Ch 54, p9
Cutibacterium avidum					x									MCM-13, Ch 54, p9
Cutibacterium granulosum					x									MCM-13, Ch 54, p9
Cyclodontostomum purvisi										x				Ashford and Crewe, 2003
Cyclospora cayetanensis													*Cyclospora cayetanensis*	
Cystoisospora belli													*Cystoisospora belli*	
Dakar bat virus								x						Field's Virology, 5th Ed., p. 1158, 1206
Delftia acidovorans									x					MCM-13, Ch 45, p2
Dengue virus				x										MCM-13, Ch 97, p2
Dermatophilus congolensis									x					MCM-13, Ch 30, p8
Dhori virus				x										MCM-13, Ch 97, p2
Dibothriocephalus latus							x							Ashford and Crewe, 2003
Dichelobacter nodosus	x													Witcomb et al
Dichotomophthora portulacae									x					https://drfungus.org/imageban/synonyms/Dichotomophthora/
Dichotomophthoropsis nymphaerum									x					http://www.drfungus.org/knowledge-

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
														base/Dichotomophthoropsis/http://www.doctorfungus.org/imageban/synonyms/Dichotomophthoropsis.htm
Dicrocoelium dendriticum							x							Ashford and Crewe, 2003
Dicrocoelium hospes										x				Ashford and Crewe, 2003
Dientamoeba fragilis							x							MCM-13, Ch 143, p2
Dioctophyme renale							x							Ashford and Crewe, 2003
Dipetalonema arbuta				x										Ashford and Crewe, 2003
Dipetalonema reconditum				x										MCM-13, Ch 138, p15
Diphyllobothrium cameroni										x				Ashford and Crewe, 2003
Diphyllobothrium cordatum							x							Ashford and Crewe, 2003
Diphyllobothrium dalliae							x							Ashford and Crewe, 2003
Diphyllobothrium dendriticum							x							Ashford and Crewe, 2003
Diphyllobothrium elegans										x				Ashford and Crewe, 2003
Diphyllobothrium erinaceieuropaei										x				Ashford and Crewe, 2003
Diphyllobothrium hians										x				Ashford and Crewe, 2003
Diphyllobothrium houghtoni										x				Ashford and Crewe, 2003
Diphyllobothrium klebanovskii										x				Ashford and Crewe, 2003
Diphyllobothrium lanceolatum							x							Ashford and Crewe, 2003
Diphyllobothrium mansonoides							x							Ashford and Crewe, 2003
Diphyllobothrium nihonkaiense										x				Ashford and Crewe, 2003
Diphyllobothrium orcini										x				Ashford and Crewe, 2003

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Diphyllobothrium scoticum										x				Ashford and Crewe, 2003
Diphyllobothrium stemmacephalum							x							Ashford and Crewe, 2003
Diphyllobothrium theileri										x				Ashford and Crewe, 2003
Diplogonoporus balaenopterae										x				Ashford and Crewe, 2003
Diplogonoporus balaenopterae										x				Ashford and Crewe, 2003
Diplogonoporus brauni										x				Ashford and Crewe, 2003
Diplostomum spathaceum										x				Ashford and Crewe, 2003
Dipylidium caninum							x							Ashford and Crewe, 2003
Dirofilaria immitis				x										Ashford and Crewe, 2003
Dirofilaria repens				x										Ashford and Crewe, 2003
Dirofilaria striata				x										Ashford and Crewe, 2003
Dirofilaria subdermata				x										Ashford and Crewe, 2003
Dirofilaria tenuis				x										Ashford and Crewe, 2003
Dirofilaria ursi				x										Ashford and Crewe, 2003
Dissitimurus exedrus									x					Howard p. 588
Diutina rugosa									x					MCM-13, Ch 120, p2
Dobrava-Belgrade virus										x				MCM-13, Ch 98, p2
Doratomyces stemonitis									x					http://www.drfungus.org/knowledge-base/Doratomyces/http://www.doctorfungus.org/imageban/synonyms/Doratomyces.htm
Dracunculus insignis										x				Ashford and Crewe, 2003
Dracunculus medinensis										x				Ashford and Crewe, 2003
Drepanidotaenia lanceolata							x							Ashford and Crewe, 2003
Dugbe virus				x										MCM-13, Ch 80, p12
Duvenhage virus										x				Field's Virology, 5th Ed., p. 1364

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Eastern equine encephalitis virus				x										MCM-13, Ch 97, p3
Echinochasmus japonicus										x				Ashford and Crewe, 2003
Echinochasmus jiufoensis										x				Ashford and Crewe, 2003
Echinochasmus perfoliatus										x				Ashford and Crewe, 2003
Echinococcus granulosus							x							Ashford and Crewe, 2003
Echinococcus multilocularis							x							Ashford and Crewe, 2003
Echinococcus oligarthus										x				Ashford and Crewe, 2003
Echinococcus vogeli										x				Ashford and Crewe, 2003
Echinoparyphium recurvatum										x				Ashford and Crewe, 2003
Echinostoma cinetorchis										x				Ashford and Crewe, 2003
Echinostoma echinatum										x				Ashford and Crewe, 2003
Echinostoma hortense										x				Ashford and Crewe, 2003
Echinostoma ilocanum										x				Ashford and Crewe, 2003
Echinostoma jassyense										x				Ashford and Crewe, 2003
Echinostoma macrorchis										x				Ashford and Crewe, 2003
Echinostoma malayanum										x				Ashford and Crewe, 2003
Echinostoma revolutum										x				Ashford and Crewe, 2003
Edge Hill virus				x										MCM-13, Ch 97; CDC
Edwardsiella hoshinae									x					MCM-13, Ch 157, p3
Edwardsiella tarda									x					MCM-13, Ch 157, p3
Eggerthella lenta	x													MCM-13 Ch 54 p 5
Ehrlichia chaffeensis				x										MCM-13, Ch 67, p3
Ehrlichia equi				x										MCM-13, Ch 67, p3
Ehrlichia ewingii				x										MCM-13, Ch 67, p3
Eikenella corrodens					x									MCM-13, Ch 37, p2

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Elizabethkingia anophelis									x					MCM-13, Ch 46, p1
Elizabethkingia meningoseptica									x					MCM-13, Ch 40, p6
*Emergomyces spp.**									x					MCM-13, Ch 123, p7
Emergomyces crescens									x					MCM-13, Ch 123, p7
Emmonsia parva									x					MCM-13, ch 125, p2
Encephalitozoon cuniculi											x			MCM-13, Ch 131, p11
Encephalitozoon hellem											x			MCM-13, Ch 131, p11
Encephalitozoon intestinalis													Microsporidia	
Encephalomyocarditis virus								x						Field's Virology, 5th Ed., p. 796, 840, 858-860
Entamoeba chattoni											x			MCM-13, Ch 143, p2
Entamoeba histolytica													*Entamoeba histolytica*	
Entamoeba moshkovskii											x			MCM-13, Ch 143, p2
Enterobacter amnigenus									x					MCM-13, Ch 40, p6
Enterobacter asburiae									x					MCM-13, Ch 40, p6
Enterobacter cancerogenus									x					MCM-13, Ch 40, p6
*Enterobacter chuandaensis**									x					MCM-13, Ch 40, p6
Enterobacter cloacae									x					MCM-13, Ch 40, p6
Enterobacter gergoviae									x					MCM-13, Ch 40, p6
Enterobacter hormaechei									x					MCM-13, Ch 40, p6
*Enterobacter huaxiensis**									x					MCM-13, Ch 40, p6
Enterobius gregorii							x							Ashford and Crewe, 2003
Enterobius vermicularis							x							Ashford and Crewe, 2003
Enterococcus avium									x					MCM-13, Ch 24, p 3
Enterococcus casseliflavus									x					MCM-13, Ch 24, p 3

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Enterococcus durans									x					MCM-13, Ch 24, p 3
Enterococcus faecalis									x					MCM-13, Ch 24, p 3
Enterococcus faecium									x					MCM-13, Ch 24, p 3
Enterococcus flavescens									x					MCM-13, Ch 24, p 3
Enterococcus gallinarum									x					MCM-13, Ch 24, p 3
Enterococcus hirae									x					MCM-13, Ch 24, p 3
Enterococcus mundtii									x					MCM-13, Ch 24, p 3
Enterococcus raffinosus									x					MCM-13, Ch 24, p 3
Enterocytozoon bieneusi											x			MCM-13, Ch 131, p1
Epiccocum purpurascens						x								https://www.inspq.qc.ca/en/moulds/fact-sheets/epicoccum-purpurascens
Epidermophyton floccosum									x					MCM-13, Ch 126, p3
Episthmium caninum										x				Ashford and Crewe, 2003
Erysipelothrix rhusiopathiae									x					MCM-13, CH 28, p1
Escherichia coli													*Escherichia coli O157:H7*	
Eubacterium brachy	x													MCM-13 Ch 54 p 5
Eubacterium cylindroides	x													MCM-13 Ch 54 p 5
Eubacterium limosum	x													MCM-13 Ch 54 p 5
Eubacterium moniliforme	x													MCM-13 Ch 54 p 5
Eubacterium multiforme	x													MCM-13 Ch 54 p 5
Eubacterium nodatum	x													MCM-13 Ch 54 p 5
Eubacterium rectale	x													MCM-13 Ch 54 p 5
Eubacterium saburreum	x													MCM-13 Ch 54 p 5
Eubacterium saphenum	x													MCM-13 Ch 54 p 5
Eubacterium sulci	x													MCM-13 Ch 54 p 5
Eubacterium tenue	x													MCM-13 Ch 54 p 5
Eucoleus aerophilus							x							Ashford and Crewe, 2003

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
European bat lyssavirus 1										x				Field's Virology, 5th Ed., p. 1364
European bat lyssavirus 2										x				Field's Virology, 5th Ed., p. 1364
European Tick-borne encephalitis virus				x										Field's Virology, 5th Ed., p. 1153-1158, 1200-1203
Eurytrema pancreaticum							x							Ashford and Crewe, 2003
Eustrongylides sp.							x							Ashford and Crewe, 2003
Everglades virus				x										MCM-13, Ch 97; CDC
Ewingella americana					x									MCM-13, Ch 41, p4
Exophiala dermatitidis									x					MCM-13, Ch 127, p2
Exophiala jeanselmei													*Exophiala jeanselmei*	
Exophiala moniliae									x					Howard 2003 p. 590-596
Exophiala pisciphila									x					Howard 2003 p. 590-596
Exophiala psychrophila									x					http://www.drfungus.org/knowledge-base/exophiala/
Exophiala salmonis									x					Howard 2003 p. 590-596
Exophiala spinifera									x					MCM-13, Ch 127, p2
Exosporium dematium									x					Howard 2003 p. 662-664
Exserohilum longirostratum									x					MCM-13, ch 127, p1
Exserohilum macginnisii									x					Howard 2003 p. 596-597
Eyach virus				x										Krauss et al., p. 87-89
Faecalicatena contorta	x													MCM-13, Ch 55, p 3
Falciformispora senegalensis									x					MCM-12, ch 128, p1
Falciformispora tompkinsii									x					MCM-12, ch 128, p1
Far eastern Tick-borne encephalitis virus				x										Field's Virology, 5th Ed., p. 1153-1158, 1200-1203
Fasciola hepatica							x							Ashford and Crewe, 2003
Fasciola indica							x							Ashford and Crewe, 2003

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Fasciola indica							x							Ashford and Crewe, 2003
Fasciolopsis buski										x				Ashford and Crewe, 2003
Fibrobacter intestinalis	x													Neumann et al
Filifactor alocis	x													MCM-13, Ch 54, p 4
Finegoldia magna	x													MCM-13, Ch 53, p 3
Fonsecaea compacta									x					http://www.drfungus.org/knowledge-base/Fonsecaea/http://www.doctorfungus.org/thefungi/Fonsecaea.htm
Foot and mouth disease virus								x						Field's Virology, 5th Ed., p. 796, 840, 858-860
Francisella tularensis				x										MCM-13, Ch 48, p1
Fusarium aquaeductuum									x					Howard 2003 p. 402
Fusarium chlamydosporum									x					MCM-13, Ch 121, p3
Fusarium dimerum									x					MCM-13, Ch 121, p3
Fusarium falciforme									x					MCM-13, Ch 121, p3
Fusarium moniliforme									x					MCM-13, Ch 121, p3
Fusarium napiforme									x					MCM-13, Ch 121, p3
Fusarium neocosmosporiellum									x					Howard 2003 p. 434-436
Fusarium nivale									x					Howard 2003 p. 431
Fusarium oxysporum									x					MCM-13, Ch 121, p3
Fusarium pallidoroseum									x					Howard 2003 p. 320, 418-421
Fusarium proliferatum									x					MCM-13, Ch 121, p3
Fusarium sacchari									x					MCM-13, Ch 121, p3
Fusarium solani													*Fusarium solani*	
Fusarium subglutinans									x					MCM-13, Ch 121, p3
Fusarium ventricosum									x					http://www.doctorfungus.org/thefungi/fusarium.htm
Fusarium verticillioides									x					MCM-13, Ch 121, p3

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Fusobacterium mortiferum	x													MCM-13 Ch 56 p 5
Fusobacterium necrophorum	x													MCM-13 Ch 56 p 5
Fusobacterium nucleatum	x													MCM-13 Ch 56 p 5
Fusobacterium periodonticum	x													MCM-13 Ch 56 p 5
Fusobacterium ulcerans	x													MCM-13 Ch 56 p 5
Fusobacterium varium	x													MCM-13 Ch 56 p 5
Ganjam virus				x										MCM-13, Ch 97; CDC
Gardnerella vaginalis					x									MCM-13, Ch 29, p27
Gastrodiscoides hominis										x				Ashford and Crewe, 2003
Gemella morbillorum					x									MCM-13, Ch 25, p 3
*Geothrix fermentans**														
Geotrichum candidum									x					Rosenzweig et al., 1986
Getah virus				x										Field's Virology, 5th Ed., p. 1024
Giardia duodenalis														
Gigantobilharzia huttoni							x							Ashford and Crewe, 2003
Gigantobilharzia sturniae										x				Ashford and Crewe, 2003
Gliomastix roseogrisea									x					Howard 2003, p. 384
Gnathostoma doloresi										x				Ashford and Crewe, 2003
Gnathostoma hispidum										x				Ashford and Crewe, 2003
Gnathostoma nipponicum										x				Ashford and Crewe, 2003
Gnathostoma spinigerum							x							Ashford and Crewe, 2003
Gongylonema pulchrum							x							Ashford and Crewe, 2003
Gordonia amarae									x					MCM-13, Ch 30, p8
Gordonia bronchialis									x					MCM-13, Ch 30, p8
Gordonia rubropertincta									x					MCM-13, Ch 30, p8
Gordonia sputi									x					MCM-13, Ch 30, p8
Gordonia terrae									x					MCM-13, Ch 30, p8

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Granulicatella adiacens					x									MCM-13, Ch 25, p 4
Guama virus				x										MCM-13, Ch 80, p12
Guanarito virus										x				MCM-13, Ch 80, p12
Guaroa virus				x										MCM-13, Ch 97, p2
Gymnophalloides sp.										x				Ashford and Crewe, 2003
Haemonchus contortus										x				Ashford and Crewe, 2003
Haemophilus ducreyi			x											MCM-13, Ch 38, p3
Haemophilus haemolyticus					x									MCM-13, Ch 38, p2
Haemophilus influenzae					x									MCM-13, Ch 38, p2
Haemophilus parahaemolyticus					x									MCM-13, Ch 38, p2
Haemophilus parainfluenzae					x									MCM-13, Ch 38, p2
Haemophilus paraphrophilus					x									MCM-13, Ch 38, p2
Haemophilus segnis					x									MCM-13, Ch 38, p2
Hafnia alvei									x					MCM-13, Ch 157, p3
Hansenula anomala									x					MCM-13, Ch 120, p2
Hantaan virus										x				MCM-13, Ch 98, p2
Haplorchis pumilo										x				Ashford and Crewe, 2003
Haplorchis taichui										x				Ashford and Crewe, 2003
Haplorchis vanissima							x							Ashford and Crewe, 2003
Haplorchis yokogawai							x							Ashford and Crewe, 2003
Helicobacter cinaedi											x			MCM-13, Ch 59, p5
Helicobacter fennelliae											x			MCM-13, Ch 59, p5
Helicobacter heilmannii											x			MCM-13, Ch 59, p5
Helicobacter pullorum											x			MCM-13, Ch 59, p5
Helicobacter pylori													*Helicobacter pylori*	
Hendra virus										x				MCM-13, Ch 80, p14
Hepatitis A virus													Hepatitis A	
Hepatitis B virus			x											MCM-13, Ch 111, p3

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Hepatitis C virus			x											MCM-13, Ch 94, p2
Hepatitis delta virus			x											MCM-13, Ch 111, p15
Hepatitis E virus													Hepatitis E	
Hepatitis G virus			x											MCM-13, Ch 111, p15
Heterobilharzia americana							x							Ashford and Crewe, 2003
Heterophyes dispar										x				Ashford and Crewe, 2003
Heterophyes heterophyes										x				Ashford and Crewe, 2003
Heterophyes nocens										x				Ashford and Crewe, 2003
Heterophyopsis continua										x				Ashford and Crewe, 2003
Himasthala muehlensi							x							Ashford and Crewe, 2003
Histoplasma capsulatum									x					MCM-13, Ch 125, p2
Hortaea werneckii									x					MCM-13, Ch 127, p2
HU39694 virus				x										http://www.cdc.gov/ncidod/diseases/hanta/hps/noframes/phys/ecology.htm
Hughes virus				x										Field's Virology, 5th Ed., p. 1743-1745
Human adenovirus A													Adenovirus	
Human adenovirus B						x								MCM-13, Ch 106, p4
Human adenovirus C											x			MCM-13, Ch 106, p4
Human adenovirus D						x								MCM-13, Ch 106, p4
Human adenovirus E						x								MCM-13, Ch 106, p4
Human adenovirus F											x			MCM-13, Ch 106, p4
Human astrovirus													Astrovirus	
Human bocavirus								x						Allander (2008)
Human Coronavirus 229E						x								MCM-13, Ch 92, p3
Human Coronavirus OC43						x								MCM-13, Ch 92, p3
Human Coronavirus SARS-CoV-2						x								MCM-13, Ch 94, p4
Human enterovirus 68											x			MCM-13, Ch 90, p2

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Human enterovirus 70											x			MCM-13, Ch 90, p2
Human enterovirus A													Enterovirus	
Human enterovirus B											x			MCM-13, Ch 90, p2
Human enterovirus C											x			MCM-13, Ch 90, p2
Human enterovirus D											x			MCM-13, Ch 90, p2
Human Herpesvirus 1			x											MCM-13, Ch 100, p2
Human Herpesvirus 2			x											MCM-13, Ch 100, p2
Human Herpesvirus 3			x											MCM-13, Ch 100, p2
Human Herpesvirus 4			x											MCM-13, Ch 100, p2
Human Herpesvirus 5			x											MCM-13, Ch 100, p2
Human Herpesvirus 6			x											MCM-13, Ch 100, p2
Human Herpesvirus 7			x											MCM-13, Ch 100, p2
Human Herpesvirus 8			x											MCM-13, Ch 100, p2
Human Immunodeficiency Virus 1			x											MCM-13, Ch84, p3
Human Immunodeficiency Virus 2			x											MCM-13, Ch84, p3
Human metapneumovirus*						x								MCM-13, Ch 88, p2
Human papillomavirus			x											MCM-13, Ch 107, p4
Human parainfluenza virus 1						x								MCM-13, Ch 87, p2
Human parainfluenza virus 2						x								MCM-13, Ch 87, p2
Human parainfluenza virus 3						x								MCM-13, Ch 87, p2
Human parainfluenza virus 4						x								MCM-13, Ch 87, p2
Human parechovirus type 1								x						MCM-13, Ch 90, p3
Human parechovirus type 2								x						MCM-13, Ch 90, p3

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Human Respiratory Syncytial virus						x								MCM-13 Ch 88
Human Rhinovirus A						x								MCM-13, Ch 91, p2
Human Rhinovirus B						x								MCM-13, Ch 91, p2
Human T-Lymphotropic Virus 1			x											MCM-12
Humicola lanuginosa									x					Howard 2003 p. 623
Hymenolepis diminuta							x							Ashford and Crewe, 2003
Hymenolepis nana							x							Ashford and Crewe, 2003
Hypoderaeum conoideum										x				Ashford and Crewe, 2003
Igbo-ora virus				x										Field's Virology, 5th Ed., p. 1024, 1048
Ilheus virus				x										MCM-13, Ch 97, p2
Inermicapsifer madagascariensis										x				Ashford and Crewe, 2003
Influenza A virus						x								MCM-13, Ch 86, p2
Influenza B virus						x								MCM-13, Ch 86, p2
Influenza C virus						x								MCM-13, Ch 86, p2
Isoparorchis hypselobagri										x				Ashford and Crewe, 2003
Issyk-Kul virus				x										MCM-13, Ch 97; CDC
Japanese encephalitis virus				x										MCM-13, Ch 97, p2
JC virus			x											MCM-13, Ch 108, p1
Junin virus			x											MCM-13, Ch 99, p3
Juquitiba virus				x										Field's Virology, 5th Ed., p. 1743-1745
Karshi virus										x				MCM-12
Kasokero virus				x										Schuh et al., 2020
Kedougou virus				x										Field's Virology, 5th Ed., p. 1153-1158, 1199
Kemerovo virus				x										Safonova et al
KI polyomavirus			x											Bofill-Mas, S., et al, 2010

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Kiflimonium curvulum									x					Pérez-Cantero & Guarro, 2020
Kingella denitrificans					x									MCM-13, Ch 37, p2
Kingella kingae					x									MCM-13, Ch 37, p2
Klebsiella aerogenes									x					MCM-13, Ch 40, p6
Klebsiella granulomatis									x					MCM-13, Ch 40, p6
Klebsiella oxytoca									x					MCM-13, Ch 40, p6
Klebsiella pneumoniae									x					MCM-13, Ch 40, p6
*Klebsiella variicola**									x					MCM-13, Ch 40, p6
Kluyvera ascorbata									x					MCM-13, Ch 40, p3
Kluyvera cryocrescens									x					MCM-13, Ch 40, p3
Kluyveromyces marxianus									x					MCM-13, Ch 120, p2
Kobuvirus								x						Khamrin, P et al
Kokobera virus				x										MCM-13, Ch 97; CDC
Koutango virus				x										MCM-13, Ch 97; CDC
Kyasanur forest disease virus				x										MCM-13, Ch 97, p2
Lactobacillus sp.	x													MCM-13 Ch 54 p 5
Lagochilascaris minor							x							Ashford and Crewe, 2003
Laguna Negra virus										x				MCM-13, Ch 98, p2
Lanjan virus				x										Matsuno et al., 2015
Lasiodiplodia theobromae									x					MCM-13, Ch 127, p2
Lassa virus										x				MCM-13, Ch 80, p12
Lebombo virus				x										MCM-13, Ch 80, p2
Lechiguanas virus				x										Colombo et al., 2019
Legioenalla gormanii											x			MCM-13, Ch 51, p1
Legioenalla maceachernii											x			MCM-13, Ch 51, p1
Legionealla micdadei											x			MCM-13, Ch 51, p1
Legionella anisa											x			MCM-13, Ch 51, p2

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Legionella birminghamensis											x			MCM-13, Ch 51, p2
*Legionella bononiensis**											x			MCM-13, Ch 51, p2
Legionella bozemanae											x			MCM-13, Ch 51, p1
Legionella cherrii											x			MCM-13, Ch 51, p2
Legionella cincinnatiensis											x			MCM-13, Ch 51, p2
Legionella dumoffii											x			MCM-13, Ch 51, p1
Legionella feeleii											x			MCM-13, Ch 51, p2
Legionella hackeliae											x			MCM-13, Ch 51, p2
Legionella jordanis											x			MCM-13, Ch 51, p2
Legionella lansingensis											x			MCM-13, Ch 51, p2
Legionella longbeachae											x			MCM-13, Ch 51, p2
Legionella oakridgensis											x			MCM-13, Ch 51, p2
Legionella pneumophila													*Legionella pneumophila***	
Legionella rubrilucens											x			MCM-13, Ch 51, p2
Legionella sainthelensi											x			MCM-13, Ch 51, p2
Legionella tucsonensis											x			MCM-13, Ch 51, p2
Legionella wadsworthii											x			MCM-13, Ch 51, p2
Leifsonia aquatica									x					MCM-13, Ch 29, p2
Leishmania aethiopica				x										MCM-13, Ch 140, p1
Leishmania amazonensis				x										MCM-13, Ch 140, p1
Leishmania braziliensis				x										MCM-13, Ch 140, p1
Leishmania chagasi				x										MCM-13, Ch 140, p1
Leishmania donovani				x										MCM-13, Ch 140, p1
Leishmania guyanensis				x										MCM-13, Ch 140, p1
Leishmania infantum				x										MCM-13, Ch 140, p1
Leishmania lainsoni				x										MCM-13, Ch 140, p1
Leishmania major				x										MCM-13, Ch 140, p1
Leishmania mexicana				x										MCM-13, Ch 140, p1

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Leishmania naiffi				x										MCM-13, Ch 140, p1
Leishmania panamensis				x										MCM-13, Ch 140, p1
Leishmania peruviana				x										MCM-13, Ch 140, p1
Leishmania pifanoi				x										MCM-13, Ch 140, p1
Leishmania shawi				x										MCM-13, Ch 140, p1
Leishmania tropica				x										MCM-13, Ch 140, p1
Leishmania venezuelensis				x										MCM-13, Ch 140, p1
Leptospira borgpetersenii								x						MCM-13, Ch 60, p2
Leptospira inadai								x						MCM-13, Ch 60, p2
Leptospira interrogans								x						MCM-13, Ch 60, p2
Leptospira kirschneri								x						MCM-13, Ch 60, p2
Leptospira meyeri								x						MCM-13, Ch 60, p2
Leptospira noguchii								x						MCM-13, Ch 60, p2
Leptospira santarosai								x						MCM-13, Ch 60, p2
Leptospira weilii								x						MCM-13, Ch 60, p2
Leptotrichia buccalis	x													MCM-13 Ch 56 p 5
Ligula intestinalis										x				Ashford and Crewe, 2003
Listeria ivanovii								x						MCM-13, Ch 28, p2
Listeria monocytogenes								x					*Listeria monocytogenes***	MCM-13, Ch 28, p2
Listeria seeligeri								x						MCM-13, Ch 28, p2
Listeria welshimeri								x						MCM-13, Ch 28, p2
Loa loa				x										Ashford and Crewe, 2003
Lophophyton gallinae									x					MCM-13, Ch 126, p4
Louping ill virus				x										MCM-13, Ch 80, p8
Lujo virus			x											
Lymphocytic choriomeningitis virus								x						MCM-13, Ch 80, p12
Lysinibacillus sphaericus									x					MCM-13, Ch 27, p1
Machupo virus										x				MCM-13, Ch 80, p12

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Macracanthorhynchus hirudinaceus										x				Ashford and Crewe, 2003
Macracanthorhynchus ingens							x							Ashford and Crewe, 2003
Madrid virus				x										MCM-13, Ch 80, p12
Madurella ikedae									x					de Hoog et al
Magnusiomyces capitatus									x					MCM-13, Ch 120, p2
Malassezia globosa					x									MCM-13, Ch 120, p3
Malassezia obtusa					x									MCM-13, Ch 120, p3
Malassezia pachydermatis					x									MCM-13, Ch 120, p3
Malassezia restricta					x									MCM-13, Ch 120, p3
Malassezia sloofiae					x									MCM-13, Ch 120, p3
Malassezia sympodialis					x									MCM-13, Ch 120, p3
Mammomonogamus laryngeus										x				Ashford and Crewe, 2003
Mammomonogamus nasicola										x				Ashford and Crewe, 2003
Mannheimia haemolytica					x									MCM-13, Ch 37, p4
Mansonella ozzardi				x										Ashford and Crewe, 2003
Mansonella perstans				x										Ashford and Crewe, 2003
Mansonella rodhaini				x										Ashford and Crewe, 2003
Mansonella semiclarum				x										Ashford and Crewe, 2003
Mansonella streptocerca				x										Ashford and Crewe, 2003
Marburg virus			x											MCM-13, Ch 99, p4
Marituba virus				x										MCM-13, Ch 97; CDC
Marshallagia marshalli										x				Ashford and Crewe, 2003
Mathevotaenia symmetrica										x				Ashford and Crewe, 2003
Mayaro virus				x										MCM-13, Ch 80, p2
Measles virus						x								MCM-13, Ch 89, p2
Mecistocirrus digitatus							x							Ashford and Crewe, 2003

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Megamonas hypermegale	x													MCM-13, Ch 56 p4
Megasphaera sp.	x													MCM-13, Ch 53, p 3
Menangle virus										x				Webby et al., 2021
Meningonema peruzzii										x				Ashford and Crewe, 2003
Mesocestoides lineatus										x				Ashford and Crewe, 2003
Mesocestoides variabilis							x							Ashford and Crewe, 2003
Metagonimus minutus										x				Ashford and Crewe, 2003
Metagonimus yokogawai										x				Ashford and Crewe, 2003
Metastrongylus apri							x							Ashford and Crewe, 2003
Methylobacterium mesophilicum								x						MCM-13, Ch 46, p20
Methylobacterium zatmanii								x						MCM-13, Ch 46, p20
Metorchis albidus							x							Ashford and Crewe, 2003
Metorchis conjunctus							x							Ashford and Crewe, 2003
Meyerozyma guilliermondii									x					MCM-13, Ch 120, p2
Microascus cinereus									x					MCM-13, Ch 127, p3
Microascus cirrosus									x					MCM-13, Ch 127, p3
Microfilaria bolivarensis				x										Ashford and Crewe, 2003
Micromonas micros	x													MCM-13, Ch 53, p 3
Micronema deletrix							x							Ashford and Crewe, 2003
Microsporum audouinii									x					MCM-13, Ch 126, p4
Microsporum canis									x					MCM-13, Ch 126, p4
Microsporum equinum									x					MCM-13, Ch 126, p4
Microsporum ferrugineum									x					MCM-13, Ch 126, p4
Microsporum nanum									x					MCM-13, Ch 126, p4
Microsporum praecox									x					MCM-13, Ch 126, p4
Mimivirus								x						Field's Virology, 5th Ed., p. 627-628, 637-638
Mogibacterium timidum	x													MCM-13 Ch 54 p 5

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Mokola virus				x										Field's Virology, 5th Ed., p. 1363-1364
Molluscum contagiosum virus			x											MCM-12
Moniezia expansa							x							Ashford and Crewe, 2003
Moniliella suaveolens									x					http://www.drfungus.org/knowledge-base/Moniliella/
Moniliformis moniliformis							x							Ashford and Crewe, 2003
Monkeypox virus										x				MCM-13, Ch 110, p2
Monongahela virus				x										Jacob et al., 2023
Moraxella atlantae					x									MCM-13, Ch 46, p1
Moraxella bovis					x									MCM-13, Ch 46, p1
Moraxella catarrhalis					x									MCM-13, Ch 46, p1
Moraxella caviae					x									MCM-13, Ch 46, p1
Moraxella cuniculi					x									MCM-13, Ch 46, p1
Moraxella lacunata					x									MCM-13, Ch 46, p1
Moraxella lincolnii					x									MCM-13, Ch 46, p1
Moraxella liquefaciens					x									MCM-13, Ch 46, p1
Moraxella nonliquefaciens					x									MCM-13, Ch 46, p1
Moraxella osloensis					x									MCM-13, Ch 46, p1
Moraxella ovis					x									MCM-13, Ch 46, p1
Morganella morganii					x									MCM-13, Ch 157, p1
Mucambo virus				x										MCM-13, Ch 97; CDC
Mucor circinelloides									x					MCM-13, Ch 124, p2
Mucor hiemalis									x					MCM-13, Ch 124, p2
Mucor indicus									x					Howard p. 70, 98-99, 101
Mucor racemosus									x					MCM-13, Ch 124, p2
Mucor ramosissimus									x					MCM-13, Ch 124, p2
Multiceps brauni										x				Ashford and Crewe, 2003
Multiceps longihamatus										x				Ashford and Crewe, 2003
Multiceps multiceps							x							Ashford and Crewe, 2003

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Mumps virus			x											MCM-13, Ch 87, p8
Murray Valley encephalitis virus				x										MCM-13, Ch 97, p2
Myceliophthora thermophila									x					MCM-13, ch 123, p9
Mycobacterium abscessus													*Mycobacterium abscessus***	
Mycobacterium africanum										x				MCM-13, Ch 33, p13
Mycobacterium asiaticum									x					MCM-13, Ch 33, p2
Mycobacterium avium													*Mycobacterium avium***	
Mycobacterium bovis		x												MCM-13, Ch 32, p2
Mycobacterium celatum									x					MCM-13, Ch 33, p2
Mycobacterium chelonae													*Mycobacterium chelonae***	MCM-13, Ch 33, p2
Mycobacterium conspicuum									x					MCM-13, Ch 33, p2
Mycobacterium fortuitum													*Mycobacterium fortuitum***	MCM-13, Ch 33, p2
Mycobacterium genavense									x					MCM-13, Ch 33, p2
Mycobacterium gordonae													*Mycobacterium gordonae***	MCM-13, Ch 33, p2
Mycobacterium haemophilum									x					MCM-13, Ch 33, p2
Mycobacterium intracellulare													*Mycobacterium intracellulare***	MCM-13, Ch 33, p1
Mycobacterium kansasii													*Mycobacterium kansasii***	MCM-13, Ch 33, p2
Mycobacterium leprae		x												MCM-13, Ch 33, p2
Mycobacterium malmoense									x					MCM-13, Ch 33, p2
Mycobacterium marinum									x					MCM-13, Ch 33, p2

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Mycobacterium mucogenicum													*Mycobacterium mucogenicum***	MCM-13, Ch 33, p2
*Mycobacterium paraintracellulare**											x			MCM-13, Ch 33, p1
Mycobacterium peregrinum									x					MCM-13, Ch 33, p2
Mycobacterium porcinum									x					MCM-13, Ch 33, p2
Mycobacterium scrofulaceum									x					MCM-13, Ch 33, p2
Mycobacterium senegalense									x					MCM-13, Ch 33, p2
Mycobacterium shimoidei									x					MCM-13, Ch 33, p2
Mycobacterium simiae									x					MCM-13, Ch 33, p2
Mycobacterium smegmatis									x					MCM-13, Ch 33, p2
Mycobacterium szulgai									x					MCM-13, Ch 33, p2
Mycobacterium tuberculosis						x								MCM-13, Ch 32, p2
Mycobacterium ulcerans									x					MCM-13, Ch 33, p2
Mycobacterium xenopi													*Mycobacterium xenopi***	MCM-13, Ch 33, p2
Mycocentrospora acerina									x					Howard p. 602-603
Mycoleptodiscus indicus									x					Howard p. 602-603
Mycoplasma fermentans		x												MCM-13, Ch 64, p2
Mycoplasma genitalium		x												MCM-13, Ch 64, p2
Mycoplasma hominis		x												MCM-13, Ch 64, p2
Mycoplasma pneumoniae		x												MCM-13, Ch 64, p2
Mycoplasma salivarium		x												MCM-13, Ch 64, p2
Myriodontium keratinophilum									x					MCM-13, ch 123, p9
Myroides odoratus								x						MCM-13, Ch 46, p14

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Naegleria fowleri													*Naegleria fowleri*	
Nannizzia cajetani									x					Howard 2003 p. 155
Nannizzia fulva									x					MCM-13, Ch 126, p5
Nannizzia gypsea									x					MCM-13, Ch 126, p5
Nannizzia persicolor									x					MCM-13, Ch 126, p5
Nannizzia racemosa									x					MCM-13, Ch 126, p5
Nanophyetus salmincola							x							Ashford and Crewe, 2003
Nattrassia mangiferae									x					MCM-13, ch 127, p5
Necator americanus							x							Ashford and Crewe, 2003
Neisseria cinerea					x									MCM-13, Ch 36, p3
Neisseria elongata					x									MCM-13, Ch 36, p3
Neisseria flava					x									MCM-13, Ch 36, p3
Neisseria flavescens					x									MCM-13, Ch 36, p3
Neisseria gonorrhoeae			x											MCM-13, Ch 36, p1
Neisseria lactamica					x									MCM-13, Ch 36, p3
Neisseria meningitidis						x								MCM-13, Ch 36, p2
Neisseria mucosa					x									MCM-13, Ch 36, p3
Neisseria perflava					x									MCM-13, Ch 36, p3
Neisseria sicca					x									MCM-13, Ch 36, p3
Neisseria subflava					x									MCM-13, Ch 36, p3
Neisseria weaveri					x									MCM-13, Ch 36, p3
Nematodirus abnormalis							x							Ashford and Crewe, 2003
Neocosmospora cyanescens									x					MCM-13, Ch 123, p11
Neocosmospora keratoplastica									x					Howard 2003 p. 394
Neocosmospora lichenicola									x					MCM-13, Ch 123, p11
Neodiplostomum seoulense										x				Ashford and Crewe, 2003
Neodiplostomum sp.										x				Ashford and Crewe, 2003
Neoehrlichia mikurensis				x										MCM-13, Ch 67, p3

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Neorickettsia sennetsu				x										MCM-13, Ch 67, p3
Neoscytalidium hyalinum									x					MCM-13, ch 127, p1
Neotestudina rosatii									x					MCM-13, Ch 128, p3
Neurospora sitophila									x					http://www.drfungus.org/knowledge-base/Chrysonilia/
New York virus				x										MCM-13, Ch 80, p13
Newcastle disease virus						x								Field's Virology, 5th Ed., p. 1497-1498
Nigrospora sphaerica									x					http://www.drfungus.org/knowledge-base/Nigrospora/http://www.doctorfungus.org/thefungi/Nigrospora.htm
Nipah virus										x				MCM-13, Ch 87, p1
Nocardia asteroides									x					MCM-13, Ch 30, p8
Nocardia brasiliensis									x					MCM-13, Ch 30, p8
Nocardia caviae									x					MCM-13, Ch 30, p8
Nocardia farcinica									x					MCM-13, Ch 30, p8
Nocardia nova									x					MCM-13, Ch 30, p8
Nocardia otitidiscaviarum									x					MCM-13, Ch 30, p8
Nocardia pseudobrasiliensis									x					MCM-13, Ch 30, p8
Nocardia transvalensis									x					MCM-13, Ch 30, p8
Nosema africanum								x						MCM-13, Ch 131, p1
Nosema ceylonensis								x						MCM-13, Ch 131, p1
Nosema connori								x						MCM-13, Ch 131, p1
Nosema ocularum								x						MCM-13, Ch 131, p1
Nyando virus				x										MCM-13, Ch 97; CDC
Ochrobactrum anthropi									x					MCM-13, Ch 46, p14
Ochroconis gallopava									x					MCM-13, ch 127, p4
Ochroconis tshawytschae									x					Howard 2003 p. 617

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Ockelbo virus				x										Lundström et al
Odoribacter splanchnicus	x													MCM-13, Ch 56 p13
Oesophagostomum aculeatum										x				Ashford and Crewe, 2003
Oesophagostomum bifurcum										x				Ashford and Crewe, 2003
Oesophagostomum stephanostomum							x							Ashford and Crewe, 2003
Oidiodendron cereale									x					http://www.drfungus.org/knowledge-base/Oidiodendron/
Oidium chartarum									x					Doggett, 2000
Oligella ureolytica					x									MCM-13, Ch 46, p1
Oligella urethralis					x									MCM-13, Ch 46, p1
Omsk haemorrhagic fever virus				x										MCM-13, Ch 97, p2
Onchocerca volvulus				x										Ashford and Crewe, 2003
O'nyong-nyong virus				x										MCM-13, Ch 97, p3
Oospora sulphureo-ochracea									x					Howard 2003 p. 230-232
Opisthorchis (Chlonorchis) sinensis										x				Ashford and Crewe, 2003
Opisthorchis felineus										x				Ashford and Crewe, 2003
Opisthorchis noverca							x							Ashford and Crewe, 2003
Opisthorchis viverrini										x				Ashford and Crewe, 2003
Oran virus				x										Levis et al., 1998
Orf virus								x						MCM-13, Ch 110, p2
Oriboca virus				x										MCM-13, Ch 97; CDC
Orientia tsutsugamushi		x												MCM-13, Ch 66, p1
Orientobilharzia turkestanica										x				Ashford and Crewe, 2003
Ornithobilharzia sp.										x				Kolářová, 2007
Oropouche virus				x										MCM-13, Ch 80, p12

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Orungo virus				x										MCM-13, Ch 80, p2
Ostertagia ostertagi										x				Ashford and Crewe, 2003
Ovadendron ochraceum									x					Thomas & Kaliamurthy, 2013http://www.catalogueoflife.org/show_species_details.php?record_id=3330913
Paecilomyces farinosus									x					http://www.drfungus.org/knowledge-base/Paecilomyces/
Paecilomyces fumerosoreus									x					Howard 2003 p. 361-362
Paecilomyces javanicus									x					MCM-13, ch 123, p9
Paecilomyces lilacinum									x					MCM-13, Ch 123, p18
Paecilomyces marquandii									x					MCM-13, Ch 123, p18
Paecilomyces viridis									x					Howard 2003 p. 357-359
Paenibacillus alvei									x					MCM-13, Ch 27, p1
Paenibacillus macerans									x					MCM-13, Ch 27, p1
Pantoea agglomerans													*Pantoea agglomerans*	
Parabacteroides distasonis	x													MCM-13, Ch 56 p5
Parabacteroides merdae	x													MCM-13, Ch 56 p5
Parachlamydia acanthamoebae		x												MCM-13, Ch 65, p6
Paraclostridium bifermentans	x													MCM-13, Ch 55, p 3
Paracoccidioides brasiliensis									x					https://drfungus.org/knowledge-base/Lacazia/
Paracoccidioides brasiliensis									x					MCM-13, Ch 125, p2
Paragonimus africanus										x				Ashford and Crewe, 2003
Paragonimus bankokensis							x							Ashford and Crewe, 2003
Paragonimus caliensis							x							Ashford and Crewe, 2003

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Paragonimus heterotremus										x				Ashford and Crewe, 2003
Paragonimus hueitungensis										x				Ashford and Crewe, 2003
Paragonimus kellicotti							x							Ashford and Crewe, 2003
Paragonimus mexicanus							x							Ashford and Crewe, 2003
Paragonimus miyazakii										x				Ashford and Crewe, 2003
Paragonimus ohirai										x				Ashford and Crewe, 2003
Paragonimus phillipinensis										x				Ashford and Crewe, 2003
Paragonimus sadoensis										x				Ashford and Crewe, 2003
Paragonimus siamensis										x				Palmer et al., 1998, p. 736
Paragonimus skrjabini										x				Ashford and Crewe, 2003
Paragonimus uterobilateralis										x				Ashford and Crewe, 2003
Paragonimus westermani										x				Ashford and Crewe, 2003
Parascaris equorum							x							Ashford and Crewe, 2003
Parastrongylus cantonensis										x				Ashford and Crewe, 2003
Parastrongylus costaricensis							x							Ashford and Crewe, 2003
Parengyodontium album									x					MCM-13, ch 123, p9
Parvovirus 4			x											Sharp et al., 2010
Parvovirus B19						x								MCM-12
Pasteurella aerogenes					x									MCM-13, Ch 37, p2
Pasteurella caballi					x									MCM-13, Ch 37, p2
Pasteurella canis					x									MCM-13, Ch 37, p2
Pasteurella dagmatis					x									MCM-13, Ch 37, p2
Pasteurella multocida					x									MCM-13, Ch 37, p2
Pasteurella stomatis					x									MCM-13, Ch 37, p2
Pelodera strongyloides										x				Ashford and Crewe, 2003
Penicillium chrysogenum									x					MCM-13, Ch 122, p23

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Penicillium citrinum									x					MCM-13, Ch 122, p23
Penicillium commune									x					MCM-13, Ch 122, p23
Penicillium decumbens									x					MCM-13, Ch 122, p23
Penicillium expansum									x					MCM-13, Ch 122, p23
Penicillium marneffei									x					MCM-13, Ch 122, p23
Penicillium purpurogenum									x					MCM-13, Ch 122, p23
Pentatrichomonas hominis					x									MCM-13, Ch 143, p2
Peptococcus niger	x													MCM-13, Ch 53 p 4
Peptostreptococcus anaerobius	x													MCM-13, Ch 53 p 4
Peptostreptococcus asaccharolyticus	x													MCM-13, Ch 53 p 4
Peptostreptococcus lactolyticus	x													MCM-13, Ch 53 p 4
Peptostreptococcus prevotii	x													MCM-13, Ch 53 p 4
Peptostreptococcus vaginalis	x													MCM-13, Ch 53 p 4
Phaeoanellomyces elegans									x					Howard 2003 p. 605-606
Phaeoanellomyces werneckii									x					MCM-13, ch 127, p2
Phaeosclera dematioides									x					http://www.drfungus.org/knowledge-base/Phaeosclera/http://www.doctorfungus.org/imageban/synonyms/Phaeosclera.htm
Phaeotrichoconis crotalariae									x					Howard 2003 p. 606-607
Phanerochaete chrysosporium									x					Doggett, 2000
Phaneropsolus bonnei										x				Ashford and Crewe, 2003
Phialemoniopsis curvata									x					MCM-13, Ch 123, p20

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Phialemonium obovatum									x					MCM-13, Ch 123, p9
Phialophora bubakii									x					Howard 2003 p. 607-612
Phialophora pedrosoi									x					http://www.drfungus.org/knowledge-base/Fonsecaea/http://www.doctorfungus.org/thefungi/Fonsecaea.htm
Phialophora richardsiae									x					MCM-13, Ch 127, p2
Phialophora verrucosa									x					MCM-13, Ch 127, p2
Philophthalmus lacrymosus										x				Ashford and Crewe, 2003
Phnom-Penh bat virus								x						Field's Virology, 5th Ed., p. 1153-1158, 1206
Phoma cava									x					http://www.drfungus.org/knowledge-base/phoma/http://www.doctorfungus.org/thefungi/phoma.htm
Phoma cruris-hominis									x					Howard, 2003 p. 666-668
Phoma eupyrena									x					Howard, 2003 p. 666-668
Phoma glomerata									x					Howard, 2003 p. 666-668
Phoma herbarum									x					http://www.drfungus.org/knowledge-base/phoma/
Phoma hibernica									x					Howard, 2003 p. 666-668
Phoma minutella									x					Howard, 2003 p. 666-668
Phoma oculo-hominis									x					Howard, 2003 p. 666-668
Photobacterium damselae									x					MCM-13, Ch 43, p5
Phyllosticta citricarpa									x					http://www.drfungus.org/knowledge-base/phoma/
Physaloptera caucasica							x							Ashford and Crewe, 2003
Physaloptera transfuga										x				Ashford and Crewe, 2003
Picobirnavirus								x						MCM-12
Piedraia hortae									x					MCM-13, Ch 126, p25

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Piry virus				x										MCM-13, Ch 97; CDC
Pityrosporum orbiculare					x									MCM-13, Ch 126, p23
Plagiorchis harinasutai										x				Ashford and Crewe, 2003
Plagiorchis javensis										x				Ashford and Crewe, 2003
Plagiorchis muris										x				Ashford and Crewe, 2003
Plagiorchis philippinensis										x				Ashford and Crewe, 2003
Plasmodium falciparum				x										MCM-13, Ch 139, p1
Plasmodium knowlesi				x										MCM-13, Ch 139, p1
Plasmodium malariae				x										MCM-13, Ch 139, p1
Plasmodium ovale				x										MCM-13, Ch 139, p1
Plasmodium simium				x										MCM-13, Ch 139, p1
Plasmodium vivax				x										MCM-13, Ch 139, p1
Plesiomonas shigelloides													*Plesiomonas shigelloides*	
Pleurophoma pleurospora									x					Howard, 2003 p. 666-668
Pleurostoma repens									x					MCM-13, ch 127, p1
Pneumocystis carinii						x								MCM-13, Ch 121, p2
Poikilorchis congolensis										x				Ashford and Crewe, 2003
Poliovirus											x			MCM-12
Porphyromonas asaccharolytica	x													MCM-13, Ch 56 p13
Porphyromonas catoniae	x													MCM-13 Ch 56 p 5
Porphyromonas circumdentaria	x													MCM-13 Ch 56 p 5
Porphyromonas endodontalis	x													MCM-13 Ch 56 p 5
Porphyromonas gingivalis	x													MCM-13 Ch 56 p 5
Porphyromonas levii	x													MCM-13 Ch 56 p 5
Porphyromonas macacae	x													MCM-13 Ch 56 p 5

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Powassan virus				x										MCM-13, Ch 97, p2
Prevotella bivia	x													MCM-13 Ch 56 p 5
Prevotella buccae	x													MCM-13 Ch 56 p 5
Prevotella buccalis	x													MCM-13 Ch 56 p 5
Prevotella corporis	x													MCM-13 Ch 56 p 5
Prevotella dentalis	x													MCM-13 Ch 56 p 5
Prevotella denticola	x													MCM-13 Ch 56 p 5
Prevotella disiens	x													MCM-13 Ch 56 p 5
Prevotella enoeca	x													MCM-13 Ch 56 p 5
Prevotella heparinolytica	x													MCM-13 Ch 56 p 5
Prevotella intermedia	x													MCM-13 Ch 56 p 5
Prevotella loescheii	x													MCM-13 Ch 56 p 5
Prevotella melaninogenica	x													MCM-13 Ch 56 p 5
Prevotella nigrescens	x													MCM-13 Ch 56 p 5
Prevotella oralis	x													MCM-13 Ch 56 p 5
Prevotella oris	x													MCM-13 Ch 56 p 5
Prevotella oulora	x													MCM-13 Ch 56 p 5
Prevotella ruminicola	x													MCM-13 Ch 56 p 5
Prevotella veroralis	x													MCM-13 Ch 56 p 5
Prevotella zoogleoformans	x													MCM-13 Ch 56 p 5
Procerovum calderoni										x				Ashford and Crewe, 2003
Prohemistomum vivax										x				Ashford and Crewe, 2003
Propionibacterium propionicus	x													MCM-13, Ch 54, p1
Prosthodendrium molenkampi										x				Ashford and Crewe, 2003
Proteus mirabilis									x					MCM-13, Ch 157, p2
Proteus penneri									x					MCM-13, Ch 157, p2
Proteus vulgaris									x					MCM-13, Ch 157, p2
Prototheca wickerhamii									x					MCM-13, Ch 120, p7

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Prototheca zopfii									x					Abu Ali et al., 2021
Providencia alcalifaciens									x					MCM-13, Ch 157, p2
Providencia rettgeri									x					MCM-13, Ch 157, p2
Providencia stuartii									x					MCM-13, Ch 157, p2
Pseudamphistomum aethiopicum										x				Ashford and Crewe, 2003
Pseudamphistomum truncatum										x				Ashford and Crewe, 2003
Pseudocowpox virus			x											Field's Virology, 5th Ed., p. 2948, 2960, 2963
Pseudomicrodochium suttonii									x					MCM-13, Ch 127, p2
Pseudomonas aeruginosa													*Pseudomonas aeruginosa**	
Pseudomonas alcaligenes									x					MCM-13, Ch 44, p2
Pseudomonas fluorescens									x					MCM-13, Ch 44, p2
Pseudomonas pseudoalcaligenes									x					MCM-13, Ch 44, p2
Pseudomonas putida									x					MCM-13, Ch 44, p2
Pseudomonas stutzeri									x					MCM-13, Ch 44, p2
Pseudonocardia autotrophica									x					MCM-13, Ch 44, p2
Pseudoramibacter alactolyticus	x													MCM-13, Ch 54, p7
Pseudoterranova decipiens							x							Ashford and Crewe, 2003
Psilorchis hominis							x							Ashford and Crewe, 2003
Psychrobacter phenylpyruvicus									x					MCM-13, Ch 46, p12
Punta Toro virus				x										MCM-13, Ch 97; CDC
Puumala virus										x				MCM-13, Ch 98, p2
Pygidiopsis summa										x				Ashford and Crewe, 2003

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Pyramicocephalus anthrocephalus							x							Ashford and Crewe, 2003
Pyrenochaeta mackinnonii									x					MCM-13, Ch 128, p3
Pyrenochaeta romeroi									x					MCM-13, Ch 128, p2
Pyrenochaeta unguis-hominis									x					Howard, 2003 p. 666-668
Pyrenophora biseptata									x					Howard, 2003 p. 588-589
Pythium insidiosum									x					MCM-13, Ch 130, p2
Quaranfil Virus				x										MCM-13, Ch 97; CDC
Rabies virus							x							MCM-13, Ch 96, p1
Rahnella aquatilis									x					MCM-13, Ch 41, p3
Raillietina celebensis										x				Ashford and Crewe, 2003
Raillietina demerariensis							x							Ashford and Crewe, 2003
Ralstonia pickettii									x					MCM-13, Ch 45, p2
Ramichloridium obovoidea									x					http://www.drfungus.org/knowledge-base/Ramichloridium/http://www.doctorfungus.org/imageban/synonyms/Ramichloridium.htm
Raoultella ornithinolytica									x					MCM-13, Ch 40, p3
Reovirus								x						Field's Virology, 5th Ed., p. 1897-1900
Reston Ebola virus										x				MCM-13, Ch 99, p4
Retortamonas intestinalis					x									MCM-13, Ch 143, p2
Rhabditis elongata										x				Ashford and Crewe, 2003
Rhabditis inermis										x				Ashford and Crewe, 2003
Rhabditis niellyi							x							Ashford and Crewe, 2003
Rhabditis pellioditis							x							Ashford and Crewe, 2003
Rhinocladiella aquaspersa									x					MCM-13, Ch 127, p2
Rhinocladiella schulzeri									x					http://www.drfungus.org/knowledge-

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
														base/Ramichloridium/http://www.doctorfungus.org/imageban/synonyms/Ramichloridium.htm
Rhinosporidium seeberi									x					MCM-13, Ch 130, p2
Rhizomucor miehei									x					MCM-13, Ch 124, p2
Rhizomucor pusillus									x					MCM-13, Ch 124, p2
Rhizopus azygosporus									x					MCM-13, ch 124, p2
Rhizopus microsporus									x					MCM-13, ch 124, p2
Rhizopus oryzae									x					MCM-13, ch 124, p11
Rhizopus stolonifer									x					MCM-13, ch 124, p11
Rhodococcus equi									x					MCM-13, Ch 30, p8
Rhodococcus erythropolis									x					MCM-13, Ch 30, p8
Rhodococcus fascians									x					MCM-13, Ch 30, p8
Rhodococcus rhodnii									x					MCM-13, Ch 30, p8
Rhodococcus rhodochrous									x					MCM-13, Ch 30, p8
Rhodotorula glutinis					x									MCM-13, Ch 120, p3
Rhodotorula minuta					x									MCM-13, Ch 120, p3
Rhodotorula mucilaginosa					x									MCM-13, Ch 120, p3
Rhodotorula rubra					x									MCM-13, Ch 120, p3
Rickettsia africae				x										MCM-13, Ch 66, p2
Rickettsia akari				x										MCM-13, Ch 66, p2
Rickettsia australis				x										MCM-13, Ch 66, p2
Rickettsia conorii				x										MCM-13, Ch 66, p2
Rickettsia felis				x										MCM-13, Ch 66, p2
Rickettsia honei				x										MCM-13, Ch 66, p2
Rickettsia japonica				x										MCM-13, Ch 66, p2
Rickettsia massiliae				x										MCM-13, Ch 66, p2
Rickettsia prowazekii				x										MCM-13, Ch 66, p2
Rickettsia rickettsii				x										MCM-13, Ch 66, p2

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Rickettsia sibirica				x										MCM-13, Ch 66, p2
Rickettsia typhi				x										MCM-13, Ch 66, p2
Rictularia sp.							x							Ashford and Crewe, 2003
Rift Valley fever virus										x				MCM-13, Ch 80, p12
Rio Bravo virus								x						Field's Virology, 5th Ed., p. 1153-1158, 1206
Rocio virus				x										MCM-13, Ch 97, p2
Rodentibacter pneumotropicus					x									MCM-13, Ch 37, p4
Ross River virus				x										MCM-13, Ch 97, p3
Rotavirus A													Rotavirus	
Rotavirus B										x				MCM-13, Ch 95, p4
Rotavirus C										x				MCM-13, Ch 95, p4
Rotavirus D										x				MCM-13, Ch 95, p4
Rotavirus E										x				MCM-13, Ch 95, p4
Rotavirus F										x				MCM-13, Ch 95, p4
Rothia dentocariosa					x									MCM-13, Ch 29, p5
Royal Farm virus				x										Field's Virology, 5th Ed., p. 1153-1158, 1204
Rubella virus						x								MCM-13, Ch 110, p3
Sabia virus										x				MCM-13, Ch 80, p12
Saccharomonospora viridis									x					MCM-13, Ch 30, p8
Saccharomyces cerevisiae									x					MCM-13, Ch 120, p3
Saccharopolyspora rectivirgula									x					MCM-13, Ch 30, p8
Saimiriine herpesvirus 1								x						Field's Virology, 4th Ed., p. 2383, 2483, 2511, 2848
Saksenaea vasiformis									x					MCM-13, Ch 124, p2
Salehabad virus				x										Shahhosseini et al., 2023
Salmonella bongori											x			MCM-13. Ch 39, p699
Salmonella choleraesuis											x			MCM-13. Ch 39, p699

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Salmonella enteritidis											x			MCM-13. Ch 39, p699
Salmonella typhi											x			MCM-13. Ch 39, p699
Salmonella typhimurium													*Salmonella enterica*	
Sandfly fever Naples virus				x										MCM-13, Ch 97, p3
Sandfly fever virus group				x										MCM-13, Ch 97, p3
Sarcinomyces phaeomuriformis									x					MCM-13, ch 127, p2
Sarcocystis hominis							x							MCM-13, Ch 144, p2
Sarcocystis lindermanni							x							MCM-13, Ch 144, p2
Sarcocystis suihominis							x							MCM-13, Ch 144, p2
Saumarez Reef virus				x										Field's Virology, 5th Ed., p. 1153-1158,1206
*Scedosporium aurantiacum**									x					MCM-13, Ch 123, p13
Scedosporium boydii									x					MCM-13, Ch 123, p13
Scedosporium prolificans									x					MCM-13, Ch 127, p3
Schistocephalus solidus							x							Ashford and Crewe, 2003
Schistosoma bovis										x				Ashford and Crewe, 2003
Schistosoma haematobium										x				Ashford and Crewe, 2003
Schistosoma intercalatum										x				Ashford and Crewe, 2003
Schistosoma japonicum										x				Ashford and Crewe, 2003
Schistosoma malayensis										x				Ashford and Crewe, 2003
Schistosoma mansoni							x							Ashford and Crewe, 2003
Schistosoma mattheei										x				Ashford and Crewe, 2003
Schistosoma mekongi										x				Ashford and Crewe, 2003
Schistosoma rodhaini										x				Ashford and Crewe, 2003
Schistosoma spindale										x				Ashford and Crewe, 2003
Schistosomatium douthitti							x							Ashford and Crewe, 2003

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Schizophyllum commune									x					MCM-13, Ch 123, p16
Scolecobasidium humicola									x					Howard 2003 p. 617
Scopulariopsis acremonium									x					MCM-13, Ch 127, p3
Scopulariopsis asperula									x					MCM-13, Ch 127, p3
Scopulariopsis brevicaulis									x					MCM-13, Ch 127, p3
Scopulariopsis brumptii									x					MCM-13, Ch 127, p3
Scopulariopsis candida									x					MCM-13, Ch 127, p3
Scopulariopsis flava									x					MCM-13, Ch 127, p3
Scopulariopsis fusca									x					MCM-13, Ch 127, p3
Scytalidium infestans									x					https://www.scielo.br/j/rimtsp/a/TKXV5hJK9f34cdDyYmBPgnq/?lang=en
Sealpox virus								x						MCM-13, Ch 110, p2
Sebaldella termitidis	x													Bergey's Manual of Systematics of Archaea and Bacteria
Selenomonas artemidis	x													MCM-13, Ch 56, p 4
Selenomonas dianae	x													MCM-13, Ch 56, p 4
Selenomonas flueggei	x													MCM-13, Ch 56, p 4
Selenomonas infelix	x													MCM-13, Ch 56, p 4
Selenomonas noxia	x													MCM-13, Ch 56, p 4
Semliki Forest virus				x										MCM-13, Ch 80, p4
Seoul virus				x										MCM-13, Ch 98, p2
Sepik virus										x				MCM-12
Septonema exile									x					Howard, 2003 p. 621
Serratia ficaria									x					MCM-13, Ch 41, p 3
Serratia marcescens									x					MCM-13, Ch 41, p 3
Serratia odorifera									x					MCM-13, Ch 41, p 3
Serratia plymuthica									x					MCM-13, Ch 41, p 3
Serratia proteamaculans									x					MCM-13, Ch 41, p 3
Serratia rubidaea									x					MCM-13, Ch 41, p 3

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Setaria equina				x										Ashford and Crewe, 2003
Setosphaeria rostrata									x					MCM-13, ch 127, p4
Shigella boydii											x			MCM-13. Ch 39, p696
Shigella dysenteriae											x			MCM-13. Ch 39, p696
Shigella flexneri											x			MCM-13. Ch 39, p696
Shigella sonnei													*Shigella sonnei*	
Sin Nombre virus				x										MCM-13, Ch 80, p13
Sindbis virus										x				MCM-13, Ch 80, p4
Sphingomonas paucimobilis									x					MCM-13, Ch 46, p15
Spirillum minus				x										CDC
Spirocerca lupi										x				Ashford and Crewe, 2003
*Sporothrix brasiliensis**									x					MCM-13, Ch 127, p3
Sporothrix schenckii									x					MCM-13, Ch 127, p3
St. Louis encephalitis virus				x										MCM-13, Ch 97, p2
Staphylococcus aureus					x									MCM-13, Ch 22, p 375
Staphylococcus epidermidis					x									MCM-13, Ch 22, p 375
Staphylococcus haemolyticus					x									MCM-13, Ch 22, p 375
Staphylococcus hyicus					x									MCM-13, Ch 22, p 375
Staphylococcus intermedius					x									MCM-13, Ch 22, p 375
Staphylococcus lugdunensis					x									MCM-13, Ch 22, p 375
Staphylococcus saprophyticus					x									MCM-13, Ch 22, p 375
Staphylococcus warneri					x									MCM-13, Ch 22, p 375
Stellantchasmus falcatus							x							Ashford and Crewe, 2003
Stemphylium macrosporoideum									x					West 1986

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Stenella araguata									x					http://www.drfungus.org/knowledge-base/Stenella/
Stenotrophomonas maltophilia									x					MCM-13, Ch 45, p2
Stictodora fuscata										x				Ashford and Crewe, 2003
Streptobacillus moniliformis				x										MCM-13, Ch 37, p3
Streptococcus acidominimus					x									MCM-13, Ch 23, p3
Streptococcus agalactiae					x									MCM-13, Ch 23, p3
Streptococcus anginosus					x									MCM-13, Ch 23, p3
Streptococcus bovis					x									MCM-13, Ch 23, p3
Streptococcus canis					x									MCM-13, Ch 23, p3
Streptococcus constellatus					x									MCM-13, Ch 23, p3
Streptococcus criceti					x									MCM-13, Ch 23, p3
Streptococcus equi					x									MCM-13, Ch 23, p3
Streptococcus gordonii					x									MCM-13, Ch 23, p3
Streptococcus intermedius					x									MCM-13, Ch 23, p3
Streptococcus milleri					x									MCM-13, Ch 23, p3
Streptococcus mitis					x									MCM-13, Ch 23, p3
Streptococcus mutans					x									MCM-13, Ch 23, p3
Streptococcus pneumoniae					x									MCM-13, Ch 23, p3
Streptococcus pyogenes					x									MCM-13, Ch 23, p3
Streptococcus salivarius					x									MCM-13, Ch 23, p3
Streptococcus sanguis					x									MCM-13, Ch 23, p3
Streptococcus sobrinus					x									MCM-13, Ch 23, p3
Streptococcus suis					x									MCM-13, Ch 23, p3
Streptococcus uberis					x									MCM-13, Ch 23, p3

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Streptomyces somaliensis									x					MCM-13, ch 30, p11
Strongyloides fuelleborni										x				Ashford and Crewe, 2003
Strongyloides papillosus							x							Ashford and Crewe, 2003
Strongyloides ransomi							x							Ashford and Crewe, 2003
Strongyloides stercoralis							x							Ashford and Crewe, 2003
Strongyloides westeri							x							Ashford and Crewe, 2003
Sudan Ebola virus										x				MCM-13, Ch 80, p14
Suid herpesvirus								x						Field's Virology, 4th Ed., p. 2385, 2484, 2707
Sutterella wadsworthensis	x													MCM-13, Ch 56 p13
Suttonella indologenes					x									MCM-13, Ch 37, p2
Swine vesicular disease virus										x				Field's Virology, 5th Ed., p. 963
Syphacea obvelata										x				Ashford and Crewe, 2003
Tacaiuma virus				x										MCM-13, Ch 80, p12
Taenia serialis							x							Ashford and Crewe, 2003
Taenia crassiceps							x							Ashford and Crewe, 2003
Taenia glomeratus										x				Ashford and Crewe, 2003
Taenia saginata							x							Ashford and Crewe, 2003
Taenia solium							x							Ashford and Crewe, 2003
Taenia taeniaeformis										x				Ashford and Crewe, 2003
Taeniolella stilbaspora									x					Howard 2003 p. 621
Tamdy virus				x										MCM-13, Ch 97; CDC
Tanapox virus										x				MCM-13, Ch 110, p3
Tanerella forsythia	x													MCM-13, Ch 56 p13
Tataguine virus				x										MCM-13, Ch 97, p3
Tatumella ptyseos								x						MCM-13, Ch 157, p2
Teladorsagia circumcincta										x				Ashford and Crewe, 2003
Ternidens deminutus										x				Ashford and Crewe, 2003

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Tetraploa aristata									x					Howard p. 621-623
Thelazia californiensis				x										Ashford and Crewe, 2003
Thelazia callipaeda										x				Ashford and Crewe, 2003
Thelazia rhodesi										x				MCM-13, Ch 138, p15
Thermomyces dupontii									x					Howard 2003 p. 340-346
Thielavia terrestris									x					Tolgo et al
Thogoto virus				x										MCM-13, Ch 97, p2
Torulopsis magnoliae									x					http://www.drfungus.org/knowledge-base/Torulopsis/
Toxascaris leonina							x							Ashford and Crewe, 2003
Toxocara canis							x							Ashford and Crewe, 2003
Toxocara cati							x							Ashford and Crewe, 2003
Toxoplasma gondii													*Toxoplasma gondii*	
Trachipleistophora hominis											x			MCM-13, Ch 131, p1
Trematosphaeria grisea									x					MCM-13, Ch 128, p2
Treponema carateum								x						MCM-13, Ch 62, p1
Treponema pallidum			x											MCM-13, Ch 62, p1
Trichinella britovi										x				Ashford and Crewe, 2003
Trichinella nativa							x							Ashford and Crewe, 2003
Trichinella nelsoni										x				Ashford and Crewe, 2003
Trichinella pseudospiralis										x				Ashford and Crewe, 2003
Trichinella spiralis							x							Ashford and Crewe, 2003
Trichinella T5							x							Ashford and Crewe, 2003
Trichobilharzia brevis										x				Ashford and Crewe, 2003
Trichobilharzia ocellata							x							Ashford and Crewe, 2003
Trichobilharzia stagnicolae							x							Ashford and Crewe, 2003
Trichoderma pseudokoningii									x					MCM-13, Ch 123, p18
Trichoderma viride									x					MCM-13, Ch 123, p18

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Trichomaris invadens									x					https://www.dfo-mpo.gc.ca/science/aah-saa/diseases-maladies/chitfdcb-eng.htmlhttp://www.pac.dfo-mpo.gc.ca/sci/shelldis/pages/chitfdcb_e.htm
Trichomonas tenax					x									MCM-13, Ch 143, p2
Trichomonas vaginalis			x											MCM-13, Ch 143, p1
Trichophyton concentricum									x					MCM-13, Ch 126, p6
Trichophyton equinum									x					MCM-13, Ch 126, p6
Trichophyton gallinae									x					MCM-13, Ch 126, p6
Trichophyton gourvilii									x					MCM-13, Ch 126, p6
Trichophyton megninii									x					MCM-13, Ch 126, p6
Trichophyton mentagrophytes									x					MCM-13, Ch 126, p7
Trichophyton rubrum									x					MCM-13, Ch 126, p7
Trichophyton schoenleinii									x					MCM-13, Ch 126, p7
Trichophyton simii									x					MCM-13, Ch 126, p7
Trichophyton soudanense									x					MCM-13, Ch 126, p10
Trichophyton tonsurans									x					MCM-13, Ch 126, p10
Trichophyton verrucosum									x					MCM-13, Ch 126, p11
Trichophyton violaceum									x					MCM-13, Ch 126, p11
Trichosporon asahii									x					MCM-13, Ch 120, p3
Trichosporon beigelii									x					MCM-13, Ch 120, p3
Trichosporon cutaneum									x					MCM-13, Ch 120, p3
Trichosporon inkin									x					MCM-13, Ch 120, p3
Trichosporon mucoides									x					MCM-13, Ch 120, p3
Trichosporon ovoides									x					MCM-13, Ch 120, p3
Trichostrongylus affinis							x							Ashford and Crewe, 2003

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Trichostrongylus axei							x							Ashford and Crewe, 2003
Trichostrongylus brevis										x				Ashford and Crewe, 2003
Trichostrongylus calcaratus										x				Ashford and Crewe, 2003
Trichostrongylus capricola										x				Ashford and Crewe, 2003
Trichostrongylus colubriformis							x							Ashford and Crewe, 2003
Trichostrongylus instabilis										x				Ashford and Crewe, 2003
Trichostrongylus lerouxi										x				Ashford and Crewe, 2003
Trichostrongylus orientalis										x				Ashford and Crewe, 2003
Trichostrongylus probolurus										x				Ashford and Crewe, 2003
Trichostrongylus skrjabini										x				Ashford and Crewe, 2003
Trichostrongylus vitrinus										x				Ashford and Crewe, 2003
Trichuris suis							x							Ashford and Crewe, 2003
Trichuris trichiura							x							Ashford and Crewe, 2003
Trichuris vulpis							x							Ashford and Crewe, 2003
Tritirachium oryzae									x					https://drfungus.org/knowledge-base/Tritirachium/
Tropheryma whippelii									x					MCM-13, Ch 69, p2
Trubanaman virus				x										MCM-13, Ch 97; CDC
Trueperella bernardiae					x									MCM-13, Ch 29, p5
Trueperella pyogenes					x									MCM-13, Ch 29, p5
Trypanosoma brucei				x										MCM-13, Ch 140, p1
Trypanosoma cruzi				x										MCM-13, Ch 140, p1
Tsukamurella inchonensis									x					MCM-13, Ch 30, p8
Tsukamurella paurometabola									x					MCM-13, Ch 30, p8
Tsukamurella pulmonis									x					MCM-13, Ch 30, p8

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Tsukamurella tyrosinosolvens									x					MCM-13, Ch 30, p8
Tuberculatia vulgaris									x					Howard p. 448-449
Tyuleniy virus				x										Field's Virology, 5th Ed., p. 1153-1158, 1206
Ulocladium chartarum									x					Howard, 2003 p. 623-624
Uncinaria stenocephala							x							Ashford and Crewe, 2003
Ureaplasma urealyticum		x												MCM-13, Ch 64, p2
Usutu virus				x										MCM-13, Ch 80, p8
Variola virus			x											MCM-13, Ch 110, p3
Veillonella atypica	x													MCM-13, Ch 53 p 4
Veillonella dispar	x													MCM-13, Ch 53 p 4
Veillonella parvula	x													MCM-13, Ch 53 p 4
Venezuelan Equine Encephalitis virus				x										MCM-13, Ch 97, p3
Vermamoeba vermiformis*									x					
Veronaea botryosa									x					http://www.drfungus.org/knowledge-base/Veronaea/http://www.doctorfungus.org/imageban/synonyms/Veronaea.htm
Verticillium nigrescens									x					Howard, 2003 p. 449-450
Vesicular stomatitis virus				x										MCM-13, Ch 97, p3
Vibrio alginolyticus									x					MCM-13, Ch 43, p1
Vibrio cholerae													*Vibrio cholerae*	
Vibrio cincinnatiensis									x					MCM-13, Ch 43, p1
Vibrio fluvialis									x					MCM-13, Ch 43, p1
Vibrio furnissii									x					MCM-13, Ch 43, p1
Vibrio hollisae									x					MCM-13, Ch 43, p1
Vibrio mimicus									x					MCM-13, Ch 43, p1
Vibrio parahaemolyticus									x					MCM-13, Ch 43, p1
Vibrio vulnificus									x					MCM-13, Ch 43, p1

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Vittaforma corneae								x						MCM-13, Ch 131, p1
Volutella cinerescens									x					Howard p. 451
Wad Medani virus				x										Field's Virology, 5th Ed., p. 1975-1977
Waddlia chondrophila		x												MCM-13, Ch 65, p7
Wanowrie virus				x										MCM-13, Ch 97; CDC
Watsonius macaci										x				Ashford and Crewe, 2003
Wesselsbron virus				x										MCM-13, Ch 80, p8
West Nile virus				x										MCM-13, Ch 97, p2
Western Equine Encephalitis virus				x										MCM-13, Ch 80, p4
Wolinella succinogenes	x													MCM-13, Ch 59, p1
WU polyomavirus						x								Bofill-Mas, S., 2010
Wuchereria bancrofti				x										Ashford and Crewe, 2003
Wuchereria lewisi				x										Ashford and Crewe, 2003
Wyeomyia virus				x										MCM-13, Ch 97; CDC
Yaba monkey tumor virus										x				MCM-13, Ch 80, p4
Yarrowia lipolytica									x					MCM-13, Ch 120, p32
Yellow fever virus				x										MCM-13, Ch 97, p2
Yersinia bercovieri								x						MCM-13, Ch 59, p1
Yersinia enterocolitica													*Yersinia enterocolitica*	
Yersinia frederiksenii								x						MCM-13, Ch 41, p1
Yersinia intermedia								x						MCM-13, Ch 41, p1
Yersinia kristensenii								x						MCM-13, Ch 41, p1
Yersinia mollaretii								x						MCM-13, Ch 41, p1
Yersinia pestis				x										MCM-13, Ch 41, p1
Yersinia pseudotuberculosis									x					MCM-13, Ch 41, p1
Yersinia rohdei								x						MCM-13, Ch 41, p1
Yersinia ruckeri								x						MCM-13, Ch 41, p1
Yogue virus				x										Kirejczyk 2022

Microbe	Screening Criteria Used for Exclusion												PCCL	Page Reference
	1	2	3	4	5	6	7	8	9	10	11	12		
Zaire Ebola virus										x				MCM-13, Ch 80, p14
Zika virus										x				MCM-13, Ch 97, p2
Zinga virus				x										http://www.cdc.gov/mmwr/preview/mmwrhtml/00001253.htm

*New contaminant to the CCL Microbial Universe
**Publicly nominated

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Appendix C: PCCL 6 Microbes Total Scores

Ranking	Microbial Name	WBDO	Occurrence	Health[1]	Total score[2]
1	*Naegleria fowleri*	5	3	5.0	10.0
2	*Balamuthia mandrillaris*	4	3	4.6	8.6
3	*Legionella pneumophila*	5	3	3.6	8.6
4	*Acanthamoeba spp.*	5	3	3.2	8.2
5	Pathogenic Waterborne *Mycobacteria*	5	3	3.2	8.2
6	*Pseudomonas aeruginosa*	5	3	3.2	8.2
7	*Escherichia coli O157*	5	3	3.2	8.2
8	*Campylobacter jejuni*	5	3	2.9	7.9
9	*Helicobacter pylori*	1	3	4.3	7.3
10	Norovirus	5	3	2.1	7.1
11	Enterovirus	2	3	3.6	6.6
12	*Aspergillus fumigatus*	1	3	3.2	6.2
13	Hepatitis A	3	2	3.2	6.2
14	*Listeria monocytogenes*	1	3	3.2	6.2
15	Adenovirus	2	3	2.9	5.9
16	*Fusarium solani*	1	3	2.9	5.9
17	*Shigella sonnei*	4	3	1.8	5.8
18	Hepatitis E	2	1	3.5	5.6
19	*Acinetobacter baumannii*	2	3	2.5	5.5
20	*Cyclospora cayetanensis*	3	3	2.5	5.5
21	*Pantoea agglomerans*	3	3	2.5	5.5
22	*Toxoplasma gondii*	2	1	3.2	5.2
23	*Aliarcobacter butzleri*	3	3	2.1	5.1
24	*Entamoeba histolytica*	3	3	2.1	5.1
25	*Exophiala jeanselmei*	1	3	2.1	5.1

Ranking	Microbial Name	WBDO	Occurrence	Health[1]	Total score[2]
26	Rotavirus	3	3	2.1	5.1
27	*Vibrio cholerae*	3	3	2.1	5.1
28	*Plesiomonas shigelloides*	3	3	1.8	4.8
29	*Salmonella enterica*	3	3	1.8	4.8
30	*Comamonas testosteroni*	1	2	2.5	4.5
31	*Aeromonas hydrophila*	1	3	1.4	4.4
32	*Yersinia enterocolitica*	3	3	1.4	4.4
33	*Blastocystis hominis*	3	1	0.7	3.7
34	Astrovirus	2	2	1.4	3.4
35	Microsporidia	1	2	1.4	3.4
36	*Cystoisospora belli*	2	1	1.0	3.1

[1] The score for Health is the calculated health score. Calculated health score =General population health score + highest sensitive subpopulation health score.

Appendix D: CCL Listings for Microbial Contaminants

Microbial Contaminant	Final CCL 1	Final CCL 2	Final CCL 3	Final CCL 4	Final CCL 5	Draft CCL 6
Acanthamoeba spp.	X					X
Adenovirus	X	X	X	X	X	
Aeromonas hydrophila	X	X				
Balamuthia mandrillaris						X
Caliciviruses	X	X	X	X	X	X
Coxsackieviruses	X	X				
Campylobacter jejuni			X	X	X	X
Cyanobacteria (blue-green algae), other freshwater algae, and their toxins[2]	X	X				
Echoviruses	X	X				
Enterovirus			X	X	X	
Escherichia coli (O157)			X	X	X	X
Helicobacter pylori	X	X	X	X	X	
Hepatitis A			X	X		

[2] Cyanobacteria, other freshwater algae, and their toxins were evaluated under the CCL microbial process during CCL 1 and CCL 2. Since CCL 3, cyanotoxins are evaluated under in the CCL chemical process.

Microbial Contaminant	Final CCL 1	Final CCL 2	Final CCL 3	Final CCL 4	Final CCL 5	Draft CCL 6
Legionella pneumophila			X	X	X	X
Microsporidia (Enterocytozoon & Septata)	X	X				X
Mycobacterium abscessus					X	
Mycobacterium avium intracellulare (MAC)	X	X	X	X	X	
Naegleria fowleri			X	X	X	
Pathogenic Waterborne Mycobacteria						X
Pseudomonas aeruginosa					X	X
Salmonella enterica			X	X		
Shigella sonnei			X	X	X	

Appendix E: Microbial Contaminant Information Sheets (CISs)

Selection of microbes from the CCL Universe for placement on the PCCL is based upon exclusionary screening criteria that assess the potential of water-related transmission (occurrence) and the plausibility of causing waterborne disease by ingestion, inhalation, or dermal contact (health risk). Microbes that met any of the exclusionary criteria were not included on the PCCL.

Elements of each CIS include:

Past CCL Status-shows which previous CCLs the contaminant was listed on, if any.

Past Negative Regulatory Determination Status-shows which past regulatory determination cycles the contaminant received a negative determination, if any.

Public Nomination Status-notes if the contaminant was publicly nominated for CCL 6.

Scoring Summary – shows the contaminant's scores for the occurrence and health risk protocols. To calculate the total score for each microbial contaminant which includes the highest score between the WBDO and occurrence, the health risk score for the general population, the highest health risk score of the sensitive populations, and the calculated health risk score.

> **Calculated Health Risk Score-**the health risk score for the general population added to the highest health risk score of the sensitive subpopulation scores, and then multiplied by 5/14 to normalize the score to the occurrence score.
>
> **Total Score**-The contaminant's calculated health risk score added to the highest score of the occurrence scores (the waterborne disease outbreak score or the score from the occurrence protocol).

Data Tables – shows the categories for each potential score, the scoring data, if applicable, and reference(s) used to support a score. The highest-ranking score for each of the three scoring categories is shown in bold font. The WBDOs scoring results are presented first, followed by the occurrence results and the health risks.

References – presents the full references for the data presented in the table.

Due to the technical limitations of this section, for further assistance with reasonable accommodation please contact Nicole Tucker at tucker.nicole@epa.gov or 202-564-1946.

Acanthamoeba spp.

Protozoa

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
X				

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
X	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISK SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Risk Score[1]
Score	5	3	3	6	3.2
Total Score[2]	8.2				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	**Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021**	**Yes. Outbreak documented in 2015 from treated recreational water and cases in 2015 and 2017 of Granulomatous amebic encephalitis (GAE) using tap water for nasal irrigation.[2][7]**
4	Has caused at least one documented WBDOs in U.S. reported by CDC between 2013-2021	Yes [2]
3	Has caused documented WBDOs at any time in the U.S.	Yes [1]
2	Has caused WBDOs in countries other than the U.S.	Yes. Outbreaks have been reported worldwide, including southeast Asia and the Middle East.[5][8][9][10]
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence		
Score	**Data Element**	**Scoring Data**
3	**Detected in drinking water in the U.S.**	**Yes. Has been detected in tap water. [7][11]**
2	Detected in source water in the U.S.	Yes. Detected in surface waters. [5][10]
1	Not detected in the U.S.	

Acanthamoeba spp.

HEALTH RISK DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	Non-keratitis *Acanthamoeba* infections are rare, affecting only 3–12 persons annually in the United States; but usually fatal. [7]
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**[CD] *Acanthamoeba* is capable of causing granulomatous amebic encephalitis (GAE). Symptoms include neurological impairment to varying degrees, similar to those of encephalitis and meningoencephalitis. GAE has few known survivors. Other infections include cutaneous disease, rhinosinusitis, pulmonary disease, osteomyelitis, and disseminated infections symptoms. [3][4]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	If *Acanthamoeba* ocular infection is left untreated could result in permanent visual impairment or blindness. [6]
4	Does the illness require short-term hospitalization (< week)?	
3	**Does the illness require physician intervention?**	**[G] Physician office visits are indicated for ocular infections. [6]**
2	Is the illness self-limiting (without requiring medical intervention)?	
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Acanthamoeba spp.

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC). 1991. Surveillance for Waterborne-Disease Outbreaks Associated with Drinking Water ---United States, 1989—1990. MMWR Surveillance Summaries. 40(SS-3): 1-21.
2	CDC. 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
3	CDC. 2024. Free Living Amebic Infections. Available online at: https://www.cdc.gov/dpdx/freeLivingAmebic/index.html#:~:text=Often%20the%20disease%20is%20fatal%20with%20a,case%20fatality%20rate%20of%20more%20than%2089%25. Accessed June, 2024.
4	CDC. 2024. *Acanthamoeba* Infection FAQs. Available online at: https://www.cdc.gov/parasites/acanthamoeba/gen_info/acanthamoeba.html. Accessed June, 2024.
5	CDC. 2024. Pathogen & Environment: Parasites--*Acanthamoeba*-- Granulomatous Amebic Encephalitis (GAE); Keratitis. Available online at: https://www.cdc.gov/parasites/acanthamoeba/pathogen.html. Accessed June, 2024.
6	Cope J.R., I.K. Ali, and G. Visvesvara. 2023. Pathogenic and Opportunistic Free-Living Amebae. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 12th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch142
7	Haston, J.C., Serra, C., Imada, E., Martin, E., Karim M. Ali, I., Cope, J.R. 2024. *Acanthamoeba Infection and Nasal Rinsing, United States, 1994-2022*. Emerging Infectious Diseases. 30 (4): 783-785.
8	Karimi, A., Kheirandish, F., Mamaghani, A.J., Taghipour, N., Mousavi, S.F., Aghajani, A., Zebardast, N., Faraji, M. 2023. *Identification and genotyping of Acanthamoeba spp. In the water resources of western Iran.* Parasite Epidemiology and Control. 22: e00308.
9	Majid, M.A.A., Mahboob, T., Mong, B.G.J., Jaturas, N., Richard, R.L., Tian-Chye, T., Phimphila, A., Mahaphonh, P., Aye, K.N., Aung, W.L., Chuah, J., Ziegler, A.D., Yasiri, A., Sawangjaroen, N., Lim, Y.A.L., Nissapatorn, V. 2017. *Pathogenic waterborne free-living amoebae: An update from selected Southeast Asian countries*. PLoS One. 12 (2): e0169448.
10	Marciano-Cabral, F., Cabral, G. *Acanthamoeba spp. As agents of disease in humans*. 2003. Clinical Microbiology Reviews. 16 (2).
11	Stockman, L.J., Wright, C.J., Visvesvara, G.S., Fields, B.S., Beach, M.J. 2010. *Prevalence of* Acanthamoeba spp. And other free-living amoebae in household water, Ohio, USA--1990-1992. Parasitology Research. 108: 621-627.

Acinetobacter baumannii

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISK SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Risk Score[1]
Score	2	3	1	6	2.5
Total Score[2]	5.5				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [4]
4	Has caused at least one documented WBDOs in U.S. reported by CDC between 2013-2021	No [4]
3	Has caused documented WBDOs at any time in the U.S.	
2	**Has caused WBDOs in countries other than the U.S.**	**Yes. A 2013 outbreak of antibiotic-resistant *Acinetobacter baumannii* ST219 in Japan. The bacteria spread using tap water from contaminated hand hygiene sinks for oral care. [7]**
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	Yes. *A. baumannii* outbreaks occur most commonly in hospitals among very ill patients from person to person contact or by contaminated surfaces. However, *A. baumannii* can still occur and be transmitted in water. [3]

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes. *A. baumannii* has been detected in private untreated groundwater wells used as drinking water in W.VA. [2][6]**
2	Detected in source water in the U.S.	
1	Not detected in the U.S.	

Acinetobacter baumannii

HEALTH RISK DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**[CD, P] People with weakened immune systems due to chronic diseases or serious illnesses are the most susceptible to *A. baumannii* infections. *A. baumannii can* cause various diseases including pneumonia and serious blood or wound infections. *A. baumannii* infection during pregnancy can lead to premature contractions and chorioamnionitis, and can also cause septic complications in the puerperium associated with long duration of hospitalization. [1][3][5]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	Does the illness require physician intervention?	
2	Is the illness self-limiting (without requiring medical intervention)?	
1	**Does the illness result in mild symptoms with minimal or no impact on daily activities?**	**[G, C, E] *A. baumannii* poses a very limited health threat to individuals without a health condition. Most studies report outbreaks in hospitals with patients that have a health condition. [3]**

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Acinetobacter baumannii

Reference Number	Full Reference
1	Aivazova, V., F. Kainer, K. Friese, and I. Mylonas. 2010. *Acinetobacter baumannii* infection during pregnancy and puerperium. Archives of Gynecology and Obstetrics. 281(1): 171-174.
2	Bifulco, J.M., J.J. Shirey, and G.K. Bissonnette. 1989. Detection of *Acinetobacter* spp. in rural drinking water supplies. Applied and Environmental Microbiology. 55(9): 2214-2219.
3	Centers for Disease Control and Prevention (CDC). 2010. *Acinetobacter* in Healthcare Settings. (2010, November 24). https://www.cdc.gov/acinetobacter/about/?CDC_AAref_Val=https://www.cdc.gov/hai/organisms/acinetobacter.html
4	CDC, 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
5	Cools, P., A. Nemec, A. Van Den Abeele, P. Kampfer, 2023. *Acinetobacter, Chryseobacterium, Moraxella* , and Other Nonfermaentive Gram-Negative Rods. Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch46
6	Falkinham JO 3rd. Living with Legionella and Other Waterborne Pathogens. Microorganisms. 2020 Dec 18;8(12):2026. doi: 10.3390/microorganisms8122026. PMID: 33352932; PMCID: PMC7766883.
7	Umezawa K, Asai S, Ohshima T, Iwashita H, Ohashi M, Sasaki M, Kaneko A, Inokuchi S, Miyachi H. 2015. Outbreak of drug-resistant Acinetobacter baumannii ST219 caused by oral care using tap water from contaminated hand hygiene sinks as a reservoir. Am J Infect Control. 2015 Nov;43(11):1249-51. doi: 10.1016/j.ajic.2015.06.016. Epub 2015 Sep 19. PMID: 26388038.

Adenovirus

Virus

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
X	X	X	X	X

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISK SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	2	3	2	6	2.9
Total Score[2]	5.9				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [3]
4	Has caused at least one documented WBDOs in U.S. reported by CDC between 2013-2021	No [3]
3	Has caused documented WBDOs at any time in the U.S.	
2	**Has caused WBDOs in countries other than the U.S.**	**Yes. Europe, S. Korea [7][8]**
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence		
Score	**Data Element**	**Scoring Data**
3	**Detected in drinking water in the U.S.**	**Yes. PCR detection in connection with an outbreak. [4] [9]**
2	Detected in source water in the U.S.	Yes. 38% of surface water samples collected as part of the Information Collection Rule contained Adenovirus 40 and Adenovirus 41. [11]
1	Not detected in the U.S.	

Adenovirus

HEALTH RISK DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**[CD] Human Adenoviruses can cause serious illnesses, such as pneumonia, bronchitis, conjunctivitis (pink eye), bladder infection, or bowel infection, and in rare cases, can lead to neurologic disease or even death. [5][6][10]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	[C] Children with chronic disease may require respiratory ventilation. Young adults may contract acute respiratory disease. [1][2]
3	Does the illness require physician intervention?	Physician office visits are indicated for ocular infections. [6]
2	**Is the illness self-limiting (without requiring medical intervention)?**	**[G] Approximately 50% of cases are asymptomatic, symptomatic cases usually present as upper respiratory infections similar to the common cold or flu. Symptoms may include fever, and diarrhea. [10]**
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Adenovirus

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC). 1983. Adenovirus type 7 outbreak in a pediatric chronic-care facility – Pennsylvania. 1972. MMWR. 32: 258-260.
2	CDC. 1998. Civilian Outbreak of Adenovirus Acute Respiratory Disease – South Dakota, 1997. MMWR. 47(27): 567-570.
3	CDC. 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
4	Fong, T., L. Mansfield, D. Wilson, D. Schwab, S. Molloy, and J Rose. 2007. Massive Microbiological Groundwater Contamination Associated with a Waterborne Outbreak in Lake Erie, South Bass Island, OH. Environmental Health Perspective. 115(6): 856-864.
5	Gray, G.C., P.R. Goswami, M.D. Malasig, A.W. Hawksworth, D.H. Trump, M.A. Ryan, and D.P. Schnurr. 2001. Adult Adenovirus Infections: Loss of Orphaned Vaccines Precipitates Military Respiratory Disease Epidemics. Clinical Infectious Diseases. 31: 663-70.
6	Heim, A. and A. Kajon. 2019. Adenoviruses. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 12th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch106
7	Kukkula, M., P. Arstila, M.L. Klossner, L. Maunula, C.H. Bonsdorff, and P. Jaatinen. 1997. Waterborne outbreak of viral gastroenteritis. Scandinavian Journal of Infectious Disease. 29(4): 415-418.
8	Lee, S. and S. Kim. 2002. Detection of infectious enteroviruses and adenoviruses in tap water in urban areas in Korea. Water Research. 36(1): 248-256. doi:10.1016/S0043-1354(01)00199-3.
9	O'Reilly, C.E., A.B. Bowen, E.P. Nytzia, J.P. Sarisky, C.A. Shepherd, M.D. Miller, B.C. Hubbard, M. Herring, S.D. Buchanan, C.C. Fitzgerald, V. Hill, M.J. Arrowood, L.X. Xiao, R.M. Hoekstra, E.D. Mintz, M.F. Lynch, and the Outbreak Working Group. 2007. A Waterborne Outbreak of Gastroenteritis with Multiple Etiologies among Resort Island Visitors and Residents: Ohio, 2004. Clinical Infectious Diseases. 44: 506-512.
10	Hindiyeh, M., S. Das., and S. Dunbar. Gastroenteritis Viruses. 2023.In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC
11	United States Environmental Protection Agency. 2007. Adenovirus Health and Criteria Document (Draft).

Aeromonas hydrophila

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
X	X			

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISK SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	1	3	2	2	1.4
Total Score[2]	4.4				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [1]
4	Has caused at least one documented WBDOs in U.S. reported by CDC between 2013-2021	No [1]
3	Has caused documented WBDOs at any time in the U.S.	
2	Has caused WBDOs in countries other than the U.S.	
1	**Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease**	**Yes [2]**

Occurrence		
Score	**Data Element**	**Scoring Data**
3	**Detected in drinking water in the U.S.**	**Yes. EPA found *A. hydrophila* in the distribution systems of 42 public water systems out of 293 systems tested. [6][7]**
2	Detected in source water in the U.S.	Yes [3][5][7]
1	Not detected in the U.S.	

Aeromonas hydrophila

HEALTH RISK DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	Septicemia may occur in immunocompetent hosts. Can cause HUS. Wound infections such as cellulitis and myronecrotic infections may occur with open wounds. [4]
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	Does the illness require physician intervention?	Children may require hospitalization due to dehydration. [4]
2	**Is the illness self-limiting (without requiring medical intervention)?**	**[G, P, E, C, CD] Acute watery disease is the most common symptom as well as abdominal pain, vomiting, fever. [4]**
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Aeromonas hydrophila

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC). 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
2	Gavriel, A.A., J.P.B. Landre, and A.J. Lamb. 1998. Incidence of mesophilic Aeromonas within a public drinking water supply in northeast Scotland. Journal of Applied Bacteriology. 84: 383-392.
3	Holmes, P., L.M. Niccolls, and D.P. Sartory. 1996. The ecology of mesophilic Aeromonas in the aquatic environment. In Austin, B., M. Altwegg, P.J. Gosling, and S. Joseph, (ed.) The Genus Aeromonas. John Wiley & Sons, Inc. Chichester, UK.
4	Lamy, B. 2023. Aeromonas. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch42
5	McLellan SL, Roguet A. The unexpected habitat in sewer pipes for the propagation of microbial communities and their imprint on urban waters. Curr Opin Biotechnol. 2019 Jun;57:34-41. doi: 10.1016/j.copbio.2018.12.010. Epub 2019 Jan 22. PMID: 30682717; PMCID: PMC7018504.
6	United States Environmental Protection Agency (USEPA). 2003. Data on occurrence results from the Unregulated Contaminant Monitoring Rule. FR 49094. August 22, 2005.
7	USEPA. 2006. Aeromonas: Human Health Criteria Document.

Aliarcobacter butzleri (formerly Arcobacter butzleri)

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISK SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	3	3	3	3	2.1
Total Score[2]	5.1				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [1]
4	Has caused at least one documented WBDOs in U.S. reported by CDC between 2013-2021	No [1]
3	**Has caused documented WBDOs at any time in the U.S.**	**Yes. *Acrobacter* was detected in drinking water during outbreak. [3]**
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes [3]**
2	Detected in source water in the U.S.	Yes [7]
1	Not detected in the U.S.	

Aliarcobacter butzleri (formerly Arcobacter butzleri)

HEALTH RISK DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	Persons with underlying disease such as liver disease, cirrhosis, or alcoholism may be at increased risk of complications. [4] [6] [10] Has been isolated from patients with bacteremia, endocarditis, peritonitis and diarrhea. Clinical significance unknown. [2]
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	**Does the illness require physician intervention?**	**[All populations] Displays clinical features similar to *Campylobacter jejuni* , however is more frequently associated with a persistent diarrhea. Twenty-six percent of Belgian patients required antibiotics. [5] [8]**
2	Is the illness self-limiting (without requiring medical intervention)?	Usual symptoms are diarrhea, abdominal pain, vomiting, and nausea resolving in < 3 days. [7] [9]
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Aliarcobacter butzleri (formerly Arcobacter butzleri)

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC). 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
2	Fitzgerald, C. and I. Nachamkin. 2010. Campylobacter and Arcobacter. In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.L. Landry, and M.A. Pfaller (ed.) Manual of Clinical Microbiology, 10th Edition, Volume 1, p.885. American Society for Microbiology Press, Washington, DC.
3	Fong, T., L. Mansfield, D. Wilson, D. Schwab, S. Molloy, and J. Rose. 2007. Massive Microbiological Groundwater Contamination Associated with a Waterborne Outbreak in Lake Erie, South Bass Island, OH. Environmental Health Perspectives. 115(6): 856-864.
4	Hsueh, P.R., L.J. Teng, P.C. Yang, S.K. Wang, S.C. Chang, S.W. Ho, W.C. Hsieh, and K.T Luh. 1997. Bacteremia caused by Arcobacter cryaerophilus 1B. Journal of Clinical Microbiology. 35(2): 489-491.
5	Nachamkin. 2023. Campylobacter and Arcobacter. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC. doi: 10.1128/9781683670438.MCM.ch58
6	Lerner, J., V. Brumberger, and V. Preac-Mursic. 1994. Severe diarrhea associated with Arcobacter butzleri. European Journal of Clinical Microbiology and Infectious Diseases. 13(8): 660-662.
7	Rice, E.W., M.R. Rodgers, I.V. Wesley, C.H. Johnson, and S.A. Tanner. 1999. Isolation of Arcobacter butzleri from ground water. Letters in Applied Microbiology. 28: 31-35.
8	Vandenberg, O., A. Dediste, K. Houg, S. Ibekwen, H. Souayah, S. Cadranel, N. Douat, G. Zissis, J. Butzler, and P. Vandamme. 2004. Arcobacter Species in Humans. Emerging Infectious Diseases. 10(10): 1863.
9	Wybo, I., J. Breynaert, S. Lauwers, F. Lindenburg, and K. Houf. 2004. Isolation of Arcobacter skirrowii from a patient with chronic diarrhea. Journal of Clinical Microbiology. 42(4): 1851-1852.
10	Yan, J.J., W.C. Ko, A.H. Huang, H.M. Chen, Y.T. Jin, and J.J Wu. 2000. Arcobacter butzleri bacteremia in a patient with liver cirrhosis. Journal of the Formosan Medical Association. 99(2): 166-169.

Aspergillus fumigatus

Fungi

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	1	3	3	6	3.2
Total Score[2]	6.2				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [5]
4	Has caused at least one documented WBDOs in U.S. reported by CDC between 2013-2021	No [4]
3	Has caused documented WBDOs at any time in the U.S.	
2	Has caused WBDOs in countries other than the U.S.	
1	**Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease**	**Yes. Study on two bone marrow transplantation units at a Little Rock, AR hospital. [1][2][14]**

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes [1][2][7][10][11][13]**
2	Detected in source water in the U.S.	Yes [8][9]
1	Not detected in the U.S.	

Aspergillus fumigatus

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**[CD] Sporadic cases of invasive aspergillosis have been reported in severly immunocompetent hosts (chronic meningitis, endocarditis, pericarditis, osteomyelitys). [3][6][12]** **Serious infection can also occur in patients with more modest impairments of host immune system such as diabetics. [10]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	**Does the illness require physician intervention?**	**[G] Most infections and allergies caused by this organism require physician intervention. [3][4]**
2	Is the illness self-limiting (without requiring medical intervention)?	
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	*Aspergillus* spores are allergens and persons who become sensitized experience symptoms of allergy and asthma. [8]

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Aspergillus fumigatus

Reference Number	Full Reference
1	Anaissie, E.J., S.L. Stratton, M.C. Dignani, R.C. Summerbell, J.H. Rex, T.P. Monson, T. Spencer, M. Kasai, A. Francesconi, and T.J. Walsh. 2002. Pathogenic *Aspergillus* species recovered from a hospital water system: a 3-year prospectie study. Clinical Infectious Diseases. 34: 780-789.
2	Anaissie, E.J., S.L. Stratton, M.C. Dignani, C. Lee, R.C. Summerbell, J.H. Rex, T.P. Monson, and T.J. Walsh. 2003. Pathogenic molds (including *Aspergillus* species) in hospital water distribution systems: a 3-year prospective study and clinical implications for patients with hematologic malignancies. Blood. 101(7): 2542-2546.
3	Bodey, G.P. and S. Vartivarian. 1989. Aspergillosis. European Journal of Clinical Microbiology and infectious diseases. 8(5): 413-437.
4	Centers for Disease Control and Prevention (CDC). 2019. *Aspergillus* homepage. Available online at: www.cdc.gov/fungal/diseases/aspergillosis/index.html.
5	CDC, 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
6	Chen, S.C.-A., W. Meyer, T.C. Sorrell, and C. L. Halliday. 2023. Apergillus, Talarmyces, and Penicillium. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC.
7	Doggett, M.S. 2000. Characterization of fungal biofilms within a municipal water distribution system. Applied and Environmental Microbiology. 66(3): 1249-1251.
8	Horner, W.E., A. Helbling, J.E. Salvaggio, and S.B. Lehrer. 1995. Fungal allergens. Clinical Microbiology Reviews. 8(2): 161-179.
9	King, D.N., Donohue, M.J., Vesper, S.J., Villegas, E.N., Ware, M.W., Vogel, M.E., Furlong, E.F., Kolpin, D.W., Glassmeyer, S.T. and Pfaller, S., 2016. Microbial pathogens in source and treated waters from drinking water treatment plants in the United States and implications for human health. Science of the Total Environment, 562, pp.987-995.
10	Nagy, L.A. and B.H. Olson. 1982. The occurrence of filamentous fungi in drinking water distribution systems. Canadian Journal of Microbiology. 28: 667-671.
11	Rosenzweig, W.D., H. Minnigh, and W.O. Pipes. 1986. Fungi in potable water distribution systems. Journal of the American Water Works Association. 78(1): 53-55.
12	Verweij, P.E. and M.E. Brandt. 2010. *Aspergillus* , *Fusarium* , and Other Opportunistic Moniliaceous Fungi. In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.L. Landry, and M.A. Pfaller (ed.) Manual of Clinical Microbiology, 10th Edition, Volume 2, p. 1836. American Society for Microbiology Press, Washington, DC.
13	Vesper, S.J., M.E. Rogers, A.N. Neely, and R.A. Haugland. 2007. Opportunistic Aspergillus pathogens measured in home and hospital tap water by quantitative PCR (QPCR). Journal of Water and Health. 5(3): 427-431.
14	Warris, A., C.H. Klassen, J.F. Meis, M.T. De Ruiter, H.A. de Valk, T.G. Abrahamsen, P. Gaustaad, and P.E. Verweij. 2003. Molecular epidemiology of *Aspergillus fumigatus* isolates recovered from water, air, and patients shows two clusters of genetically distinct strains. Journal of Clinical Microbiology. 41(9): 4101-4106.

Astrovirus

Virus

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	2	2	2	2	1.4
Total Score[2]	3.4				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [2]
4	Has caused at least one documented WBDOs in U.S. reported by CDC between 2013-2021	No [2]
3	Has caused documented WBDOs at any time in the U.S.	No [1]
2	**Has caused WBDOs in countries other than the U.S.**	**Yes, England and Wales [7]**
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	Yes [5]

Occurrence		
Score	**Data Element**	**Scoring Data**
3	Detected in drinking water in the U.S.	
2	**Detected in source water in the U.S.**	**Yes, Astrovirus was detected in 15 of 29 samples collected under the Information Collection Rule. [3]**
1	Not detected in the U.S.	

Astrovirus

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	Does the illness require physician intervention?	
2	**Is the illness self-limiting (without requiring medical intervention)?**	**[All populations] Asymptomatic infections common. Moderate self-limiting gastroenteritis (vomiting and diarrhea). [4] [6]**
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Astrovirus

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC). 1991. Surveillance for Waterborne-Disease Outbreaks Associated with Drinking Water ---United States, 1989—1990. MMWR Surveillance Summaries. 40(SS-3): 1-21.
2	CDC. 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
3	Chapron, C.D., N.A. Ballester, J.H. Fontaine, C.N. Frades, and A.B. Margolin. 2000. Detection of astroviruses, enteroviruses, and adnovirus types 40 and 41 in surface waters collected and evaluated by the information collection rule and an integrated cell culture-nested PCR procedure. Applied and Environmental. Microbiology. 66(6): 2520-2525.
4	Farkas, T. and X. Jiang. 2010. Rotaviruses, Caliciviruses, Astroviruses, Enteric Adenoviruses, and Other Diarrheic Viruses. In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.A. Pfaller, and R.H. Yolken (ed.) Manual of Clinical Microbiology, 10th Edition, Volume 2, p.1456. American Society for Microbiology Press, Washington, DC.
5	Gofti-Laroche, L., B. Gratacap-Cavallier, D. Demanse, O. Genoulaz, J.–M. Segneurin, and D. Zmirou. 2003. Are waterborne astrovirus implicated in acute digestive morbidity (E. MI. RA study)? Journal of Clinical Virology. 27: 74-82.
6	Hindiyeh, M., S. Das., and S. Dunbar. Gastroenteritis Viruses. 2023.In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC
7	Smith, A., M. Reacher, W. Smerdon, G.K. Adak, G. Nichols, and R.M. Chalmers. 2006. Outbreaks of waterborne infectious intestinal disease in England and Wales, 1992-2003. Epidemiology & Infection. 134(6): 1141-1149.

Balamuthia mandrillaris

Protozoa

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	4	3	6	7	4.6
Total Score[2]	8.6				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No
4	**Has caused at least one documented WBDOs in U.S. reported by CDC between 2013-2021**	**Yes, Infection in Seattle, WA traced to nasal irrigation using tap water. [1]**
3	Has caused documented WBDOs at any time in the U.S.	
2	Has caused WBDOs in countries other than the U.S.	Yes. While most common in the Americas, particularly Latin America, cases have occurred in Europe and Asia. [2][4]
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes. Infection in Seattle, WA traced to nasal irrigation using tap water.[1]**
2	Detected in source water in the U.S.	There have been recorded cases from water exposure in the U.S. since 2013 in California, Texas, and Arizona. [1][2][3]
1	Not detected in the U.S.	

Balamuthia mandrillaris

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	**Does the organism cause significant mortality (> 1/1,000 cases)?**	**[G, CD] Granulomatous amebic encephalitis (GAE) is nearly always fatal, with a reported mortality rate of around 95%. Out of 109 identified cases in the U.S. between 1974 and 2016, 90% of patients died. [2]**
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**[G, CD] GAE is a disease that primarily affects the central nervous system (CNS), which can affect patients of all ages and requires hospitalization. [2][5]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	Does the illness require physician intervention?	
2	Is the illness self-limiting (without requiring medical intervention)?	
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Balamuthia mandrillaris

Reference Number	Full Reference
1	Piper et al., 2018. Fatal Balamuthia mandrillaris brain infection associated with improper nasal lavage. International Journal of Infectious Diseases 77 (2018) 18–22. DOI: https://doi.org/10.1016/j.ijid.2018.09.013.]
2	Cope, J.R., Landa, J., Nethercut, H., Collier, S.A., Glaser, C., Moser, M., Puttagunta, R., Yoder, J.S., Ali, I.K., Roy, S.L. 2019. *The Epidemiology and Clinical Features of Balamuthia mandrillaris Disease in the United States, 1974-2016.* Clinical Infectious Diseases 68 (11): 1815-1822.
3	CDC. 2024. Free Living Amebic Infections. Available online at: https://www.cdc.gov/dpdx/freeLivingAmebic/index.html. Accessed June, 2024.
4	Wang, L. Cheng, W., Bing, L., Jian, Z., Qi, X., Sun, D., Gao, J., Lu, X., Yang, Y., Lin, K., Lu, C., Chen, J., Li, C., Wang, G., Gao, T. 2020. *Balamuthia mandrillaris infection in China: a retrospective report of 28 cases*. Emerging Microbes & Infection 9 (1): 2348-2357.
5	Cope J.R., I.K. Ali, and G. Visvesvara. 2023. Pathogenic and Opportunistic Free-Living Amebae. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch142

Blastocystis hominis

Protozoa

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	3	1	1	1	0.7
Total Score[2]	3.7				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [1]
4	Has caused at least one documented WBDOs in U.S. reported by CDC between 2013-2021	No [1]
3	**Has caused documented WBDOs at any time in the U.S.**	**Suspected outbreak in a transient noncommunity PWS in 2012 [1]**
2	Has caused WBDOs in countries other than the U.S.	Yes. Thailand [8]
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	Yes. Drinking untreated water has been associated with infection. [4][6][7]

Occurrence		
Score	**Data Element**	**Scoring Data**
3	Detected in drinking water in the U.S.	
2	Detected in source water in the U.S.	
1	**Not detected in the U.S.**	**Yes [2]**

Blastocystis hominis

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	Does the illness require physician intervention?	
2	Is the illness self-limiting (without requiring medical intervention)?	Symptoms may be more pronounced and prolonged in immunocompromised. [3]
1	**Does the illness result in mild symptoms with minimal or no impact on daily activities?**	**[All populations] Symptoms may include diarrhea, vomiting and abdominal pain. [3][5]**

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Blastocystis hominis

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC), 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
2	Karanis, P. 2006. A review of an emerging waterborne medical important parasitic protozoan. Japanese Journal of Protozoology. 39(1): 5-19.
3	Leber, A. and S. Novak-Weekley. 2010. Intestinal and Urogenital Amebae, Flagellates, and Ciliates. In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.L. Landry, and M.A. Pfaller (ed.) Manual of Clinical Microbiology, 10th. Edition, Volume 2, p. 2149. American Society for Microbiology Press, Washington, DC.
4	Leelayoova, S., R. Rangsin, P. Taamasri, T. Naaglor, U. Thathaisong, and M. Mungthin. 2004. Evidence of waterborne transmission of *Blastocystis hominis* . American Journal of Tropical Medicine & Hygiene. 70(6): 658-662.
5	Novak-Weekly, S. and M. Couturier. 2023. Intestinal and Urogenital Amebae, Flagellates, and Ciliates. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch143.
6	Stenzel, D.J. and P.F. Boreham. 1996. *Blastocystis hominis* revisited. Clinical Microbiology Reviews. 9(4): 563-584.
7	Taamasri, P., M. Mungthin, R. Rangsin, B. Tongupprakarn, W. Areekul, and S. Leelayoova. 2000. Transmission of intestinal blastocystosis related to the quality of drinking water. Southeast Asian Journal of Tropical Medicine & Public Health. 31(1): 112-117.
8	Vasana Jinatham, Chadsiri Nonebudsri, Thanawat Wandee, Siam Popluechai, Anastasios D. Tsaousis, Eleni Gentekaki, *Blastocystis* in tap water of a community in northern Thailand,Parasitology International, Volume 91, 2022, 102624, ISSN 1383-5769, https://doi.org/10.1016/j.parint.2022.102624.

Calicivirus/Norovirus

Virus

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
X	X	X	X	X

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	5	3	2	4	2.1
Total Score[2]	7.1				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	**Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021**	**Yes [5]** **2014: 2 Transient noncommunity** **2015: 1 Community (suspected)** **2018: 1 Community**
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	
3	Has caused documented WBDOs at any time in the U.S.	1971-2013: 13 Community 30 Noncommunity [3]
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence		
Score	**Data Element**	**Scoring Data**
3	**Detected in drinking water in the U.S.**	**Yes, detection by PCR. [8]**
2	Detected in source water in the U.S.	Yes, detected in groundwater by PCR. [1] [7]
1	Not detected in the U.S.	

Calicivirus/Norovirus

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	No long term sequelae have been reported. [2]
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	No [2]
4	**Does the illness require short-term hospitalization (< week)?**	**[E, CD] (Norovirus) Although rare, severe dehydration can be fatal, with this outcome occurring among susceptible persons (e.g., older persons with debilitating health conditions). [4]** **[C] Sappoviruses cause disease mainly in children. [6] [9]**
3	Does the illness require physician intervention?	
2	**Is the illness self-limiting (without requiring medical intervention)?**	**[G, P] Acute gastroenteritis. Highly contagious, able to cause large outbreaks and environmentally stable. [6] [9]**
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Calicivirus/Norovirus

Reference Number	Full Reference
1	Borchardt, M.A., P.D. Bertz, S.K. Spencer, and D.A. Battigelli. 2003. Incidence of enteric viruses in groundwater from household wells in Wisconsin. Applied and Environmental. Microbiology. 69: 1172-1180.
2	Centers for Disease Control and Prevention (CDC). 2001. Norwalk-like viruses: Public health consequences and outbreak management. Morbidity and Mortality Weekly Report (MMWR). 50(RR-9):1-18.
3	CDC. 2003. Managing acute gastroenteritis among children. MMWR. 52(RR-16):1-16.
4	CDC. 2019. Norovirus home page. Available online at: https://www.cdc.gov/norovirus/index.html
5	CDC. 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
6	Farkas, T. and X. Jiang. 2007. Rotaviruses, Caliciviruses, Astroviruses, Enteric Adenoviruses, and Other Diarrheic Viruses. In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.A. Pfaller, and R.H. Yolken (ed.) Manual of Clinical Microbiology, 9th Edition, Volume 2, pp. 1454-1457. American Society for Microbiology Press, Washington, DC.
7	Fout, G.S., B.C. Martinson, M.W. Moyer, and D.R. Dahling. 2003. A multiplex reverse transcription-PCR method for detection of human enteric viruses in groundwater. Applied and Environmental Microbiology. 69: 3158-3164.
8	Huffman, D.E., K.L. Nelson, and J.B. Rose. 2003. Calicivirus – an emerging contaminant in water: state of the art. Environmental Engineering Science. 20: 503-515.
9	Hindiyeh, M., S. Das., and S. Dunbar. Gastroenteritis Viruses. 2023.In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC

Campylobacter jejuni

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
		X	X	X

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	5	3	2	6	2.9
Total Score[2]	7.9				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	**Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021**	**Yes [4]** **2015: 2 Community [4], one suspected** **2017: 1 Community [4]** **2021: 1 Community [4][8]**
4	Has caused at least one documented WBDOs in U.S. reported by CDC between 2013-2021	
3	Has caused documented WBDOs at any time in the U.S.	Yes 1971-2013: 17 Community and 16 Noncommunity [4]
2	Has caused WBDOs in countries other than the U.S.	Yes . Finland [9] New Zealand [14] Norway [7]
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence		
Score	**Data Element**	**Scoring Data**
3	**Detected in drinking water in the U.S.**	**Yes [12][13]**
2	Detected in source water in the U.S.	Yes [2][6]
1	Not detected in the U.S.	

Campylobacter jejuni

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	No, death is uncommon. [10]
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, causes other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**[E, P, CD] The eldery, pregnant, and those with severe disease are at greater risk for severe disease. Complications include hepatitis, bacteremia cholecystitis, pancreatitis, nephritis, abortion and neonatal sepsis, urinary tract infection, meningitis and septic arthritis. [10]** **Bacteremia occurs at 1.5 per 1,000 cases with the highest rate occurring in the elderly. [10]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	*Campylobacter* infection can result in long-term consequences, such as arthritis, irritable bowel syndrome (IBS), and Guillain-Barré syndrome. [1][5][10]
4	Does the illness require short-term hospitalization (< week)?	[C, E] Most cases do not require hospitalization, pediatric cases and elderly are more likely to require hospitalization than adult cases. [11]
3	Does the illness require physician intervention?	
2	**Is the illness self-limiting (without requiring medical intervention)?**	**[G] Duration 2-5 days, usually self-limiting. [5] Relapse occurs in 5-10% cases. [3][10]**
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	Asymptomatic to acute diarrhea, abdominal pain, malaise, and fever. [10]

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Campylobacter jejuni

Reference Number	Full Reference
1	Altekruse, S.F., N.J. Stern, P.I. Fields, and D.L. Swerdlow. 1999. *Campylobacter jejuni* – An Emerging Foodborne Pathogen. Emerging Infectious Diseases. 5(1): 28-35.
2	Carter, A.M., R.E. Pacha, G.W. Colark, and E.A. Williams. 1987. Seasonal occurrence of *Campylobacter* spp. in surface waters and their correlation with standard indicator bacteria. Applied and Environmental. Microbiology. 53(3): 523-526.
3	Centers for Disease Control and Prevention (CDC), 2019. *Campylobacter* home page. Available online at: https://www.cdc.gov/campylobacter/index.html.
4	CDC, 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
5	Heymann, D. (ed.). 2022. Control of Communicable Diseases Manual, 21st Edition. American Public Health Association, Washington, DC.
6	Hinnenkamp R, Sorenson S, Evanson E, Yoder J, Mattioli M. Notes From the Field: Campylobacteriosis Outbreak Associated with Consumption of Raw Water — Montana, 2022. MMWR Morb Mortal Wkly Rep 2023;72:411–412. DOI: http://dx.doi.org/10.15585/mmwr.mm7215a6
7	Hyllestad, S., Iversen, A., MacDonald, E., Amato, E., Borge, B.Å.S., Bøe, A., Sandvin, A., Brandal, L.T., Lyngstad, T.M., Naseer, U. and Nygård, K., 2020. Large waterborne *Campylobacter* outbreak: use of multiple approaches to investigate contamination of the drinking water supply system, Norway, June 2019. Eurosurveillance, 25(35), p.2000011.
8	Jansen, L., Birn, R., Koirala, S., Oppegard, S., Loeck, B., Hamik, J., Wyckoff, E., Spindola, D., Dempsey, S., Bartling, A. and Roundtree, A., 2024. Campylobacteriosis Outbreak Linked to Municipal Water, Nebraska, USA, 2021. Emerging Infectious Diseases, 30(10), p.1998.
9	Kuusi, M., J.P. Nuorti, M.L. Hanninen, M. Koskela, V. Jussila, E. Kela, I. Miettinen, and P. Ruutu. 2005. A large outbreak of campylobacteriosis associated with a municipal water supply in Finland. Epidemiology & Infection. 133(4): 593-601.
10	Nachamkin. 2023. *Campylobacter* and *Arcobacter* . In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC. doi: 10.1128/9781683670438.MCM.ch58
11	Nachamkin, I. 2019. *Campylobacter* and *Arcobacter* . In Carroll, K.C., M.A. Pfaller, M.L. Landry, A.J. McAdam, R. Patel, S.S. Richter, and D.W. Warnock (ed). Manual of Clinical Microbiology, 12th Edition. American Society of Microbiology, Washington, DC.
12	O'Reilly, C.E., A.B. Bowen, N.E. Perez, J.P. Sarisky, C.A. Shepherd, M.D. Miller, B.C. Hubbard, M. Herring, S.D. Buchanan, C.C. Fitzgerald, V. Hill, M.J. Arrowood, L.X. Xiao, R.M. Hoekstra, E.D. Mintz, F. Lynch, and Outbreak Working Group. 2007. A Waterborne Outbreak of Gastroenteritis with Multiple Etiologies among Resort Island Visitors and Residents: Ohio, 2004. Clinical Infectious Diseases. 44(4): 506-512.
13	Sacks, J.J., S. Lieb, L.M. Baldy, S. Berta, C.M. Patton, M.C. White, W.J. Bigler, and J.J. Witte. 1986. Epidemic campylobacteriosis associated with a community water supply. American Journal of Public Health. 76(4): 424-429.
14	Water Quality and Health Council. 2017 Update: New Zealand's Largest Drinking Water Outbreak. Available online at: https://waterandhealth.org/safe-drinking-water/update-new-zealands-largest-drinking-water-outbreak-2.

Comamonas testosteroni

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	1	2	1	6	2.5
Total Score[2]	4.5				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [3]
4	Has caused at least one documented WBDOs in U.S. reported by CDC between 2013-2021	No [3]
3	Has caused documented WBDO at any time in the U.S.	
2	Has caused WBDOs in countries other than the U.S.	
1	**Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease**	

Occurrence		
Score	**Data Element**	**Scoring Data**
3	Detected in drinking water in the U.S.	
2	**Detected in source water in the U.S.**	***Comamonas testosteroni*** **is often found in freshwater, soil, plants, and in hospital devices such as intravenous lines and the reservoir water in the humidifiers of respiratory therapy equipment. [5]**
1	Not detected in the U.S.	

Comamonas testosteroni

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**[CD] *Comamonas testosteroni* has been shown to cause pneumonia in patients with AIDS. [2] Also documented causing meningitis in a patient with recurrent cholesteatoma [1]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	Does the illness require physician intervention?	
2	Is the illness self-limiting (without requiring medical intervention)?	
1	**Does the illness result in mild symptoms with minimal or no impact on daily activities?**	**[G] Infrequently cause human infections on healthy individuals. [4]**

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Comamonas testosteroni

Reference Number	Full Reference
1	Arda, B., S. Aydemir, T. Yamazhan, A. Hassan, A. Tünger, and D. Serter. 2003. Comamonas testosteroni meningitis in a patient with recurrent cholesteatoma: Case report. Apmis. 111(4): 474-476.
2	Franzetti, F., M. Cernuschi, R. Esposito, and M. Moroni. 1992. Pseudomonas infections in patients with AIDS and AIDS-related complex. Journal of internal medicine. 231(4): 437-443.
3	Centers for Disease Control and Prevention (CDC). 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
4	LiPuma, J.J., B.J. Currie, R. Baird, and P.A.R. Vandamme. 2023. Burkholderia, Stenotrophomonas, Ralstonia, Cupriavidus, Pandoraea, Brevundimonas, Comamonas, Delftia, and Acidovorax. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC
5	Tiwari, S. and M. Nanda. 2019. Bacteremia caused by Comamonas testosteroni an unusual pathogen. Journal of laboratory physicians. 11(1): 87.

Cyclospora cayetanensis

Protozoa

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	3	3	3	4	2.5
Total Score[2]	5.5				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [2]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [2]
3	**Has caused documented WBDOs at any time in the U.S.**	**Yes** **1971-2008: 2 Community [2]**
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	Yes [7]

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes [1]**
2	Detected in source water in the U.S.	No
1	Not detected in the U.S.	Yes, detected in drinking water in Guatemala. [4]

Cyclospora cayetanensis

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	Guillain-Barré and Reiter's syndromes have been reported. [3][6]
4	**Does the illness require short-term hospitalization (< week)?**	**[C] Most cases do not required hospitalization, infants may require hospitalization for rehydration therapy. [5]**
3	**Does the illness require physician intervention?**	**[All populations] Can cause diarrhea and biliary disease. In patients not treated, illness can be protracted with relapsing symptoms.[1][6][8]**
2	Is the illness self-limiting (without requiring medical intervention)?	
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Cyclospora cayetanensis

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC). 2019. Cyclospora homepage. Available online at: https://www.cdc.gov/parasites/cyclosporiasis/index.html.
2	CDC. 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
3	Connor, B.A., E. Johnson, and R. Soave. 2001. Reiter syndrome following protracted symptoms of Cyclospora infection. Emerging infectious diseases. 7: 453-454.
4	Dowd, E.S., D. John, J. Eliopolus, C.P. Gerba, J. Naranjo, R. Klein, B. Lopez, M. de Mejia, C.E. Mendoza, and I. Pepper. 2003. Confirmed detection of Cyclospora cayetanesis, Encepalitozoon intestinalis and Cryptosporidium parvum in water used for drinking. Journal of Water and Health. 1(3): 117-123.
5	Fisk, T.L., J.S. Keystone, and P. Kozarsky. 2005. In Mandell, G.L., J.E. Bennett, and R. Dolin (eds.). Mandell, Douglas and Bennett's Principles and Practice of Infectious Diseases, 6th Edition. Elsevier, Philadelphia, PA.
6	Heymann, D.(ed.). 2022. Control of Communicable Diseases Manual, 21st Edition. American Public Health Association, Washington, DC.
7	Huang, P., J.T. Weber, D.M. Sosin, P.M. Griffin, E.G. Long, J.J. Murphy, F. Kocka, C. Peters, and C. Kallick. 1995. The first reported outbreak of diarrheal illness associated with Cyclospora in the United States. Annals of Internal Medicine.123: 409-414.
8	Qvarnstrom, Y., and M. Arrowood. 2023. Isospora, Cyclospora and Sarcocystis. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch144

Cystoisospora belli (formerly Isospora belli)

Protozoa

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	2	1	1	2	1.1
Total Score[2]	3.1				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [1]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [1]
3	Has caused documented WBDOs at any time in the U.S.	
2	**Has caused WBDOs in countries other than the U.S.**	**Yes [2]**
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence		
Score	**Data Element**	**Scoring Data**
3	Detected in drinking water in the U.S.	
2	Detected in source water in the U.S.	
1	**Not detected in the U.S.**	**Yes [2]**

Cystoisospora belli (formerly Isospora belli)

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	Does the illness require physician intervention?	Can sometimes cause serious and sometimes fatal disease in immunocompetent patients. [3]
2	**Is the illness self-limiting (without requiring medical intervention)?**	**[C, CD] Symptoms are more severe in infants, children and immunocompromised patients. [3]**
1	**Does the illness result in mild symptoms with minimal or no impact on daily activities?**	**[G] Symptoms include diarrhea, steatorrhea, headache, fever, malaise, abdominal pain, vomiting, dehydration, and weight loss. [3]**

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Cystoisospora belli (formerly Isospora belli)

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC). 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
2	Karanis P. 2006. A review of an emerging waterborne medical important parasitic protozoan. Japanese Journal of Protozoology. 39(1): 5-19.
3	Qvarnstrom, Y., and M. Arrowood. 2023. Isospora, Cyclospora and Sarcocystis. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch144

Entamoeba histolytica

Protozoa

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISK SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	3	3	3	3	2.1
Total Score[2]	5.1				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [1]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [1]
3	**Has caused documented WBDOs at any time in the U.S.**	**1971-2008: 3 Community (one is "*Entamoeba* unknown') 1 Noncommunity [1]**
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes, found during a WBDO [1]**
2	Detected in source water in the U.S.	
1	Not detected in the U.S.	

Entamoeba histolytica

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	500 million infected (E. dispar and E. histolytica) each year with approximately 50 million cases of colitis and liver abscess and 100,000 deaths worldwide. [3]
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	Infections in the U.S. rarely progress to complications, amoebic colitis may result in perforation of the intestinal wall, resulting in peritonitis; dissemination to extraintestinal sites may involve the liver, lungs, or brain. Liver abscess is the most common complication. [2]
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	Abdominal perforations and peritonitis are rare complications. Up to 5% develop liver abscess. [3]
4	Does the illness require short-term hospitalization (< week)?	Intestinal invasion can lead to lesions, ulcers. [3]
3	**Does the illness require physician intervention?**	**[All populations]** **Clinical symptoms are dysentery, colitis or rarely amoeboma). [3]** **Fulminant colitis occurs most often in children who present with diffuse abdominal pain, profuse bloody diarrhea and fever. [4]**
2	Is the illness self-limiting (without requiring medical intervention)?	Most human infections (90%) are asymptomatic, symptomatic non-invasive strains cause gastrointestinal symptoms such as cramping and increased frequency of bowel movements, constipation may alternate with diarrhea, invasive strains may cause amoebic dysentery. [2]
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Entamoeba histolytica

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC). 2023. National Outbreak Reporting System (NORS). Available online at:https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
2	Heymann, D. (ed.). 2022. Control of Communicable Diseases Manual, 21st Edition. American Public Health Association, Washington, DC.
3	Mathison, B. and M. Couturier. 2023. Intestinal and Urogenital Amebae, Flagellates, and Ciliates. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch143
4	Marshall, M., D. Naumovitz, Y. Ortega, and C. Sterling. 1997. Waterborne protozoan pathogens. Clinical Microbiology Reviews. 10(1): 67–85.

Enterovirus

Virus

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
		X	X	X

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISK SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	2	3	4	6	3.6
Total Score[2]	6.6				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [2]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [2]
3	Has caused documented WBDOs at any time in the U.S.	
2	**Has caused WBDOs in countries other than the U.S.**	**Yes, Switzerland and others. [3]**
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes [1][5][9][10][14]**
2	Detected in source water in the U.S.	
1	Not detected in the U.S.	

Enterovirus

HEALTH RISK DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**[C] Aseptic meningitis, encephalitis, and acute flaccid paralysis. [4]** **EVs are the most common cause of meningitis in the U.S., over 80% of all viral meningitides (estimated 30,000 to 50,000 hospitalizations for non-polio EV each year (principally echo and coxsackie)). [12]** **Enterovirus causes myocarditis, viral meningitis, encephalitis and meningioencephalitis. [6]** **Widespread illness in children with asthma. [7][8][11]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	Diabetes has been associated with enterovirus infection. [4]
4	**Does the illness require short-term hospitalization (< week)?**	**[G] Hospitalization may be required for severe manifestations of disease. Approximately 20-30% of meningitis outbreak cases in young adults require hospitalization. [13]** **During the summer and fall, responsible for 50 – 60% of hospital admissions for evaluation of febrile illnesses for infants and children. [12]**
3	Does the illness require physician intervention?	Children with acute pharyngitis may be taken to a physician to differentiate between streptococcal and viral sore throat. Upper respiratory illness lasts 4-6 days, lower respiratory illness lasts 5-7 days, and meningitis lasts 7-10 days. [12] [4]
2	Is the illness self-limiting (without requiring medical intervention)?	[E, P, CD] Most cases are asymptomatic. Most common symptoms are acute nonspecific febrile illness. [12]
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Enterovirus

Reference Number	Full Reference
1	Borchardt, M.A., S.K. Spencer, B.A. Kieke, Jr., E. Lambertini, and F.J. Loge. 2012. Viruses in Nondisinfected Drinking Water from Municipal Wells and Community Incidence of Acute Gastrointestinal Illness. Environmental Health Perspectives, 120(9): 1272–1279.
2	Centers for Disease Control and Prevention (CDC). 2023. National Outbreak Reporting System (NORS). Available online at:https://wwwn.cdc.gov/norsdashboard/. Accessed August 31, 2023.
3	Hafliger D., P. Hubner, and J. Luthy. 2000. Outbreak of viral gastroenteritis due to sewage-contaminated drinking water. International Journal of Food Microbiology. 54(1-2): 123-126.
4	Heymann, D. (ed.). 2022. Control of Communicable Diseases Manual, 21st Edition. American Public Health Association, Washington, DC.
5	Keswick, B., C. Gerba, H. DuPont, and J. Rose. 1984. Detection of Enteric Viruses in Treated Drinking Water. Applied and Environmental Microbiology. 47(6): 1290-1294.
6	Khetsuriani N., R. Holman, and L. Anderson. 2002. Burden of Encephalitis-Associated Hospitalizations in the United States, 1988–1997. Clinical Infectious Diseases. 35(2): 175-182.
7	Khetsuriani, N., E.S. Quiroz, R.C. Holman, and L.J. Anderson. 2003. Viral meningitis-associated hospitalizations in the United States, 1988-1999. Neuroepidemiology. 22(6): 345-352.
8	Kim, K-S., G. Hufnagel, N.M. Chapman, and S. Tracy. 2001. The group B coxsackieviruses and myocarditis. Reviews in Medical Virology. 11(6): 355-368.
9	Lieberman, R.J., L.C. Shadix, B.S. Newport, C.P. Frebis, M.W.N. Moyer, R.S. Safferman, R.E. Stetler, D. Lye, G.S. Fout, and D. Dahling. 2002. Microbial monitoring of vulnerable public ground water supplies, p. 142. American Water Works Association, Dever, CO.
10	Mack, W.N., L. Yue-Shoung, and D.B. Coohon. 1972. Isolation of poliomyelitis virus from a contaminated well. Health Services Report. 87(3): 271-274.
11	Midgley, C.M., J.T. Watson, W.A. Nix, A.T. Curns, S.L. Rogers, B.A., Brown, C. Conover, S.R. Dominguez, D.R. Feikin, S. Gray, and F. Hassan. 2015. Severe respiratory illness associated with a nationwide outbreak of enterovirus D68 in the USA (2014): a descriptive epidemiological investigation. The Lancet Respiratory medicine. 3(11): 879-887.
12	Romero, J. 2007. Enteroviruses and Parechoviruses. In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.L. Landry, and M.A. Pfaller (ed.) Manual of Clinical Microbiology, 9th Edition, Volume 2, p. 1394. American Society for Microbiology Press, Washington, DC.
13	Sawyer, M.H. 2002. Enterovirus infections: diagnosis and treatment. Seminars in Pediatric Infectious Diseases.13(1): 40-47.
14	Stokdyk, J.P., Firnstahl, A.D., Walsh, J.F., Spencer, S.K., de Lambert, J.R., Anderson, A.C., Rezania, L.I.W., Kieke Jr, B.A. and Borchardt, M.A., 2020. Viral, bacterial, and protozoan pathogens and fecal markers in wells supplying groundwater to public water systems in Minnesota, USA. Water research, 178, p.115814.

Escherichia coli O157

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
		X	X	X

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	5	3	3	6	3.2
Total Score[2]	8.2				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	**Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021**	**Yes [5]** **2013: 1 Transient Noncommunity** **2014: 1 Nontransient Noncommunity** **2016: 1 Community**
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	
3	Has caused documented WBDOs at any time in the U.S.	1971-2008: 6 Community 6 Noncommunity [5]
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence		
Score	**Data Element**	**Scoring Data**
3	**Detected in drinking water in the U.S.**	**Yes [1][8]**
2	Detected in source water in the U.S.	Yes, as a result of animal fecal contamination. [8][9]
1	Not detected in the U.S.	

Escherichia coli O157

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	Approximately 60 deaths per 73,000 cases per year (nearly >1/1,000) are reported due to E. coli (O157). A case fatality rate of 0.5 has been reported for outbreak-related cases caused by E. coli O157:H7 [10] [12] [2]
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**[C, E] Patients at extremes of age have an increased risk for infection and associated complications. [3]** **Children under 5 are most frequently diagnosed with infection and are at greatest risk of developing HUS. The elderly also appear to be an increased risk of complications. [11]** **HUS develops in 10% of patients under the age of 10. [8] [4]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	25% of HUS survivors develop long term renal sequelae. [7] 3.2% of children with diarrhea plus HUS develop diabetes. [13] Adults have a greater likelihood of hypertension and reduced renal function. [6]
4	Does the illness require short-term hospitalization (< week)?	
3	**Does the illness require physician intervention?**	**[G, P, CD] Some clinicians choose to hospitalize all patients with *E. coli O157:H7* for hydration to prevent HUS. [8]**
2	Is the illness self-limiting (without requiring medical intervention)?	
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	Can present as mild non-bloody diarrhea. [10]

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Escherichia coli O157

Reference Number	Full Reference
1	Bopp, D.J., B.D. Sauders, A.L. Waring, J. Ackelsberg, N. Dumas, E. Braun-Howland, D. Dziewulski, B.J. Wallace, M. Kelly, T. Halse, K. Aruda Musser, P.F. Smith, D.L. Morse, and Limberger, R.J. 2003. Detection, Isolation, and Molecular Subtyping of Escherichia coli O157:H7 and Campylobacter jejuni Associated with a Large Waterborne Outbreak. Journal of Clinical Microbiology. 41(1): 174-180.
2	Buchan, B., M. Faron, R. Humphries, J. Dekker, and N. Ledeboer. 2023. Escherichia, Shigella and Salmonella. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 12th Edition. ASM Press, Washington, DC.
3	Chinyu S., and L.J. Brandt. Escherichia coli: H7 Infection in Humans. 1995. Annals of Internal Medicine. 123(9): 698-707.
4	Centers for Disease Control and Prevention (CDC). 2019. E. coli (Escherichia coli) homepage. Available online at: https://www.cdc.gov/ecoli/index.html.
5	CDC, 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
6	Garg, A.X., L. Moist, D. Matsel, H.R. Thiessen-Philbrook, R.B. Haynes, R.S. Suri, M. Salvadori, J. Ray, and W.F. Clark. 2005. Risk of hypertension and reduced kidney function after acute gastroenteritis from bacteria-contaminated drinking water. CMAJ. 173(3): 261–268.
7	Garg, A.X., R.S. Suri, N. Barrowman, F. Rehman, D. Matsell, M.P. Rosas-Arellano, M. Salvadori, R.B. Haynes, and W.F. Clark. 2003. Long-term Renal Prognosis of Diarrhea-Associated Hemolytic Uremic Syndrome. Journal of the American Medical Association. 290(10): 1360-1370.
8	Heymann, D. (ed.). 2022. Control of Communicable Diseases Manual, 21st Edition. American Public Health Association, Washington, DC.
9	Kramer, M.H., B.L. Herwaldt, G.F. Craun, R.L. Calderon, and D.D. Juranek. 1996. Surveillance for waterborne-disease outbreaks – United States, 1993-1994. MMWR Surveillance Summaries. 45(SS-1): 1-33.
10	Nataro, J., C. Bopp, P. Fields, J. Kaper, and N. Strockbine. 2007. Escherichia, Shigella and Salmonella. In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.L. Landry, and M.A. Pfaller (ed.) Manual of Clinical Microbiology, 9th Edition, Volume 1, pp. 670 - 672. American Society for Microbiology Press, Washington, DC.
11	Nataro, J.P. and J.B. Kaper. 1998. Diarrheagenic Escherichia coli. Clinical microbiology reviews.11(1): 142-201.
12	Rangel, J.M., P.H. Sparling, C. Crowe, P.M. Griffin, and D.L. Swerdlow. 2005. Epidemiology of Escherichia coli O157:H7 outbreaks, United States, 1982-2002. Emerging infectious diseases. 11(4): 603-609.
13	Suri, R.S., W.F. Clark, N. Barrowman, J.L. Mahon, H.R. Thiessen-Philbrook, M.P. Rosas-Arellano, K. Zarnke, J.S. Garland, and A.X. Garg. 2005. Diabetes during diarrhea-associated hemolytic uremic syndrome: a systematic review and meta-analysis. Diabetes Care. 28(10): 2556-2562.

Exophiala jeanselmei

Fungi

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	1	3	3	3	2.1
Total Score[2]	5.1				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [1]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [1]
3	Has caused documented WBDOs at any time in the U.S.	
2	Has caused WBDOs in countries other than the U.S.	
1	**Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease**	**Yes [3][4]**

Occurrence		
Score	**Data Element**	**Scoring Data**
3	**Detected in drinking water in the U.S.**	**Yes [6]**
2	Detected in source water in the U.S.	Yes [3]
1	Not detected in the U.S.	

Exophiala jeanselmei

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	Infections increase in severity in patients with impaired immunity and metabolic diseases such as diabetes.[5]
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	**Does the illness require physician intervention?**	**[All populations] A chronic spreading mycosis. [2]** **The frequency of infection is low, yet potential severe outcome and high degrees of resistance to antifungal drugs requires medical attention. [5]**
2	Is the illness self-limiting (without requiring medical intervention)?	
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Exophiala jeanselmei

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC). 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
2	Heymann, D. (ed.). 2022. Control of Communicable Diseases Manual, 21st Edition. American Public Health Association, Washington, DC.
3	Nucci, M., Akiti, T., Barreiros, G., Silveira, F., Revankar, S.G., Sutton, D.A. and Patterson, T.F., 2001. Nosocomial fungemia due to Exophiala jeanselmei var. jeanselmei and a Rhinocladiella species: newly described causes of bloodstream infection. Journal of clinical microbiology, 39(2), pp.514-518.
4	Marcio, N., A. Tiyomi, B. Gloria, S. Fernanda, S.G. Revankar, L.W. Brian, D.A. Sutton, and T.F. Patterson. 2002. Nosocomial outbreak of Exophiala jeanselmei fungemia associated with contamination of hospital water. Clinical infectious diseases. 34: 1475-1480.
5	Guarro, J. H. Madrid, and S. Dehoog. 2023. Curvularia, Exophiala, Scedosporium, Sporothrix, and Other Melanized Fungii. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch127
6	West, P.R. 1986. Isolation rates and characterization of fungi in drinking water distribution systems. Proceedings of the Water Quality Technology Conference. American Water Works Association, Denver, CO.

Fusarium solani

Fungi

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	1	3	4	4	2.9
Total Score[2]	5.9				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [2]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [2]
3	Has caused documented WBDOs at any time in the U.S.	
2	Has caused WBDOs in countries other than the U.S.	
1	**Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease**	**Yes [1]**

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes [1][5]**
2	Detected in source water in the U.S.	Yes [1]
1	Not detected in the U.S.	

Fusarium solani

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	Mortality associated with cutaneous Fusarium infection is high in immunocompromised patients. [6]
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	[CD] Most severe disease occurs in severely immunocompromised. [1][4] Manifestations include keratitis, localized skin lesions, onychomycosis, and occasionally cellulitis and peritonitis. [3] *Fusarium* has been associated with pneumonia and disseminated infections. [7]
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	**Does the illness require short-term hospitalization (< week)?**	**[All populations] Can cause infections that may require hospitalization, particularly in immunocompromised patients (endophthalmitis, central nervous system infections, endocarditis). [3]**
3	Does the illness require physician intervention?	Treatment and/or removal of the foreign body is usually required as well as antifungal therapy.[3]
2	Is the illness self-limiting (without requiring medical intervention)?	
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Fusarium solani

Reference Number	Full Reference
1	Anaissie, E.J., R.T. Kuchar, J.H. Rex, A. Francesconi, M. Kasai, F-M.C. Muller, M. Lozano-Chiu, R.C. Summerbell, M.C. Dignani, S.J. Chanock, and T.J. Walsh. 2001. Fusariosis Associated with Pathogenic Fusarium Species Colonization of a Hospital Water System: A New Paradigm for the Epidemiology of Opportunistic Mold Infections. Clinical Infectious diseases. 33: 1871-1878.
2	Centers for Disease Control and Prevention (CDC). 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
3	Dignani, M. and E. Anaissie. 2004. Human Fusariosis. Clinical and Infection Microbiology.1: 67-75.
4	Fridkin, S. and W. Jarvis. 1996. Epidemiology of Nosocomial Fungal Infections. Clinical microbiology reviews. 9(4): 499-511.
5	Nagy L. and B. Olson. 1982. The occurrence of filamentous fungi in drinking water distribution systems. Canadian Journal of Microbiology. 28(6): 667-71.
6	Nucci, M. and E. Anaissie. 2002. Cutaneous infection by Fusarium species in health and immunocompromised hosts: implications for diagnosis and management. Clinical Infectious diseases. 35: 909-920.
7	Zhang, S., K. O'Donnell, N. Wiederhold, and C. Cañete-Gibas. 2023. Fusarium, and Other Opportunistic Hyaline Fungi. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch123

Helicobacter pylori

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
X	X	X	X	X

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	1	3	6	6	4.3
Total Score[2]	7.3				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [16]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [16]
3	Has caused documented WBDOs at any time in the U.S.	No [2-15]
2	Has caused WBDOs in countries other than the U.S.	
1	**Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease**	**Yes [1][20][21][23]**

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes [22]**
2	Detected in source water in the U.S.	Yes [19]
1	Not detected in the U.S.	

Helicobacter pylori

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	[G, E] *H.pylori* is a major risk factor for gastric cancer. In the U.S., gastric cancer causes ~ 6,500 deaths per year. 1.2 million acute cases per year (>1/1,000 deaths). 46% of deaths occur before age of 64. [5] [24]
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**[G, E] *H. pylori* is a major risk factor for gastric cancer and peptic ulcer disease. [17] [18]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	Does the illness require physician intervention?	[C, P, CD] Many patients have recurrent abdominal symptoms; 16% develop duodenal ulcers. NIH (1994) recommends diagnosis and antimicrobial treatment for anyone with peptic ulcers. [18]
2	Is the illness self-limiting (without requiring medical intervention)?	No, infection can persist lifelong without treatment. [18]
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Helicobacter pylori

Reference Number	Full Reference
1	Aziz, R.K., M.M. Khalifa, and R.R. Sharaf. 2013. Contaminated water as a source of Helicobacter pylori infection: A review. Journal of Advanced Research. 6(4): 539–547. doi:10.1016/j.jare.2013.07.007.
2	CDC. 1991. Surveillance for Waterborne-Disease Outbreaks Associated with Drinking Water ---United States, 1989—1990. MMWR Surveillance Summaries. 40(SS-3): 1-21.
3	CDC. 1993. Surveillance for Waterborne-Disease Outbreaks Associated with Drinking Water ---United States, 1991—1992. MMWR Surveillance Summaries. 42(SS-5): 1-22.
4	CDC. 1996. Surveillance for Waterborne-Disease Outbreaks Associated with Drinking Water ---United States, 1993—1994. MMWR Surveillance Summaries. 45(SS-1): 1-33.
5	CDC.1997. Knowledge About Causes of Peptic Ulcer Disease -- United States, March-April 1997, October 24, 1997. 46(42):985-987.
6	CDC. 1998. Surveillance for Waterborne-Disease Outbreaks Associated with Drinking Water ---United States, 1995—1996. MMWR Surveillance Summaries. 47(SS-5): 1-33.
7	CDC. 2000. Surveillance for Waterborne-Disease Outbreaks Associated with Drinking Water ---United States, 1997—1998. MMWR Surveillance Summaries. 49(SS-4): 1-35.
8	CDC. 2002. Surveillance for Waterborne-Disease Outbreaks Associated with Drinking Water ---United States, 1999—2000. MMWR Surveillance Summaries. 51(SS-8): 1-36.
9	CDC. 2004. Surveillance for Waterborne-Disease Outbreaks Associated with Drinking Water ---United States, 2001—2002. MMWR Surveillance Summaries. 53(SS08): 23-45.
10	CDC. 2006. Surveillance for Waterborne-Disease Outbreaks Associated with Drinking Water ---United States, 2003—2004. MMWR Surveillance Summaries. 55(SS12): 31-58.
11	CDC. 2008. Surveillance for Waterborne Disease and Outbreaks Associated with Drinking Water and Water not Intended for Drinking — United States, 2005–2006. MMWR. 60(SS12): 38-68.
12	CDC. 2011. Surveillance for Waterborne Disease Outbreaks Associated with Drinking Water — United States, 2007–2008. MMWR. 60(SS12): 38–68
13	CDC. 2013. Surveillance for waterborne disease outbreaks associated with drinking water and other nonrecreational water — United States, 2009–2010. MMWR. 62(35): 714-20.
14	CDC. 2015. Surveillance for waterborne disease outbreaks associated with drinking water — United States, 2011–2012. MMWR. 64(31): 842-848.
15	CDC. 2017. Surveillance for waterborne disease outbreaks associated with drinking water — United States, 2013–2014. MMWR. 66 (44): 1216-21.
16	CDC. 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
17	Roger-Couturier, M. Helicobacter. 2023. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch59
18	Fox, G. and F. Megraud. 2007. Helicobacter. In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.L. Landry, and M.A. Pfaller (ed.) Manual of Clinical Microbiology, 9th Edition, Volume 1, p. 950. American Society for Microbiology Press, Washington, DC.
19	Hegarty, J.P. and K.H. Baker. 1999. Occurrence of Helicobacter pylori in surface water in the United States. Journal of Applied Microbiology. 87: 697-701.
20	Hulten, K., S.W. Han, H. Enroth, P.D. Klein, A.R. Opekun, R.H. Gilman D.G. Evans, L. Engstrand, D.Y. Graham, and F.A.K. El-Zaatari. 1996. Helicobacter pylori in the drinking water in Peru. Gastroenterology. 110: 1031-1035.
21	Klein, P.D, A.R. Opekun, E.O. Smith, D.Y. Graham, A. Gaillour, and Gastrointestinal Physiology Working Group.1991. Water source as risk factor for Helicobacter pylori infection in Peruvian children. The Lancet. 337(8756): 1503-1506.
22	Richards C.L., S.C. Broadaway, M.J. Eggers, J. Doyle, B.H. Pyle, A.K. Camper, and T.E. Ford. 2018. Detection of Pathogenic and Non-pathogenic Bacteria in Drinking Water and Associated Biofilms on the Crow Reservation, Montana, USA. Microbial Ecology. 76(1): 52-63. doi: 10.1007/s00248-015-0595-6.
23	Rolle-Kampczyk, U.E., G.J. Fritz, U. Diez, I. Lehman, M. Richter, and O. Herbarth. 2004. Well water – one source for Helicobacter pylori colonization. International Journal of Hygiene and Environmental Health. 207: 363-368.
24	Stratton, K.R., J.S. Durch, and R.S. Lawrence (eds.). 2000. Committee to Study Priorities for Vaccine Development. Institute of Medicine. Vaccines for the 21st century: a tool for decision making. National Academies Press, Washington, DC.

Hepatitis A

Virus

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
		X	X	

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	3	2	3	6	3.2
Total Score[2]	6.2				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [5]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [5]
3	**Has caused documented WBDOs at any time in the U.S.**	**Yes [5] 1971-2008: 11 Community 10 Noncommunity**
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence		
Score	**Data Element**	**Scoring Data**
3	**Detected in drinking water in the U.S.**	**Yes [1] [3]**
2	Detected in source water in the U.S.	
1	Not detected in the U.S.	

Hepatitis A

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	Reported case fatality is normally low, 0.1% –0.3%; it can reach 1.8% for adults over 50. [6]
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**[E] Fulminant hepatitis may develop. Disease severity shows a general increase with age. [2] [4]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	**Does the illness require physician intervention?**	**[G, C, P, CD] Commonly begins with "flu-like" symptoms. May develop jaundice. Physician office visit is common for diagnosis and/or vaccination. [2]**
2	Is the illness self-limiting (without requiring medical intervention)?	
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Hepatitis A

Reference Number	Full Reference
1	Abbaszadegan, M., M. LeChevallier, and C. P. Gerba. 2003. Occurrence of viruses in U. S. groundwaters. Journal American Water Works. A95: 107-120.
2	Izopet J., AND N. Kamar. 2023. Hepatitis A and E Viruses. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC.
3	Borchardt, M.A., N.L. Haas, and R.L. Hunt. 2004. Vulnerability of drinking-water wells in La Crosse, Wisconsin to enteric-virus contamination from surface water contributions. Applied and Environmental Microbiology. 10: 5937-5946.
4	Centers for Disease Control and Prevention (CDC). 2019. Viral Hepatitis-Hepatitis A home page. Available online at: https://www.cdc.gov/hepatitis/hav/index.htm.
5	CDC. 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
6	Heymann, D. (ed.). 2022. Control of Communicable Diseases Manual 21st Editon. American Public Health Association, Washington, DC.

Hepatitis E

Virus

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score
Score	2	1	3	7	3.6
Total Score	5.6				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [2]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [2]
3	Has caused documented WBDOs at any time in the U.S.	
2	**Has caused WBDOs in countries other than the U.S.**	**Yes, Waterborne outbreaks have occurred in Asia and Africa. [3] [7]**
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	Yes [8]

Occurrence

Score	Data Element	Scoring Data
3	Detected in drinking water in the U.S.	No
2	Detected in source water in the U.S.	No
1	**Not detected in the U.S.**	**Yes, India [6]**

Hepatitis E

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	**Does the organism cause significant mortality (> 1/1,000 cases)?**	**[P] May progress to fulminant disease in pregnant women when infection occurs during the third trimester. High mortality (for fetus) when infection occurs during pregnancy. [1] [5]** **The case-fatality rate is similar to that of hepatitis A except in pregnant women, where it may reach 20% among those infected during the third trimester of pregnancy. [4]**
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	[E] Fulminant hepatitis may develop. Disease severity shows a general increase with age. [1]
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	**Does the illness require physician intervention?**	**[G, C] Commonly begins with "flu-like" symptoms. May develop jaundice. Physician office visit is common for diagnosis and/or vaccination. [1]**
2	Is the illness self-limiting within 72 hours (without requiring medical intervention)?	
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Hepatitis E

Reference Number	Full Reference
1	Anderson, D., and N. Counahan. 2010. Hepatitis A and E Viruses. In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.L. Landry, and M.A. Pfaller (ed.) Manual of Clinical Microbiology, 10th Edition, Volume 2, p.1423. American Society for Microbiology Press, Washington, DC.
2	CDC. 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
3	Guthmann, J.P., H. Klovstad, D. Boccia, N. Hamid, L. Pinoges, J.Y. Nizou, M. Tatay, F. Diaz, A. Moren, R.F. Grais, I. Ciglenecki. 2006. A large outbreak of hepatitis E among a displaced population in Darfur, Sudan, 2004: the role of water treatment methods. Clinical Infectious Diseases. 42: 1685-1691.
4	Heymann, D. (ed.). 2022. Control of Communicable Diseases Manual, 21st Edition. American Public Health Association, Washington, DC.
5	Izopet J., AND N. Kamar. 2023. Hepatitis A and E Viruses. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC.
6	Jothikumar N., R. Paulmurugan, P. Padmanabhan, R.B. Sundari, S. Kamatchiammal, and K.S. Rao. 2000. Duplex RT-PCR for simultaneous detection of hepatitis A and hepatitis E virus isolated from drinking water samples. Journal of Environmental Monitoring. 2(6): 587-90.
7	Panda, S.K., D. Thakral, and S. Rehman. 2007. Hepatitis E virus. Reviews in Medical Virology. 17(3): 151-180.
8	Tsang, T.H., E.K. Denison, H.V. Williams, L.V. Venczel, M.M. Ginsberg, and D.J. Vugia. Acute Hepatitis E Infection Acquired in California. Clinical Infectious Diseases. 30: 618–9.

Legionella pneumophila

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
		X	X	X

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
Y

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	5	3	4	6	3.6
Total Score[2]	8.6				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	**Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021**	**Yes [2]** **2013: 5 Community** **2014: 20 Community** **2015: 13 Community** **2016: 33 Community** **2017: 33 Community** **2018: 36 Community** **2019: 37 Community** **2020: 16 Community** **2021: 8 Community**
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	
3	Has caused documented WBDOs at any time in the U.S.	1971-2012: 74 Community [2] 25 Noncommunity
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes [6] [7]**
2	Detected in source water in the U.S.	Yes [7]
1	Not detected in the U.S.	

Legionella pneumophila

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	Avg. 12% fatality rate; death rates of 15% (general pop.) up to 75% (immunocompromised) if untreated. [3] 10 – 15% death rate. [1] Case-fatality rates are approximately 5-10% in community aquired cases but may be higher in nosocomial cases. [5]
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**[E, CD] Acute pneumonia may progress to respiratory collapse and death if diagnosis and effective antibiotic therapy are delayed. The elderly and individuals with chronic diseases are at higher risk. [1][3][4]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	**Does the illness require short-term hospitalization (< week)?**	**[G, C, P] Hospitalization is required for treatment of acute pneumonia. [3]**
3	Does the illness require physician intervention?	
2	Is the illness self-limiting (without requiring medical intervention)?	Pontiac fever resolves without treatment and has flu-like symptoms. [3] [5]
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Legionella pneumophila

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC). 2005. Legionellosis: Legionnaires' Disease (LD) and Pontiac Fever. Disease Listing. October 12, 2005. http://www.cdc.gov/ncidod/dbmd/diseaseinfo/legionellosis_t.htm
2	CDC. 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
3	Edelstein, P. 2007. Legionella. In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.L. Landry, and M.A. Pfaller (ed.) Manual of Clinical Microbiology, 9th Edition, Volume 1, p. 837. American Society for Microbiology Press, Washington, DC.
4	Lindsay, D. and M. Ricci, 2023. Legionella In: Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch51
5	Heymann, D.(ed.). 2022. Control of Communicable Diseases Manual, 21st Edition. American Public Health Association, Washington, DC.
6	Lin, Y.S., J.E. Stout, V.L. Yu, and R.D. Vidic. 1998. Disinfection of water distribution systems for Legionella. Seminars in Respiratory lnfections. 13: 147-159.
7	Maier, R.M., I.L. Pepper, and C.P. Gerba (eds.) 2000. Environmental Microbiology, pp. 454-455, 539. Academic Press.
8	Riffard, S., S. Springthorpe, L. Filion, and S. Sattar. 2002. Occurrence of Legionella in Groundwater. AWWA Research Foundation Reports, American Water Works Association, Dever, CO.

Listeria monocytogenes

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
Y

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	1	3	2	7	3.2
Total Score[2]	6.2				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No
3	Has caused documented WBDOs at any time in the U.S.	
2	Has caused WBDOs in countries other than the U.S.	
1	**Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease**	**Yes [1]**

Occurrence		
Score	**Data Element**	**Scoring Data**
3	**Detected in drinking water in the U.S.**	**Yes [4]**
2	Detected in source water in the U.S.	Yes [2]
1	Not detected in the U.S.	

Listeria monocytogenes

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	**Does the organism cause significant mortality (> 1/1,000 cases)?**	**[P][C] 25% of cases in pregnancy result in fetal loss or newborn death [3]**
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	Can cross the blood-brain barrier. Neurolisteriosis presents as meningoencephalitis, meningitis, or localized central nervous system infection. [3]
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	Does the illness require physician intervention?	
2	**Is the illness self-limiting (without requiring medical intervention)?**	**[G] May occasionally cause mild gastroenteritis [3]**
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	[G] Typically asymptomotic in the general population [3]

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Listeria monocytogenes

Reference Number	Full Reference
1	Bjergbæk, L. A., Hesselsoe, M., Pagh, S., & Roslev, P. 2021. Survival of animal and human-associated Listeria monocytogenes in drinking water and biofilms. Water Supply, 21(7), 3515-3525.
2	Gartley, S.; Anderson-Coughlin, B.; Sharma, M.; Kniel, K.E. 2022. Listeria monocytogenes in Irrigation Water: An Assessment of Outbreaks, Sources, Prevalence, and Persistence. Microorganisms, 10, 1319. https://doi.org/10.3390/microorganisms10071319
3	Smith, K. and R. Harris. In: Carroll KC, Pfaller MA Manual of Clinical Microbiology, 12th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch28
4	Maria S. Gião & Charles W. Keevil. 2014. Listeria monocytogenes Can Form Biofilms in Tap Water and Enter Into the Viable but Non-Cultivable State. Microb Ecol 67:603–611. DOI 10.1007/s00248-013-0364-3

Microsporidia

Fungi

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
X	X			

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	1	2	2	2	1.4
Total Score[2]	3.4				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [1]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [1]
3	Has caused documented WBDOs at any time in the U.S.	
2	Has caused WBDOs in countries other than the U.S.	
1	**Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease**	**Yes [2][5][6]**

Occurrence		
Score	**Data Element**	**Scoring Data**
3	Detected in drinking water in the U.S.	
2	**Detected in source water in the U.S.**	**Yes [3] [4]**
1	Not detected in the U.S.	

Microsporidia

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	Does the illness require physician intervention?	Antimicrobial therapy available for immunodeficient patients. [7]
2	**Is the illness self-limiting (without requiring medical intervention)?**	**[All populations] Diarrhea and weight loss can last up to 2 – 3 weeks in immunocompetent hosts. Has been identified among elderly persons with acute or chronic diarrhea. [7]**
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Microsporidia

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC). 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
2	Cotte, L., M. Rabondonira, F. Chapuis, F. Bailly, F. Bissuel, and C. Raynal. 1999. Waterborne outbreak of intestinal microsporidiosis in persons with and without human immunodeficiency virus infection. Journal of Infectious Diseases. 180: 2003-2008.
3	Didier, E.S., M.E. Stovall, L.C. Green, P.J. Brindley, K. Sestak, and P.J. Didier. 2004. Veterinary parasitology,.126: 145-166.
4	Dowd, S.E., C.P. Gerba, and I.L. Pepper. 1998. Confirmation of the human-pathogenic microsporidia Enterocytozoon bieneusi, Encephalitozoon intestinalis, and Vittaforma corneae in water. Applied and Environmental Microbiology. 64(9): 3332-3335.
5	Enriquez, F.J., D. Taren, A. Cruz-Lopez, M. Muramoto, J.D. Palting, and P. Cruz. 1998. Prevalence of intestinal encephalitozoonosis in Mexico. Clinical Infectious Diseases. 26: 1227-1229.
6	Hutin, Y.J.F., M.N. Sombardier, O. Ligoury, C. Sarfati, F. Derouin, J. Modai, and J.M. Molina. 1998. Risk factors for intestinal micorspooridiosis in patients with human immunodeficiency virus infection: a case control study. Journal of Infectious Diseases. 178: 904-907.
7	Weiss, L. 2023. Microsporidia. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 12th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch131

Naegleria fowleri

Protozoa

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
		X	X	X

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	5	3	7	7	5
Total Score[2]	10.0				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score).

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	**Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021**	**2013: Community [5]** **2020: Texas [8]** **2021: Texas [8]**
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	
3	Has caused documented WBDOs at any time in the U.S.	1971-2008: 1 Community [4] Arizona, 2002 [1] Louisana, 2011 and 2013 [7]
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes [5]** **Arizona drinking water wells [2][9]** **Arizona storage - Sampled pre-treatment multiple-well study in Arizona. [13]** **Louisiana [12]**
2	Detected in source water in the U.S.	Yes [15]
1	Not detected in the U.S.	

Naegleria fowleri

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	**Does the organism cause significant mortality (> 1/1,000 cases)?**	**[All populations] Recovery from primary amoebic meningoencephalitis is rare. [6]** **The mortality rate of PAM in the USA is greater than 99% [10]** **Between 1962 and 2023, there were 164 reported cases of PAM in the United States. There have only been four survivors. [3]**
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	Acute fulminating disease [6].
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	All cases are hospitalized for diagnosis and treatment. [15]
3	Does the illness require physician intervention?	
2	Is the illness self-limiting (without requiring medical intervention)?	
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Naegleria fowleri

Reference Number	Full Reference
1	Bartrand, T.A., Causey, J.J. and Clancy, J.L. 2014. *Naegleria fowleri:* An emerging drinking water pathogen. Journal - American Water Works Association, 106: E418-E432. https://doi.org/10.5942/jawwa.2014.106.0140 ; https://awwa.onlinelibrary.wiley.com/doi/full/10.5942/jawwa.2014.106.0140
2	Bright, K.R.; Marciano-Cabral, F.; & Gerba, C.P., 2009. Occurrence of Naegleria fowleri in Arizona Drinking Water Supply Wells. Journal AWWA, 101:11: 44.
3	Centers for Disease Control and Prevention (CDC). 2023. *Naegleria fowleri infections* . Available online at: https://www.cdc.gov/naegleria/about/index.html
4	CDC. 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed August 31, 2023.
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10	Heymann, D. (ed.). 2022. Control of Communicable Diseases Manual, 21th Edition, pp. 6-8. American Public Health Association, Washington, DC.
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12	Louisiana Department of Health, 2013. DHH Issues Emergency Rule Requiring Drinking Water Systems in Louisiana to Raise the Level of Disinfectant in their Water, Increase Monitoring by 25 Percent. Available online at: http://ldh.la.gov/index.cfm/newsroom/detail/2906.
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15	Visvesvara, G. 2007. Pathogenic and Opportunistic Free-Living Amebae. In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.A. Pfaller, and R.H. Yolken (ed.) Manual of Clinical Microbiology, 10th Edition, Volume 2, p. 3129. American Society for Microbiology Press, Washington, DC.

Pantoea agglomerans

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	3	3	1	6	2.5
Total Score[2]	5.5				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score)

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [2]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [2]
3	**Has caused documented WBDOs at any time in the U.S.**	**Yes.** **2012: 1 Community Outbreak of *P. agglomerans* bloodstream infection occurred in a health care facility linked to the drinking water system. [2]**
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence		
Score	**Data Element**	**Scoring Data**
3	**Detected in drinking water in the U.S.**	**Yes. [5]**
2	Detected in source water in the U.S.	
1	Not detected in the U.S.	

Pantoea agglomerans

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**[C, CD] Yes.There are documented cases of long-term hospitalization and death in children with pneumonia. [1] [3]** **Septic arthritis or synovitis is a common clinical outcome of exogenous infection with *P. agglomerans* , others include endophthalmitis, periostitis, endocarditis and osteomyelitis. [3] [4]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	Does the illness require physician intervention?	
2	Is the illness self-limiting (without requiring medical intervention)?	
1	**Does the illness result in mild symptoms with minimal or no impact on daily activities?**	**[G] *P. agglomerans* is not generally an infectious agent in healthy humans. [3]**

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Pantoea agglomerans

Reference Number	Full Reference
1	Büyükcam, A., Ö. Tuncer, D. Gür, B. Sancak, M .Ceyhan, A.B. Cengiz, and A. Kara. 2018. Clinical and microbiological characteristics of *Pantoea agglomerans* infection in children. Journal of Infection and Public Health. 11(3): 304-309.
2	Centers for Disease Control and Prevention (CDC). 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
3	Dutkiewicz, J., B. Mackiewicz, M.K. Lemieszek, M. Golecand, and J. Milanowski. 2016. *Pantoea agglomerans* : a mysterious bacterium of evil and good. Part III. Deleterious effects: infections of humans, animals, and plants. Annals of Agricultural and Environmental Medicine. 23(2).
4	Giffen, S. and K. Alby. 2023. Morganellaceae, Erwiniaceae, Hafniaceae, and Selected Enterobacterales In: Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch157
5	Yablon, B.R., R. Dantes, V. Tsai, R. Lim, H. Moulton-Meissner, M. Arduino, B. Jensen, M.T. Patel, M.O. Vernon, Y. Grant-Greene, and D. Christiansen. 2017. Outbreak of *Pantoea agglomerans* Bloodstream Infections at an Oncology Clinic—Illinois, 2012-2013. Infection Control & Hospital Epidemiology. 38(3): 314-319.

Pathogenic Waterborne Mycobacteria (includes *M. avium, M. abscessus, M. fortuitum; M. gordonae; M. mucogenicum; M. chelonae; M. kansasii; M. xenopi; M. intracellulare*)

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
M. avium complex (MAC)	*M. avium complex (MAC)*	*M. avium*	*M. avium*	*M. avium and M.abscessus*

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
Y

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	5	3	4	6	3.6
Total Score[2]	8.6				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score)

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	**Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021**	**Yes [1]** **2014: 1 Hospital (M. abscessus)** **2016: 1 Community (*Mycobacterium* "other")** **2021: 1 Community (Mycobacterium"other")**
4	Has caused at least one documented WBDOs in U.S. reported by CDC between 2013-2021	
3	Has caused documented WBDOs at any time in the U.S.	
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes [3][4][6]**
2	Detected in source water in the U.S.	Yes [2][4]
1	Not detected in the U.S.	

Pathogenic Waterborne Mycobacteria (includes *M. avium, M. abscessus, M. fortuitum; M. gordonae; M. mucogenicum; M. chelonae; M. kansasii; M. xenopi; M. intracellulare*)

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**[CD] Symptoms of infection include disseminated disease (often in the presence of severe immunodeficiency), pulmonary disease (especially in vulnerable hosts with underlying structural lung disease, such as cystic fibrosis, bronchiectasis, and prior tuberculosis), lymphadentitis, post-traumatic wound infections. Diagnosis of disease and treatment requires physician intervention. [5][7][8]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	**Does the illness require short-term hospitalization (< week)?**	**[G] Symptoms of infection include pulmonary disease, lymphadenitis, posttraumatic wound**
3	Does the illness require physician intervention?	
2	Is the illness self-limiting (without requiring medical intervention)?	
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Pathogenic Waterborne Mycobacteria (includes *M. avium, M. abscessus, M. fortuitum; M. gordonae; M. mucogenicum; M. chelonae; M. kansasii; M. xenopi; M. intracellulare*)

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC). 2023 National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
2	Covert, T.C., M.R. Rodgers, A.L., Reyes, and G.N. Stelma Jr. 1999. Occurrence of nontuberculous mycobacteria in environmental samples. Applied and environmental microbiology. 65(6): 2492-2496.
3	Donohue, M.J. 2018. Increasing nontuberculous mycobacteria reporting rates and species diversity identified in clinical laboratory reports. BMC Infectious Diseases 18:163. https://doi.org/10.1186/s12879-018-3043-7.
4	Falkinham III, J.O. 2011. Nontuberculous mycobacteria from household plumbing of patients with nontuberculous mycobacteria disease. Emerging Infectious Diseases. 17: 419–424
5	Heymann, D. (ed.). 2022. Control of Communicable Diseases Manual, 21th Edition, pp. 676-677. American Public Health Association, Washington, DC.
6	King, D.N. 2016. Microbial pathogens in source and treated waters from drinking water treatment plants in the United States and implications for human health. Science of the Total Environment. 562: 987-995. https://doi.org/10.1016/j.scitotenv.2016.03.214
7	Griffith, D.E., T. Aksamit, B.A. Brown-Elliott, A. Catanzaro, C. Daley, F. Gordin, and M. Iseman. 2007. An official ATS/IDSA statement: diagnosis, treatment, and prevention of nontuberculous mycobacterial diseases. American journal of respiratory and critical care medicine. 175(4): 367-416.
8	Caulfield, A., E. Richter, B. Brown-Elliott, and N. Wengenack, 2023. Mycobacterium: Laboratory Characteristics of Slowly Growing Mycobacteria Other than Mycobacterium tuberculosis In: Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch33

Plesiomonas shigelloides

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	3	3	2	3	1.8
Total Score[2]	4.8				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score)

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [3]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [3]
3	**Has caused documented WBDOs at any time in the U.S.**	**Yes [3]** **1971-2008: 2 Noncommunity**
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes [2]**
2	Detected in source water in the U.S.	Yes [1][5][6]
1	Not detected in the U.S.	

Plesiomonas shigelloides

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	[E] Bacteremia more common with advanced age. [1]
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	[CD] Hospitalization may be required for severe infections and/or underlying diseases. [1]
3	**Does the illness require physician intervention?**	**[C, E] Physician office visit may be required for diagnosis and treatment of dysenteric form of the disease in children or the elderly. [1]**
2	**Is the illness self-limiting (without requiring medical intervention)?**	**[G] *Plesiomonas* infections are self-limiting. Diarrhea may persist up to two weeks.[1][4]**
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Plesiomonas shigelloides

Reference Number	Full Reference
1	Abbott, S.L. 2007. *Klebsiella* , *Enterobacter* , *Citrobacter* , *Serratia* , *Plesiomonas* , and other *Enterobacteriaceae* . In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.A. Pfaller, and R.H. Yolken (ed.) Manual of Clinical Microbiology, 10th Edition, Volume 1, p. 639. American Society for Microbiology Press, Washington, DC.
2	Centers for Disease Control and Prevention (CDC). 1998. *Plesiomonas shigelloides* and *Salmonella* serotype Hartford infections associated with a contaminated water supply – Livingston County, New York, 1996. MMWR. 47(19): 394-396.
3	CDC, 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
4	Das, S., V. Pierce, and K. Frank, 2023. *Klebsiella* , *Enterobacter* , *Citrobacter* , and Selected Other *Enterobacteriaceae* . In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch40
5	Holmberg, S.D. and J.J. Farmer. 1984. *Aeromonas hydrophila* and *Plesiomonas shigelloides* as causes of intestinal infections. Reviews of Infectious Diseases. 6(5):633-639.
6	Holmberg, S.D., K. Wachsmith, F.W. Hickman-Brenner, P.A. Blake, and J.J. Farmer. 1986. *Plesiomonas* enteric infections in the United States. Annals of Internal Medicine. 105(5): 690-694.

Pseudomonas aeruginosa

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
				X

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
Y

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	5	3	3	6	3.2
Total Score[2]	8.2				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score)

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	**Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021**	**Yes [2]** **2013: 1 Community** **2016: 1 Community** **2021: 1 Community**
4	Has caused at least one documented WBDOs in U.S. reported by CDC between 2013-2021	
3	Has caused documented WBDOs at any time in the U.S.	Yes; tap water in NICU [5] 2009-2012: 30 Community [2]
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes [5]**
2	Detected in source water in the U.S.	
1	Not detected in the U.S.	

Pseudomonas aeruginosa

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	Nosocomial pneumonia. [3]
6	**Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?**	**Septicemia and meningitis occur rarely in immunocompetent hosts but can occur in neonates and cystic fibrosis patients. [3] [1] [4]**
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	**Does the illness require physician intervention?**	**May require antibiotics [3]**
2	Is the illness self-limiting (without requiring medical intervention)?	
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Pseudomonas aeruginosa

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC). 2019. *Pseudomonas aeruginosa* . Available online at: https://www.cdc.gov/hai/organisms/pseudomonas.html.
2	CDC. 2023. National Outbreak Reporting System (NORS). Available online at https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
3	Henry, D. and D. Speert. 2010. *Pseudomonas* . In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.A. Pfaller, and R.H. Yolken (ed.) Manual of Clinical Microbiology, 8th Edition, p. 666. American Society for Microbiology Press, Washington, DC.
4	Høiby, N. , T. Bjarnsholt, and O. Ciofu, 2023. *Pseudomonas* In: Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch44
5	Kinsey, C.B., S. Koirala, B. Solomon, J. Rosenberg, B.F Robinson, A. Neri, A.L. Halpin, M.J. Arduino, H. Moulton-Meissner, J. Noble-Wang, and N. Chea. 2017. *Pseudomonas aeruginosa* outbreak in NICU linked to contaminated tap water. Infection Control & Hospital Epidemiology. 38(7): 801-808.

Rotavirus

Virus

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	3	3	2	4	2.142857143
Total Score[2]	5.1				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score)

OCCURRENCE DATA

Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [4]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [4]
3	**Has caused documented WBDOs at any time in the U.S.**	**Yes, 1971-2008: 1 Community [4]**
2	Has caused WBDOs in countries other than the U.S.	Yes, China and Sweden [5] and India [7]
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence		
Score	**Data Element**	**Scoring Data**
3	**Detected in drinking water in the U.S.**	**Yes [2] [5]**
2	Detected in source water in the U.S.	Yes [1] [5]
1	Not detected in the U.S.	

Rotavirus

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	Rotaviral enteritis is occasionally associated with severe dehydration in children. [6]
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	**Does the illness require short-term hospitalization (< week)?**	**[C] Rotavirus infects almost all children; causes severe gastroenteritis in infants. Children may become dehydrated and need to be hospitalized [3] [8] [9]**
3	Does the illness require physician intervention?	
2	**Is the illness self-limiting (without requiring medical intervention)?**	**[G, E, P, CD] Self-limiting acute watery diarrhea, vomiting, fever. [6]**
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Rotavirus

Reference Number	Full Reference
1	Abbaszadegan, M., M. LeChevallier, and C.P. Gerba. 2003. Occurrence of viruses in U. S. groundwaters. Journal of American Water Works Association. 95(9): 107-120.
2	Banks, W.S, C.A. Klohe, and D.A. Battigelli. 2001. Occurrence and Distribution of Enteric Viruses in Shallow Ground Water and Factors Affecting Well Vulnerability to Microbiological Contamination in Worcester and Wicomico Counties, Maryland. Water Resources Investigations Report. 01-4147: 14, 21.
3	Centers for Disease Control and Prevention (CDC). 2019. Rotavirus home page. Available online at: https://www.cdc.gov/rotavirus/index.html.
4	CDC. 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
5	Gerba, C.P., J.B. Rose, C.N. Haas, and K.D. Crabtree. 1996. Waterborne rotavirus: a risk assessment. Water Research. 30: 2929.
6	Heymann, D. (ed.). 2022. Control of Communicable Diseases Manual, 21st Edition, pp. 553-555. American Public Health Association, Washington, DC.
7	Hindiyeh, M., S. Das and S. Dunbar. 2023. Gastroenteritis Viruses. In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC.
8	Joshi, M. S., Lole, K. S., Barve, U. S., Salve, D. S., Ganorkar, N. N., Chavan, N. A., ... & Gopalkrishna, V. (2019). Investigation of a large waterborne acute gastroenteritis outbreak caused by group B rotavirus in Maharashtra state, India. *Journal of medical virology* , *91* (10), 1877-1881.
9	Pang, X. and M. Smieja. 2019. Gastroenteritis Viruses. In Carroll, K.C., M.A. Pfaller, M.L Landry, A.J. McAdam, R. Patel, S.S. Richter, and D.W. Warnock (ed) Manual of Clinical Microbiology, 12th Edition. American Society of Microbiology Press, Washington, DC.

Salmonella enterica

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
		X	X	

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISK SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	3	3	2	3	1.8
Total Score[2]	4.8				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score)

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [5]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [5]
3	**Has caused documented WBDOs at any time in the U.S.**	**Yes** **1971-2008: 13 Community** **7 Noncommunity [5]**
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence		
Score	**Data Element**	**Scoring Data**
3	**Detected in drinking water in the U.S.**	**Yes [1][3]**
2	Detected in source water in the U.S.	Yes [1]
1	Not detected in the U.S.	

Salmonella enterica

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	Each year, 1.4 M cases of illness and 600 deaths are caused by non-typhoidal salmonellosis in the U.S. [2] [7]
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	[C, E, CD] Nontyphoidal salmonellosis usually causes intestinal infection but can cause extraintestinal infections such as bacteremia, urinary tract infection, osteomyelitis, meningitis, endovascular infection, septic arthritis in rare cases (approximately 5% of people). Rates of invasive disease are generally higher among infants, older adults, and people who are immunocompromised, including those with HIV. People with atherosclerosis, hemoglobinopathies, or malignant neoplasms also have increased risk for extraintestinal infection. [7] Infection with antibiotic-resistant organisms has been associated with a greater risk for bloodstream infection and hospitalization. [4]
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	[C, E] Dehydration, especially among infants and in the elderly, may be severe. [6]
3	**Does the illness require physician intervention?**	**[C, E, CD] Antibiotics may be necessary. [6]**
2	**Is the illness self-limiting (without requiring medical intervention)?**	**[G] Nontyphoidal Salmonella infection usually presents with acute diarrhea, abdominal cramps, and fever. Illness usually resolves without treatment after 1–7 days. [4]**
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Salmonella enterica

Reference Number	Full Reference
1	Angulo, F.J., S. Tippen, D. J. Sharp, B.J. Payne, C. Collier, J.E. Hill, T.J. Barrett, R.H. Clark, E.E. Geldreich, H.D. Donnell Jr., and D.L. Swerdlow. 1997. A community waterborne outbreak of salmonellosis and the effectiveness of a boil water order. American Journal of Public Health. 87(4): 580-584.
2	Buchan, B., M. Faron, R. Humphries, J. Dekker, and N. Ledeboer. 2023. *Escherichia* , *Shigella* and *Salmonella* . In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC.
3	Centers for Disease Control and Prevention (CDC). 1998. *Plesiomonas shigelloides* and *Salmonella* serotype Hartford infections associated with a contaminated water supply – Livingston County, New York, 1996. MMWR. 47(19): 394-396.
4	CDC, 2019. Salmonella home page. https://www.cdc.gov/salmonella/index.html
5	CDC, 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023
6	Heyman, D. (ed.). 2022. Control of Communicable Diseases Manual, 21st Edition. American Public Health Association, Washington, DC.
7	Nataro, J.P., C.A. Bopp, P.I. Fields, J.B. Kaper, and N.A. Strockbine. 2007. *Escherichia* , Shigella, and *Salmonella* . In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.L. Landry, and M.A. Pfaller (ed.) Manual of Clinical Microbiology, 9th Edition, Volume 1, pp. 680-687. American Society for Microbiology Press, Washington, DC.

Shigella sonnei

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5
		X	X	X

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	4	3	2	3	1.8
Total Score[2]	5.8				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score)

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [4]
4	**Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021**	**Yes** **2015: 1 Community (suspected, not confirmed) [4]**
3	Has caused documented WBDOs at any time in the U.S.	1971-2008: 15 Community 23 Noncommunity (some unknown) [4]
2	Has caused WBDOs in countries other than the U.S.	Yes, China [8]
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes [6]**
2	Detected in source water in the U.S.	Yes [1]
1	Not detected in the U.S.	

Shigella sonnei

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	In U.S. approximately 350,000 - 500,000 cases of *Shigella* occur each year with an estimated 70 deaths. [2]
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	Reiter's syndrome (reactive arthritis). [7]
4	Does the illness require short-term hospitalization (< week)?	Hospitalization is usually required for intravenous antibiotic therapy due to bacteremia, which is uncommon. [7]
3	**Does the illness require physician intervention?**	**[C,E] Children and elderly are susceptible to increased severity of infection from *Shigella sonnei* .[7]** **Physicians may prescribe antibiotics to help treat the shigellosis.[5]** **Specific antibiotic therapy are available for prolonged or severe cases, however multi-antibiotic resistance can occur. [7]**
2	**Is the illness self-limiting (without requiring medical intervention)?**	**[G] Most people with shigellosis experience acute diarrhea that can be bloody, fever, nausea, vomiting, stomach pain, and tenesmus.** **Shigellosis is usually self-limiting in 4-7 days without treatment. [3] [7]** **People with mild shigellosis may need only fluids and rest. [5]**
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Shigella sonnei

Reference Number	Full Reference
1	Black, R.E., G.F. Craun, and P.A. Blake. 1978. Epidemiology of common-source outbreaks of shigellosis in the United States, 1961-1975. American Journal of Epidemiology. 108: 47-52.
2	Buchan, B., M. Faron, R. Humphries, J. Dekker, and N. Ledeboer. 2023. *Escherichia, Shigella and Salmonella* . In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC.
3	Centers for Disease Control and Prevention (CDC). 2019. *Shigella* home page. Available online at: https://www.cdc.gov/shigella/index.html.
4	CDC. 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
5	CDC, Shigella-Shigellosis, About Shigella infection. https://www.cdc.gov/shigella/about/index.html. Accessed November, 2023
6	Craun, G., R. Calderon, and M. Craun. 2003. Waterborne Outbreaks in the United States, 1971-2000, pp. 45-60. In Pontius, F. (ed.) Drinking Water Regulation and Health. John Wiley & Sons.
7	Heymann, D. (ed.). 2022. Control of communicable diseases manual, 21th edition. American Public Health Association, Washington, DC.
8	Ma Q, Xu X, Luo M, Wang J, Yang C, Hu X, Liang B, Wu F, Yang X, Wang J, Liu H, Li W, Zhong Y, Li P, Xie J, Jia L, Wang L, Hao R, Du X, Qiu S, Song H, Sun Y. A Waterborne Outbreak of Shigella sonnei with Resistance to Azithromycin and Third-Generation Cephalosporins in China in 2015. Antimicrob Agents Chemother. 2017 May 24;61(6):e00308-17. doi: 10.1128/AAC.00308-17. PMID: 28373192; PMCID: PMC5444132.

Toxoplasma gondii

Protozoa

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	2	1	2	7	3.2
Total Score[2]	5.2				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score)

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)		
Score	**Data Element**	**Scoring Data**
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [2]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [2]
3	Has caused documented WBDOs at any time in the U.S.	
2	**Has caused WBDOs in countries other than the U.S.**	**Yes. Canada and Brazil [1][3]**
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence		
Score	**Data Element**	**Scoring Data**
3	Detected in drinking water in the U.S.	
2	Detected in source water in the U.S.	
1	**Not detected in the U.S.**	**Detected in groundwater in Poland and Canada. [5] [7]**

Toxoplasma gondii

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	**Does the organism cause significant mortality (> 1/1,000 cases)?**	**[P] Infection during early pregnancy may lead to fetal infection with death of the fetus or other severe manifestations. Later in pregnancy, maternal infection results in mild or subclinical fetal disease. [4][6][8]**
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	Immunocompromised hosts may experience CNS, pneumonitis, and myocarditis. [8]
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	
3	Does the illness require physician intervention?	Treatment is indicated only for pregnant women, infants and immunocompromised hosts. [8]
2	**Is the illness self-limiting (without requiring medical intervention)?**	**[G, C, E, CD] Infection is generally asymptomatic; however, 10 – 20% of patients with acute infection may develop cervical lymphadenopathy and/or flu-like symptoms. [8]**
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Toxoplasma gondii

Reference Number	Full Reference
1	Bowie, W.R., S.A. King, D.H. Werker, J.L. Isaac-Renton, A. Bell, S.B. Eng, and S.A. Marion. 1997. Outbreak of toxoplasmosis associated with municipal drinking water. Lancet. 350: 173-177.
2	Centers for Disease Control and Prevention (CDC). 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
3	de Moura L., L.M. Bahia-Oliveira, M.Y. Wada, J.L. Jones, S.H. Tuboi, E.H. Carmo, W.M. Ramalho, N.J. Camargo, R. Trevisan, R.M. Graca, A.J. da Silva, I. Moura, J.P. Dubey, and D.O. Garrett. 2006. Waterborne toxoplasmosis, Brazil, from field to gene. Emerging Infectious Diseases. 12(2): 326-329.
4	Heymann, D. (ed.). 2022. *Control of Communicable Diseases Manual* , 21st Edition. American Public Health Association, Washington, DC.
5	Isaac-Renton, J., W.R. Bowie, A. King, G.S. Irwin, C.S. Ong, C.P. Fung, M.O. Shokeir, and J.P. Dubey. 1998. Detection of *Toxoplasma gondii* Oocysts in Drinking Water. Applied and Environmental Microbiology. 64(6): 2278-2280.
6	Robert-Gangneux, F. 2023. *Toxoplasma* . In Carroll KC, Pfaller MA Manual of Clinical Microbiology, 13th Edition. ASM Press, Washington, DC doi: 10.1128/9781683670438.MCM.ch142
7	Sroka J., A. Wojcik-Fatla, and J. Dutkiewicz. 2006. Occurrence of *Toxoplasma Gondii* in Water from Wells Located on Farms. Annals of Agricultural and Environmental Medicine. 13:169-175.
8	Wilson, M., J. Jones, and J. McAuley. 2007. *Toxoplasma* . In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.L. Landry, and M.A. Pfaller (ed.) *Manual of Clinical Microbiology* , 9th Edition, Volume 2, p. 2070. American Society for Microbiology Press, Washington, DC.

Vibrio cholerae

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	3	3	3	3	2.1
Total Score[2]	5.1				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score)

OCCURRENCE DATA

Reported Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [2]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [2]
3	**Has caused documented WBDOs at any time in the U.S.**	**1971-2008: 1 Bulk Water Purchase [2]**
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes (outbreak data) [2]**
2	Detected in source water in the U.S.	Yes [5] [4]
1	Not detected in the U.S.	

Vibrio cholerae

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	*V. cholerae* Non-O1: third most commonly isolated in U.S. - Septicemia case fatality rate from 47-65%. [1] [6]
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	*V. cholerae* O1: Extremely rare cases cause severe extraintestinal infection. If untreated, *V. cholerae* O1 infection causes severe dehydration which leads to hypovolemic shock, acidosis, circulatory collapse, and death. Unlike O1 strains, non-O1 isolates are commonly associated with extrainstestinal infections such as septicemia. [1]
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	
4	Does the illness require short-term hospitalization (< week)?	In severely dehydrated cases (cholera gravis), death may occur within a few hours, and the case-fatality rate may exceed 50%. With proper and timely rehydration, this can be less than 1%. [3]
3	**Does the illness require physician intervention?**	**[All populations] In most cases infection is asymptomatic or causes self-limiting diarrhea. Treatment consists of fluid replacement by oral rehydration therapy and/or intravenous fluids. [1]**
2	Is the illness self-limiting (without requiring medical intervention)?	
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Vibrio cholerae

Reference Number	Full Reference
1	Abbott, S.L., J.M. Janda, and J.J. Farmer. 2010. *Vibrio* and Related Organisms. In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.A. Pfaller, and R.H. Yolken (ed.) *Manual of Clinical Microbiology* , 8th Edition, Volume 1, p. 666. American Society for Microbiology Press, Washington, DC.
2	Centers for Disease Control and Prevention (CDC). 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
3	Heymann, D. (ed.). 2022. Control of Communicable Diseases Manual, 21st Edition, pp. 100-107. American Public Health Association, Washington, DC.
4	Kaper, J.B., H.B. Bradford, N.C. Roberts, and S. Falkow. 1982. Molecular epidemiology of Vibrio cholerae in the U.S. Gulf Coast. Journal of Clinical Microbiology. 16(1): 129-134.
5	Rhodes, J.B., H.L. Smith Jr., and J.E. Ogg. 1986. Isolation of Non-O1 Vibrio cholerae Serovars from Surface Waters in Western Colorado. Applied and Environmental Microbiology. 51(6): 1216-1219.
6	Tarr, C., W. Glover II, Y. Boucher, and J.J. Farmer III. 2019., *Vibrio* and Related Organisms. In Carroll, K.C., M.A. Pfaller, M.L. Landry, A.J. McAdam, R. Patel, S.S. Richter, and D.W. Warnock (ed). *Manual of Clinical Microbiology* , 12th Edition. American Society of Microbiology Press, Washington, DC.

Yersinia enterocolitica

Bacteria

PAST CCL STATUS

CCL 1	CCL 2	CCL 3	CCL 4	CCL 5

PAST NEGATIVE REGULATORY DETERMINATION STATUS

RD1	RD2	RD3	RD4
NA	NA	NA	NA

PUBLIC NOMINATION STATUS

Publicly Nominated for CCL 6:
N

SCORING SUMMARY

	OCCURRENCE SCORES		HEALTH RISKS SCORES		
Protocol	Waterborne Disease Outbreaks	Occurrence	General Population	Sensitive Population(s)	Calculated Health Score[1]
Score	3	3	2	2	1.4
Total Score[2]	4.4				

[1]Calculated Health Risk Score: The general population health risk score added to the highest health risk score of the sensitive subpopulation scores and multiplied by 5/14.
[2]Total Score: The calculated health risk score added to the highest score of the occurrence scores (Waterborne Disease Outbreak score or Occurrence score)

OCCURRENCE DATA

Waterborne Disease Outbreaks (WBDOs)

Score	Data Element	Scoring Data
5	Has caused multiple (2 or more) documented WBDOs in the U.S. reported by CDC between 2013-2021	No [1]
4	Has caused at least one documented WBDO in U.S. reported by CDC between 2013-2021	No [1]
3	**Has caused documented WBDOs at any time in the U.S.**	**1971-2008: 1 Noncommunity [1]**
2	Has caused WBDOs in countries other than the U.S.	
1	Has never caused WBDOs in any country, but has been epidemiologically associated with water related disease	

Occurrence

Score	Data Element	Scoring Data
3	**Detected in drinking water in the U.S.**	**Yes [2] [4]**
2	Detected in source water in the U.S.	Yes [6]
1	Not detected in the U.S.	

Yersinia enterocolitica

HEALTH RISKS DATA

Health Risks		
Score	**Data Element**	**Scoring Data**
7	Does the organism cause significant mortality (> 1/1,000 cases)?	No
6	Does the organism cause pneumonia, meningitis, hepatitis, encephalitis, endocarditis, cancer, or other severe manifestations of illness necessitating long-term hospitalization (> week)?	An uncommon complication of gastroenteritis is septicemia for which the elderly and immunocompromised are at higher risk, particularly those with metabolic diseases associated with iron overload (hemochromatosis), cancer, liver disease and steroid therapy. [5][7]
5	Does the illness result in long-term or permanent dysfunction or disability, i.e. sequelae?	Uncommon sequelae include: reactive arthritis, inflammatory bowel disease, autoimmune thyroid disorders. [7]
4	Does the illness require short-term hospitalization (< week)?	
3	Does the illness require physician intervention?	The elderly are at greater risk for septicemia. [7]
2	**Is the illness self-limiting (without requiring medical intervention)?**	**[G, C] Young children most commonly develop gastroenteritis and present with fever, diarrhea, and abdominal pain. Symptoms typically resolve within 7 days. [7]** **Infection typically manifested by acute febrile diarrhea with abdominal pain (especially in young children). [3]**
1	Does the illness result in mild symptoms with minimal or no impact on daily activities?	

Key: G - General Population, C - Child, E - Elderly, P - Pregnant Women, CD - Chronic Disease

Yersinia enterocolitica

Reference Number	Full Reference
1	Centers for Disease Control and Prevention (CDC). 2023. National Outbreak Reporting System (NORS). Available online at: https://wwwn.cdc.gov/norsdashboard/. Accessed November, 2023.
2	Eden, K.V., M.L. Rosenberg, M. Stoopler, B.T. Wood, A.K. Highsmith, P. Skaliy, J.G. Wells, and J.C. Feeley. 1977. Waterborne gastrointestinal illness at a ski resort-Isolation of *Yersinia enterocolitica* from drinking water. Public Health Reports. 92(3): 245-50.
3	Heymann, D. (ed.). 2005. *Control of Communicable Diseases Manual* , 18th Edition. American Public Health Association, Washington, DC.
4	Highsmith, A.K., J.C. Feeley, P. Skaliy, J.G. Wells, and B.T. Wood. 1977. Isolation of *Yersinia enterocolitica* from well water and growth in distilled water. Applied and Environmental Microbiology. 34: 745-750.
5	Kingry, L., C. Tarr, and J. Petersen. 2023. *Yersinia* . In Carroll KC, Pfaller MA *Manual of Clinical Microbiology* , 13th Edition. ASM Press, Washington, DC. doi: 10.1128/9781683670438.MCM.ch41
6	Meadows, C.A. and B.H. Snudden. 1982. Prevalence of *Yersinia enterocolitica* in waters of the lower Chippewa river basin, Wisconsin. Applied and Environmental Microbiology. 43: 953-954.
7	Wanger, A. 2007. *Yersinia* . In Murray, P.R., E.J. Baron, J.H. Jorgensen, M.L. Landry, and M.A. Pfaller (ed.) *Manual of Clinical Microbiology* , 9th Edition, Volume 1, p. 689-690. American Society for Microbiology Press, Washington, DC.

Appendix F. CCL 6 Data Source Descriptions

Data Sources for Microbial Contaminants

Data Source Name	**The National Outbreak Reporting System (NORS)**
Data Source Description	Launched in 2009 for Health Departments to report to CDC cases of enteric disease outbreaks caused by bacterial, viral, parasitic, chemical, toxin, and unknown agents, as well as foodborne and waterborne outbreaks of non-enteric disease. NORS was designed to integrate data on waterborne as well as foodborne outbreaks, but for CCL only the waterborne data were used.
Proprietor	CDC
Contact Information	CDC, 1600 Clifton Road, N.E., MS C-9, Atlanta, GA 30333. Telephone: 404-639-1700; E-mail: healthywater@cdc.gov
Type of Data Elements	Waterborne outbreak data
Relevance Explanation	This source is considered relevant for the CCL process because it contains information on drinking water outbreaks caused by microbial contaminants which is a major component of the scoring process.
Completeness Explanation	It meets considerations because it is peer reviewed.
Redundancy Explanation	This source is not redundant.
Retrievability Explanation	This source meets retrievability criteria because it is in tabular format.
Source URL	https://www.cdc.gov/nors/index.html

Data Source Name	**Center for Disease Control and Prevention's Morbidity and Mortality Weekly Reports (MMWR)**
Data Source Description	Since 1971, CDC, EPA and the Council of State and Territorial Epidemiologists (CSTE) have maintained a collaborative surveillance system for collecting and periodically reporting data related to occurrences and causes of Waterborne Disease Outbreaks (WBDOs). These reports from the CDC are published

	periodically in the MMWR. For CCL EPA used CDC's MMWR summaries as the source for the WBDO scoring protocol. The summaries include data on outbreaks associated with drinking water, recreational water, water not intended for drinking (excluding recreational water) and water use of unknown intent. Public health agencies are responsible for investigating outbreaks and reporting them voluntarily to CDC using a standard form. Only data on outbreaks associated with drinking water, water not intended for drinking (excluding recreational water) and water use of unknown intent are summarized in this report. CDC and EPA acknowledge that the WBDOs reported in the surveillance system represent only a portion of the burden of illness associated with drinking water exposure. The surveillance information does not include endemic waterborne disease risks. (Description adapted from website.)
Proprietor	CDC
Contact Information	Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC, 1600 Clifton Road, N.E., MS C-9, Atlanta, GA 30333. Telephone: 404-639-1700; E-mail: healthywater@cdc.gov
Type of Data Elements	Waterborne outbreak data
Relevance Explanation	This source is considered relevant for the CCL process because it contains information on drinking water outbreaks caused by microbial contaminants which is a major component of the scoring process.
Completeness Explanation	It meets considerations because it is peer reviewed.
Redundancy Explanation	This source is not redundant.
Retrievability Explanation	This source meets retrievability criteria because it is in tabular format.
Source URL	http://www.cdc.gov/mmwr/indss_2011.html

Data Source Name	**EPA Literature Search for Supplemental Data for Microbial Contaminants**
Data Source Description	As part of its ongoing assessment of microbes in drinking water, the EPA conducted a literature review of peer-reviewed, published journal literature for health risks and occurrence data for PCCL microbial contaminants from 2013-2022. The EPA reviewed all relevant research reports found to identify papers that might present data for the PCCL 6 microbes that might help inform the draft CCL 6. The EPA also reviewed studies submitted and referenced by nominators.
Proprietor	U.S. EPA
Contact Information	Nicole Tucker Email: Tucker.Nicole@epa.gov
Type of Data Elements	Health risks, drinking water occurrence data elements
Relevance Explanation	This source is considered relevant for the CCL process because it contains information on health risks and occurrence in water.
Completeness Explanation	It meets considerations because the studies were peer-reviewed.
Redundancy Explanation	This source is not redundant (though some, but not all, data may overlap among papers by the same authors).
Retrievability Explanation	Data not retrievable. This source contains written and tabulated data that can be copied and formatted.
Source URL	Not applicable

Data Source Name	**Manual of Clinical Microbiology (MCM), 13th Edition**
Data Source Description	The 13th edition of the MCM is the result of collaborative efforts of authors and editors from around the world, all experienced researchers and practitioners in medical and diagnostic microbiology. The manual has been brought fully up to date, resulting in 155 chapters containing the latest research findings, infectious agents, methods, practices and safety guidelines.
Proprietor	American Society for Microbiology Press, Washington, DC
Contact Information	James Versalovic Microbiology Laboratories Texas Children's Hospital Houston, Texas
Type of Data Elements	Production Volume

Relevance Explanation	This source is considered relevant for the CCL Universe because it contains health risks and occurrence information on microbial pathogens.
Completeness Explanation	This source meets considerations because it is peer reviewed.
Redundancy Explanation	This source is not redundant.
Retrievability Explanation	This source is not automatically retrievable. It is a book available for purchase.
Source URL	Not applicable