City of Milwaukee Health Department
Division of Disease Control and Prevention
Watershed Monitoring Report
2005

Purpose and Strategy

The waters of the Milwaukee River Watershed have been monitored by the City of Milwaukee Health Department (MHD) for *Cryptosporidium* and *Giardia* since 1994. The Watershed monitoring strategy has changed over the years as questions about *Cryptosporidium* and *Giardia* occurrence and distribution were answered and new questions arose.

In the past, samples were collected from the Milwaukee River and other sites. Because samples from the River Confluence have since been shown to be representative in content of *Cryptosporidium* and *Giardia* to those from the other sites, sampling from those other sites has been discontinued. Currently the purpose of monitoring is to track the occurrence and concentration of *Cryptosporidium* in waters (the River Confluence and diverted Waste Water Treatment Plant effluent) that are believed to influence source water quality.

Environment

The River Confluence is influenced by its three tributary rivers-the Milwaukee, Menomonee and Kinnickinnic, which are influenced by stormwater, other run-off, agriculture (Milwaukee and Menomonee) and upstream sewage treatment plants (Milwaukee River only). In addition, combined sewer and/or sanitary overflows, and/or Waste Water Treatment Plant diversions may occur during extensive rainy weather and may affect River Confluence water quality.

The waters of the River Confluence are greatly diluted by the waters of Lake Michigan. The intakes for the Linnwood and Howard Water Purification Plants are each located approximately 1 mile off-shore in Lake Michigan, where the effects of the Confluence, surface run-off, stormwater, combined and/or separate sewer overflows, and waste water effluent are greatly reduced. Source water at the two Water Purification Plants is monitored for *Cryptosporidium* and *Giardia* twice per month by Milwaukee Water Works.

Results

Results (see attached Table) from samples collected in 2005 were similar to those of previous years. *Cryptosporidium* was infrequently detected. *Giardia* was detected in more than ½ of all samples from the River Confluence in 2005, as in many of the previous years. Ranges for *Cryptosporidium* and *Giardia* were similar to the ranges detected in samples collected during 2001-2004.
No Waste Water Treatment Plant diversions occurred during the 2005 monitoring season (March 9 through October 19). In 2004, diverted waste water effluent contained between 8 and 118 *Giardia* cysts per Liter and no *Cryptosporidium.*

Discussion

The *Cryptosporidium* and *Giardia* contribution of the River Confluence to Lake Michigan and source water in 2005 was similar in frequency and concentration to that of previous years. *Cryptosporidium* and *Giardia* levels detected in samples from the River Confluence 2001-2005 when detected, were very low. *Cryptosporidium* was not detected in diverted waste water in 2005. It is not surprising that extremely low levels of *Cryptosporidum* and *Giardia* are detected, very rarely (data not shown here), in source water.

Most of the *Cryptosporidium* in samples collected from the River Confluence and analyzed by the Centers for Disease Control and Prevention in 1999-2001 were of a species not known to infect humans but rather those known to infect waterfowl or other wildlife.

For the past several years, information about the morphology of *Cryptosporidium* and *Giardia* detected in River Confluence samples has been gathered (data not shown here). Some of the oocysts/cysts appeared to have the organization, genetic material and structural integrity (though integrity does not guarantee the oocyst/cyst can cause an infection in a human) necessary support infection of a new host such as a human, but most oocysts and cysts did not.

In summary, monitoring results from the River Confluence show that very low levels of *Cryptosporidium* and *Giardia* may affect source water quality. These very low levels are likely to appear even less significant as a challenge to drinking water purification (removal or in activation of *Cryptosporidium* and *Giardia*) when it is considered that the ability of these organisms to actually establish infections in a human does not exist in all oocysts/cysts.

Plans for 2006

Monthly testing from March through October of the River Confluence will occur to track occurrence and concentration of *Cryptosporidium* and *Giardia*, and to watch for upward trends or spikes in frequency of occurrence or in concentration of either organism. If a Waste Water Treatment Plant diversion occurs, a sample will be collected and analyzed for *Cryptosporidium* and *Giardia.*

Partners

The City of Milwaukee Health Department wishes to thank the following for their assistance in Watershed Monitoring efforts:
Milwaukee Water Works
Milwaukee Metropolitan Sewerage District
Wisconsin State Laboratory of Hygiene
Water-Health Technical Subcommittee

Table: *Cryptosporidium* and *Giardia* Monitoring Results from 2001-2005
(NT=Not Tested; nd=not detected)

Cryptosporidium Oocysts/L			*Giardia Cysts/L*		
	MILW	**CONFL**		**MILW**	**CONFL**
2/15/2001	0.20	0.20	2/15/2001	1.60	1.80
3/12/2001	0.20	nd	3/12/2001	3.00	1.80
3/21/2001	0.20	0.10	3/21/2001	1.20	0.50
3/28/2001	0.10	0.10	3/28/2001	0.80	2.10
4/4/2001	0.16	nd	4/4/2001	0.79	0.95
4/11/2001	nd	0.22	4/11/2001	0.75	2.00
4/25/2001	0.90	nd	4/25/2001	1.20	1.65
5/30/2001	0.10	NT	5/30/2001	0.50	NT
6/20/2001	NT	0.20	6/20/2001	NT	1.60
6/27/2001	NT	nd	6/27/2001	NT	0.30
7/16/2001	nd	NT	7/16/2001	0.15	NT
8/22/2001	NT	nd	8/22/2001	NT	nd
9/26/2001	0.64	0.15	9/26/2001	5.32	0.30
AVG (RANGE)	**0.31 (0.1-0.9)**	**0.16 (0.10-0.22)**	**AVG (RANGE)**	**1.53 (0.15-5.32)**	**1.30 (0.5-2.1)**
2/12/2002	nd	0.30	2/12/2002	0.50	7.00
3/7/2002	0.05	nd	3/7/2002	0.70	nd
4/17/2002	0.53	nd	4/17/2002	0.53	0.53
5/16/2002	nd	nd	5/16/2002	nd	nd
6/19/2002	NT	nd	6/19/2002	NT	nd
7/23/2002	NT	nd	7/23/2002	NT	nd
7/29/2002	NT	nd	7/29/2002	NT	nd
9/11/2002	NT	0.14	9/11/2002	NT	0.28
10/9/2002	nd	nd	10/9/2002	0.69	0.15
10/16/2002	nd	nd	10/16/2002	1.23	0.30
10/23/2002	0.14	nd	10/23/2002	2.70	0.82
AVG (RANGE)	**0.24 (0.05-0.53)**	**0.22 (0.14-0.30)**	**AVG (RANGE)**	**1.06 (0.50-2.70)**	**1.51 (0.15-7.00)**
3/19/2003	nd	0.13	3/19/2003	0.25	0.13
4/8/2003	nd	nd	4/8/2003	0.27	nd
4/15/2003	1.10	nd	4/15/2003	nd	nd
5/22/2003	NT	nd	5/22/2003	NT	nd
6/26/2003	NT	nd	6/26/2003	NT	0.28
7/17/2003	NT	nd	7/17/2003	NT	nd
9/3/2003	nd	nd	9/3/2003	nd	nd
10/7/2003	nd	nd	10/7/2003	0.18	nd
11/24/2003	nd	nd	11/24/2003	0.16	0.16
AVG (RANGE)	**1.10 (1.10)**	**0.13 (0.13)**	**AVG (RANGE)**	**0.22 (0.16-0.27)**	**0.19 (0.13-0.28)**
3/11/2004	nd	nd	3/11/2004	0.40	0.27
4/14/2004	0.14	nd	4/14/2004	nd	nd
5/18/2004	NT	0.28	5/18/2004	0.40	0.28
6/23/2004	NT	nd	6/23/2004	NT	0.13
7/21/2004	NT	nd	7/21/2004	NT	0.14
8/25/2004	NT	nd	8/25/2004	NT	nd
9/8/2004	NT	nd	9/8/2004	NT	0.38
10/13/2004	nd	nd	10/13/2004	nd	0.10
AVG (RANGE)	**0.14 (0.14)**	**0.28 (0.28)**	**AVG (RANGE)**	**0.40 (0.40)**	**0.22 (0.10-0.38)**
3/9/2005	0.41	0.35	3/9/2005	0.27	0.12
4/27/2005	nd	nd	4/27/2005	0.60	3.50
5/26/2005	NT	nd	5/26/2005	NT	0.22
6/22/2005	NT	nd	6/22/2005	NT	0.30
7/13/2005	NT	0.10	7/13/2005	NT	nd
8/25/2005	NT	nd	8/25/2005	NT	0.10
9/22/2005	NT	nd	9/22/2005	NT	nd
10/19/2005	NT	nd	10/19/2005	NT	0.20
AVG (RANGE)	**0.41 (0.41)**	**0.23 (0.10-0.35)**	**AVG (RANGE)**	**0.44 (0.27-0.60)**	**0.74 (0.12-3.50)**
01-Present AVG (RANGE)	**0.35 (0.14-1.10)**	**0.19 (0.13-0.35)**	**01-Present AVG (RANGE)**	**1.01 (0.15-5.32)**	**0.89 (0.10-3.50)**