

MDHHS Response to Flint Area Community Health and Environment Partnership, American Society for Microbiology mBio Article February 5, 2018

- The article “Prevalence of infection-competent serogroup 6 within premise plumbing in Southeast Michigan” explores the genetic diversity of *Legionella pneumophila* (*L. pneumophila*) in Southeast Michigan, analyzing the Serotype and Serogroup of environmental samples from Flint and Detroit residents and clinical samples from patients submitted by hospitals in southeast Michigan.
 - The article concludes that Serogroup 6 environmental samples infected and survived within macrophages as well as virulent laboratory strains. The article concludes that *Legionella* disease caused by Serogroup 6 *L. pneumophila* is likely under reported worldwide as the commonly used urinary antigen test is not as sensitive to Serogroup 6 (SG6).
- There are 59 species of *Legionella* bacteria, three subspecies, and more than 70 serogroups found in both natural and artificial aquatic environments. Only 30 of these species are known to cause human disease. Distributions of *legionella* species and serogroups isolated from water systems and other manmade or natural aquatic sources is substantially different than the distribution of *Legionella* species isolated from human respiratory tract specimens in the published literature.
- Serogroup 1 (SG1) accounts for 80-90 percent of the clinically identified cases in the literature. Serogroups 2-14 account for about 7 percent of clinical cases.
- Only 30 percent of environmental samples are SG1; SG6 accounts for about 11 percent of *legionella* found in environmental sources in the literature. This is very close to the 12 percent of Flint samples described in this article.
- The Michigan Department of Health and Human Services (MDHHS) has examined all 3,442 confirmed cases of legionellosis reported in Michigan between 1992 and April 2017. Prior to 2004, *Legionella* species were generally not identified in case reports. Among the 2,520 confirmed cases reported since 2004, 517 cases had additional testing (sputum culture, paired serology or direct fluorescent antibody testing) capable of detecting *L. pneumophila* serogroup 2-14 or non-*pneumophila* species.
- Of these 517, 42 were non-*pneumophila* species of *Legionella* (n=26) or from a *L. pneumophila* serogroup other than SG1 (n= 16). Only three cases were found to be SG6. Another 12 cases were identified as having serogroup 2-14 but did not distinguish which specific serogroup. While based on typical distributions of *Legionella pneumophila* serogroups, it is likely that only 1-2 of these represent SG6, even if all 12 were assumed to be SG6 then 2.9 percent of the cases with known serogroup were potentially SG6. Genesee County had three non-*pneumophila* cases (one each in 2004, 2007 and 2009) but no cases positive for SG6. These Michigan findings are consistent with published studies showing the *Legionella pneumophila* serogroup 1 (Lp1) is the cause of 80-90 percent of all *legionella* cases.

- Between 2004 and 2017, the number of Legionellosis cases in Michigan increased 11 percent annually. Some of this increase is due to improvement in testing availability.
 - Urinary antigen testing is fast, noninvasive, inexpensive and highly sensitive for Lp1. The number of diagnostic tests that could reliably identify Legionella other than Lp1 remained constant over time averaging four non-Lp1 cases a year during this period. With increasing reliance on urinary antigen testing, the potential for failing to identify non-Lp1 Legionellosis cases may also increase.
- In response to concerns that urinary antigen testing would miss other serogroups of legionella, MDHHS, GCHD and area hospitals participated in a project to collect and test the sputum of pneumonia patients who tested negative for legionella on the urinary antigen testing. In the summer of 2016, there were 243 patients who were diagnosed with pneumonia in Genesee County and had tested negative for legionella on the urinary antigen test. Not a single sputum sample tested positive for any other serogroups of legionella.
- Since research has found that most exposures to legionella bacteria in the environment (especially non-Lp1) do not result in individuals developing Legionellosis and legionella bacteria are widespread through the environment, it can be challenging to define the risk of human illness, if any, from an identified source of legionella bacteria, in the absence of epidemiological data and no human cases have been linked to the source.
- Results of the enhanced surveillance effort for Legionellosis in Genesee County during 2016 support the conclusion that in 2016, missed Legionellosis (Lp1 and non-Lp1) cases were not a significant cause of pneumonia in Genesee County during the summer months when most Legionellosis cases are typically diagnosed.