

Consumer Protection, Technology and Utilities Committee
Public Hearing – Water Systems and Legionella: Closing the Regulatory and
Statutory Gap

July 20, 2026

Philadelphia City Hall – Council Chambers

11am to 1pm

Call to Order (Chair Burgos)

Opening Remarks (Chair Burgos)

Panel #1

Dr. Charles N. Haas – PhD, NAE, F AAAS, Dist. F IWA, F. AEESP, F SRA, BCEEM,
F ASCE, F AAM – Drexel University.

Dr. Jung Chueng, MD, MPH, FACOEM –Medical and Environmental Health
Scientist, Cogency

Ms. Kristina Zwolenik – Epidemiology Research Associate, PA Department of
Health

Dr. Jennifer Clancy – Medical Microbiologist

Member Q and A

Panel #2

Ms. Charlotte Katzenmoyer – Chief Executive Officer, Capital Region Water

Mr. Bill Murray – Reading Area Water Authority

Dr. Chris Crockett – PhD, P.E., Chief Environmental, Safety, and Sustainability
Officer - Essential Utilities

Benjamin C. Jewell, Commissioner – Philadelphia Water Department

Mr. Steve Chintaman – PA Apartment Association – Vice President of
Governmental Affairs

Member Q and A

Panel #3

Mr. Bill McQuade – Immediate Past President ASHRAE, Board Member – APLD,
Global VP and Head of Government Affairs and Sustainability, Baltimore
AirCoil Company

Steve Hvozdovich – Clean Water Action, PA Campaigns Director

Member Q and A

Closing Remarks

Chair Burgos

Adjournment

1 Written Testimony on House Bill 2085
2 Pennsylvania House of Representatives
3 Consumer Protection, Technology & Utilities Committee

4 Charles N. Haas, Ph.D., NAE
Betz Chair Professor of Environmental Engineering
Distinguished Professor
Drexel University

5 July 20, 2026

6 **Executive Summary**

7 Legionnaires' disease remains one of the most significant waterborne public health challenges facing
8 the United States and the Commonwealth of Pennsylvania. Although first recognized following the
9 1976 Philadelphia outbreak, the disease has continued to increase in incidence, with reported cases
10 rising more than six-fold over the past two decades [21, 10]. Most importantly, approximately 96%
11 of reported cases in the United States are sporadic, community-acquired infections for which no
12 specific environmental source is ever identified [21, 22]. This pattern indicates that preventing
13 disease requires controlling the conditions that allow *Legionella* to proliferate in engineered water
14 systems rather than responding only after recognized outbreaks occur.

15 The proposed legislation represents an important and commendable effort by the General
16 Assembly to address this continuing public health challenge. It appropriately recognizes the need
17 for systematic management of risks associated with *Legionella* and reflects growing awareness
18 that prevention requires more than ensuring the microbiological quality of water delivered by
19 public water systems. Effective prevention must also address conditions that promote pathogen
20 amplification within building plumbing and other engineered water systems.

21 The principal scientific question raised by the bill is whether increasing secondary disinfectant
22 residuals throughout public water distribution systems will, by itself, meaningfully reduce the risk of
23 Legionnaires' disease. The current scientific evidence indicates that this relationship is considerably
24 more complex. Once water enters premise plumbing, cooling towers, and other engineered water
25 systems, disinfectant residuals decline because of water age, stagnation, temperature, corrosion, and
26 biofilm development. These local conditions—rather than the disinfectant concentration entering
27 a building—largely determine whether *Legionella* amplifies to levels that present a public health
28 concern [8, 21, 17].

29 Maintaining an adequate disinfectant residual throughout the public distribution system remains
30 an essential component of safe drinking water and should continue to be required. The available
31 scientific evidence, however, indicates that increasing utility-level disinfectant residuals alone is
32 unlikely to provide substantial additional protection against building-associated Legionnaires' disease
33 while increasing the potential for undesirable consequences, including greater formation of regulated
34 disinfection by-products, accelerated corrosion of aging infrastructure, and additional operational
35 challenges associated with maintaining higher disinfectant concentrations [8, 21].

36 The current scientific evidence instead supports a shared-responsibility framework. Public water
37 suppliers are responsible for delivering biologically stable water to the building connection. Building
38 owners and operators are responsible for maintaining their internal engineered water systems in
39 a manner that minimizes the amplification and dissemination of *Legionella*. Effective legislation
40 should recognize these distinct responsibilities and establish a regulatory framework that addresses
41 both [21, 24].

42 Accordingly, I respectfully offer the following recommendations to the Committee:

- 43 1. **Emphasize proactive, systems-level prevention.** Recognize that *Legionella* is a ubiquitous
44 environmental organism for which “zero” colonization is neither an achievable nor a verifiable
45 regulatory target, and establish proactive, process-based risk management, rather than reactive
46 response to identified cases, as the state standard [21, 11].
- 47 2. **Base regulatory requirements on multi-barrier evidence rather than a single distribution-**
48 **system parameter.** Continue to require public water systems to maintain a stable secondary
49 disinfectant residual for overall distribution-system stability, while recognizing that this residual
50 is not, by itself, a reliable predictor of building-level *Legionella* occurrence [8, 11].
- 51 3. **Reform the consecutive-system classification that discourages on-site engineering con-**
52 **trols.** Pursue available federal flexibility (e.g., 40 C.F.R. §141.29) to relieve high-risk facilities
53 that install supplemental on-site disinfection from the full regulatory burden of a public water
54 system [21].
- 55 4. **Build on House Bill 2085's existing water management program requirement.** The bill
56 already directs covered buildings to implement water management programs consistent with
57 ASHRAE Standard 188 (§6707). I recommend that the Committee confirm the adequacy of
58 this provision's scope and add numeric, risk-based action levels and thermal-control targets
59 consistent with the National Academies' consensus recommendations [21].
- 60 5. **Strengthen surveillance and diagnostic capacity.** Encourage the use of respiratory culture,
61 quantitative PCR, whole-genome sequencing, and related laboratory methods that improve
62 environmental source attribution and support timely public health interventions [21, 11].

63 In summary, the proposed legislation addresses an important public health issue and provides
64 the Commonwealth with an opportunity to strengthen the prevention of Legionnaires' disease.

65 The available scientific evidence supports a comprehensive, multi-barrier approach that combines
66 sound operation of public water systems with effective management of building plumbing and
67 other engineered water systems. Aligning the legislation with this evidence will provide a stronger
68 scientific foundation for reducing the burden of Legionnaires' disease in Pennsylvania while avoid-
69 ing unintended consequences associated with relying primarily on increased distribution-system
70 disinfectant residuals.

1 Introduction

1.1 Purpose of this Testimony

I appreciate the invitation to testify on how best to reduce the occurrence of Legionnaire's disease in the context of HB 2085. My testimony will provide the scientific context to the problem, and outline what steps could be taken to reduce the risk to people from this disease, and the important roles and responsibilities of various entities in such responses.

I am appearing here in my personal, individual capacity, and not on behalf of my university or any agency, association, or corporation.

1.2 Biography and Qualifications

I am the L. D. Betz Professor of Environmental Engineering and Distinguished Professor in the Department of Civil, Architectural, and Environmental Engineering at Drexel University, where I have served since 1991. I have been engaged in teaching and research in environmental engineering since 1978. For more than 45 years, my professional and academic career has specialized in the assessment of risk from and control of human exposure to waterborne pathogenic microorganisms, specifically focusing on the treatment of water and wastewater to minimize public health risks. Throughout my research, I have developed pivotal risk assessment, occurrence, and disinfection models for *Legionella* in engineered water systems, and I co-directed the Center for Advancing Microbial Risk Assessment (CAMRA), a cooperative center of excellence funded by the U.S. Environmental Protection Agency and the U.S. Department of Homeland Security.

Among my over 250 publications are two editions of the book, *Quantitative Microbial Risk Assessment* and a forthcoming book (to be published in September), *Environmental Engineering for Pathogen Control*.

My advisory and public service contributions include serving on numerous committees of the National Academies of Sciences, Engineering, and Medicine, and I am a past member of both the Water Science and Technology Board and the U.S. EPA Board of Scientific Counselors. Notably, I served as a member of the National Academies Committee on the Management of *Legionella* in Water Systems, which produced the landmark 2020 consensus study report on this pathogen. I also served as vice chair of a 2006 National Academies Committee on Public Water Supply Distribution Systems: Assessing and Reducing Risks, which is relevant to the issues under discussion here. I am an elected Fellow of the American Academy of Microbiology, the American Association for the Advancement of Science, the American Society of Civil Engineers, the Association of Environmental Engineering and Science Professors, and the Society for Risk Analysis. I am a Distinguished Fellow of the International Water Association. I hold a B.S. in biology and an M.S. in environmental engineering from the Illinois Institute of Technology, and a Ph.D. in environmental engineering from the University of Illinois at Urbana-Champaign.

I am an elected member of the National Academy of Engineering, and have received the A.P. Black and the John Leal Awards from the American Water Works Association, and the Clarke Water

Prize from the National Water Research Institute. I am the current President-elect of the American Academy of Environmental Engineers and Scientists.

2 Legionnaires' Disease as a Continuing Public Health Problem

2.1 Burden of Disease

It is critical to recognize that infections caused by *Legionella pneumophila* present a severe and escalating public health threat in the United States and globally [21]. Estimates from the Centers for Disease Control and Prevention (CDC) indicate that Legionnaires' disease accounts for approximately 12% of all directly attributable waterborne disease healthcare costs associated with emergency department visits and hospitalizations in the United States [7]. While overall waterborne infections impose an annual financial burden of \$3.3 to \$3.8 billion on the U.S. healthcare system, water-based (saprozoic) pathogens alone account for over \$2.39 billion of these costs, reflecting the disproportionately high expense of treating severe respiratory infections compared to self-limiting gastrointestinal illnesses [7].

The burden is equally severe in Europe, where legionellosis ranks as the fifth most significant contributor to disability-adjusted life years (DALYs) among 31 selected infectious diseases, following only influenza, tuberculosis, HIV, and invasive pneumococcal disease [5]. This disease burden is further exacerbated by an aging population and a growing cohort of immunocompromised individuals who are highly susceptible to opportunistic pathogens [21, 11].

Active surveillance continues to document a relentless rise in the incidence of legionellosis. In the United States, reported cases increased more than six-fold between 2000 and 2018, rising from 0.42 to over 3.0 cases per 100,000 population [21, 10]. Pennsylvania holds a historically significant place in this public health timeline, as the disease was first identified following the landmark 1976 outbreak at the Bellevue-Stratford Hotel in Philadelphia, which infected 182 individuals and resulted in 29 fatalities [21]. Despite decades of clinical and engineering interventions, national and global notification rates have continued their upward trajectory, as detailed in recent collaborative assessments of global research needs [11].

A central challenge in managing this disease is that the vast majority of cases—approximately 96% in the United States and 70% in Europe—are sporadic, community-acquired infections for which no environmental source is ever definitively identified [21, 22]. While dramatic, high-profile outbreaks associated with cooling towers, hotels, or decorative fountains capture public attention, they represent only a fraction of the overall disease burden; the silent majority of cases are sporadic and likely trace back to colonization within complex, unmonitored building plumbing networks, or from other sources where only small numbers of persons may have been exposed [21, 10].

2.2 The Unique Ecology of *Legionella*

Unlike enteric pathogens that enter water systems via fecal contamination, *Legionella* species are naturally occurring, saprozoic organisms ubiquitous in natural aquatic and soil environments [21]. They have evolved to colonize human-made water systems, which provide highly favorable physical and chemical conditions for their survival and amplification [21].

The life cycle and environmental resilience of *Legionella* are fundamentally tied to its interactions with free-living protozoans (such as *Acanthamoeba* and *Naegleria*) and biofilms [21]. These biofilms can be in natural bodies of water, or in man-made (engineered) systems. In engineered systems, *Legionella* cells colonize the complex matrices of biofilms on pipes, cooling tower surfaces, surfaces of fountains etc., which shield the bacteria from shear stress and chemical disinfectants [21, 14]. More importantly, *Legionella* acts as an intracellular parasite, replicating inside host amoebae trophozoites [21]. This parasitic relationship offers several survival advantages:

- **Disinfection Resistance:** Intracellular growth within amoebic vacuoles or highly resilient protozoan cysts protects *Legionella* from extreme temperatures and standard municipal disinfectants like free chlorine or monochloramine [21].
- **Respirable Vesicles:** Upon lysing host cells, *Legionella* can be expelled into the water column within protozoan-derived vesicles. These lipid-bound vesicles can encapsulate hundreds of live bacteria, presenting a highly concentrated, infectious dose capable of deep inhalation into the human respiratory tract [21].
- **Phenotypic Adaptation and VBNC States:** Under environmental stress (e.g., biocide exposure or nutrient limitation), *Legionella* can transition into a viable but non-culturable (VBNC) state [21, 11]. While these cells cannot be detected using standard culture-based diagnostic media, they remain metabolically active and can resume replication and infectivity upon resuscitation inside a permissive protozoan host [21, 2].

Understanding this dual lifestyle—living both as free-floating cells in bulk water, as members of biofilm consortia, and as intracellular parasites within protective microeukaryotes—is essential to evaluating the limitations of municipal disinfectant residuals and designing effective building-level water management programs [11, 2].

3 Scientific Evidence Regarding Prevention

3.1 Potential Sources of Colonization

Engineered water systems do not exist in a sterile vacuum; they are constantly subjected to microbial seeding from various environmental reservoirs [17]. The primary sources of colonization which could result in subsequent amplification include:

- **Municipal Source Water:** Public water supplies are not intended to be sterile; low concentrations of *Legionella* cells can survive municipal treatment—often shielded inside free-living amoebae or biofilms—and continuously seed downstream plumbing networks [17].
- **Soil and Compost:** Soil, potting mixes, and garden compost are highly favorable growth media and have been found to harbor *Legionella pneumophila* as well as other pathogenic species [12].
- **Rainwater Harvesting:** Roof-runoff harvested in cisterns can be seeded with *Legionella* from environmental dust and bird droppings, presenting a notable colonization risk if used without downstream filtration and disinfection [9].
- **Construction and Plumbing Repairs:** Water-main breaks, physical repairs, and construction debris disrupt system pressure, dislodge protective pipe biofilms, introduce soil contaminants, and deplete local disinfectant residuals, frequently preceding community clusters [17].
- **Untreated Waters:** Untreated waters, including groundwater, have been found to contain viable *Legionella pneumophila* [6].

3.2 Amplification

Regardless of the source of *Legionella*, once the organism encounters a conducive environment, such as building plumbing, cooling towers, etc., multiplication can occur.

The amplification of *Legionella pneumophila* is widely documented across a diverse array of man-made and natural environments, with engineered water systems serving as the primary vectors for human exposure and subsequent infection [21]. These man-made reservoirs include building premise plumbing networks—such as showerheads, faucets, and thermostatic mixing valves—which provide the direct aerosolization mechanisms necessary for inhalation [14, 13], cooling towers and evaporative condensers [10, 26], recreational facilities like hot tubs, whirlpool spas, and public baths [18], and ornamental fountains [21]. Additionally, substantial colonization has been observed in the aeration ponds of municipal and industrial biological wastewater treatment plants, where the combination of high aeration and nutrient-rich waters creates an ideal growth environment [21, 23]. Outside of aquatic systems, non-water media such as commercial potting soils, natural soils, and garden compost piles also harbor high concentrations of both *L. pneumophila* and other pathogenic *Legionella* species (such as *L. longbeachae*), presenting a distinct, soil-associated pathway for community-acquired sporadic cases [4, 12].

This pathogen proliferation is primarily driven by three interacting environmental factors: warm water temperatures, hydraulic stagnation, and the development of complex biofilms. The optimal thermal window for *Legionella* replication is between 25°C and 45°C; water temperatures below 20°C inhibit growth as host protozoan digestion kinetics shift from parasitic replication to active predation [21, 14]. Extended water age and stagnation in dead-ends or oversized storage

tanks accelerate the decay of secondary disinfectant residuals, such as free chlorine or monochloramine, removing the primary chemical barrier to bacterial regrowth [8, 17]. Under these conditions, *Legionella* cells integrate into pipe-wall biofilms, which physically shield them from bulk-water disinfectants [21, 14]. Within the biofilm matrix, the pathogen multiplies intracellularly as an obligate parasite inside free-living protozoan hosts, such as *Acanthamoeba* and *Vermamoeba* trophozoites, which provide the essential nutrients and protection required for the bacteria to differentiate into highly infectious, transmissible forms [2, 21].

The specific chemical composition of water and the materials used in plumbing networks further dictate the rate of amplification. Dissolved iron acts as an essential nutrient that directly stimulates *Legionella* growth and virulence, meaning that unlined cast-iron pipes—which corrode rapidly, consume chlorine residuals, and form porous iron oxide scales—provide a highly favorable habitat [21]. Furthermore, modern synthetic plumbing materials, such as cross-linked polyethylene (PEX) or flexible polyvinyl chloride (PVC-P) hoses, can exacerbate colonization by leaching biodegradable organic carbon (BDOC) and assimilable organic carbon (AOC) into the water, which feeds the heterotrophic biofilm and indirectly stimulates protozoan host populations [21, 20]. Conversely, in chloraminated systems, monochloramine decay releases free ammonia, which can stimulate nitrifying biofilms under stagnant conditions, leading to rapid local disinfectant loss and accelerated pathogen proliferation [17, 20].

3.3 Exposure Pathways

Human exposure to *Legionella* species occurs almost exclusively through the inhalation or microaspiration of contaminated water droplets suspended in the air [21]. To initiate an infection in the lower respiratory tract, these aerosols must typically fall within the respirable size range of 1 to 10 μm , which allows them to bypass upper airway defenses and deposit directly within the lung alveoli [21].

Engineered water systems contain numerous proximate sources capable of generating these infectious aerosols. These include:

- **Premise Plumbing Fixtures:** Standard showerheads, particularly fine-mist models, and faucet aerators draw air into the water stream, generating high volumes of respirable aerosols [21].
- **Cooling Towers and Evaporative Condensers:** These large-scale heat-rejection systems utilize fan-induced drafts to cool circulating water, producing massive, high-velocity aerosol plumes that can disperse bacteria over several kilometers [21]. These types of equipment can be on individual buildings [19], in use by industries [15], or in use by electric power generation facilities [3]. With the dramatic growth in data centers, which frequently rely on wet cooling towers for thermal control, the potential for these additional sources merits further investigation [1].
- **Recreational and Architectural Features:** Hot tubs, whirlpool spas, and decorative fountains use water jets, air injection, or physical cascades that continuously generate fine mists directly in the breathing zone of users [18].

- **Misters and Humidifiers:** Ultrasonic and centrifugal humidifiers disperse cold, unheated water droplets, making them highly efficient dissemination vectors if their reservoir water is colonized [21].

Understanding these pathways demonstrates that public health risks are not uniform; they are heavily concentrated around specific aerosol-generating fixtures and systems, where vulnerable populations are housed, or nearby potential sources of aerosols such as cooling towers etc. [21].

3.4 Responsibilities Across the Engineered Water System

Effective prevention requires recognizing the distinct jurisdictional boundaries that govern our water infrastructure. In the United States, a public water utility's legal and operational responsibility typically ends at the property line or water meter [21]. Under the Safe Drinking Water Act (SDWA), municipal utilities are tasked with delivering biologically stable water to the building gate, but they have no control over the miles of complex plumbing inside the structure [21]. The significance of this was summarized in a 2006 National Academies Report, with relevant highlights noted in the box [24].

(summarized from [24])

The physical scale of drinking water infrastructure shifts dramatically past the property boundary, where the public distribution system's 1 million miles of municipal mains expand to over 6 million miles of private service lines and premise plumbing. Consequently, more than 80% of the wetted surface area of our nation's water infrastructure resides entirely within private buildings, beyond utility jurisdiction and regulatory oversight. This private network is characterized by an exceptionally high surface-area-to-volume ratio, estimated at 2.1 cm²/mL for standard 1.9-cm home plumbing compared to just 0.26 cm²/mL for a typical 15.2-cm public water main. This geometric reality maximizes chemical and biological reactions at the pipe-water interface.

Once municipal water enters this private network, the hydraulic regime shifts from continuous flow to prolonged stagnation, exponentially increasing water age. In contrast to the active flow maintained in looped public mains, water sits stagnant in building plumbing for hours, days, or even weeks depending on occupancy patterns. This stagnation, combined with wetted surface reactions and exposure to extreme indoor temperatures (which can range up to 100°C at the surface of water heater elements), accelerates the decay of secondary disinfectant residuals like free chlorine and chloramine.

As disinfectant residuals deplete, the high surface area and warm, stagnant conditions transform premise plumbing into highly favorable microclimates for microbial regrowth. Biofilms readily colonize wetted pipe walls and fixtures, utilizing assimilable organic carbon leached from synthetic plumbing materials (like PEX) and corrosion scales on legacy metal pipes. This environment facilitates the colonization and rapid intracellular amplification of opportunistic pathogens, most notably *Legionella pneumophila* and nontuberculous *Mycobacterium avium*, which replicate inside host amoebae and are subsequently aerosolized into the breathing zone of users at distal taps and showerheads.

An instructive analogy can be drawn to the electric utility industry:

An electric utility is responsible for generating power and delivering it safely to a building's service panel. However, the utility is not responsible for a fire caused by faulty, outdated, or overloaded wiring inside a private residence. Similarly, a water utility cannot be held solely responsible for the amplification of pathogens inside a complex building plumbing network, over which it has no control, that experiences high water age, thermal decay, and stagnation.

This split-responsibility model highlights a significant regulatory gap. While municipal water systems generally maintain high-quality water, the chemical and biological quality can degrade rapidly once inside building premise plumbing [21]. Consequently, preventing legionellosis should be treated as a shared responsibility: municipal utilities should optimize distribution system stability, while

building owners and facility managers should actively maintain their internal networks [17].

3.5 Evidence Regarding Disinfectant Residuals

Under the SDWA Surface Water Treatment Rule (SWTR), utilities are required to maintain a detectable secondary disinfectant residual throughout the distribution network [21].

In a landmark study, LeChevallier [16] demonstrated that maintaining a free chlorine residual of at least 0.1 mg/L was highly effective at keeping *L. pneumophila* concentrations below 10 MPN/100 mL, particularly when bulk water temperatures exceeded 18°C.

However, relying on distribution system residuals as a single predictor for building-level safety has severe limitations. In a comprehensive 2026 study evaluating water quality across approximately 5,600 federally owned and leased buildings, Hagen et al. [8] found **no clear numeric distribution system residual threshold consistently linked to lower *Legionella* occurrence in buildings**. This decoupling occurs because several dominant building-specific variables dictate colonization:

- **Water Age and Stagnation:** Large buildings and green designs designed to conserve water significantly increase water residence times, allowing disinfectant residuals to decay completely.
- **Plumbing Materials:** Common pipe materials react differently with disinfectants; for example, legacy unlined iron pipes rapidly consume chlorine residuals through corrosion reactions, while plastic materials like PEX can leach organic carbon that stimulates biofilm growth.
- **Nitrification:** In chloraminated systems, the decay of monochloramine releases free ammonia, which can stimulate nitrifying biofilms under warm, stagnant conditions, completely depleting the disinfectant residual and leaving the plumbing vulnerable.

A similar decoupling between the water quality at the exit of a distribution system and the water in use (that could potentially be aerosolized) exists in the context of other uses, such as cooling towers, spas and hot tubs, fountains, misters, etc.

3.6 Control Measures Supported by the Strongest Evidence

Rather than relying on a single water quality parameter, the scientific consensus emphasizes a holistic, multi-barrier approach [11]. The strongest, evidence-based preventive measures include:

1. **Systematic Water Management Plans (WMPs):** Developing and implementing building-specific WMPs in accordance with ASHRAE Standard 188 represents the gold standard of care [21]. These programs identify critical control points, establish operational limits (e.g., temperature and biocide levels), and continuously validate their efficacy [21].
2. **Strict Temperature Control:** Maintaining hot water storage heaters at a minimum of 60°C (140°F) and circulating hot water to ensure temperatures exceed 55°C (131°F) at distal points remains the most effective physical barrier to restrict *Legionella* amplification [21, 25]

- 305 3. **Cooling Tower Management:** Mandatory registration, continuous oxidizing biocide dosing
306 (e.g., maintaining 0.3 to 0.7 mg/L free chlorine), routine monthly servicing, and the installation
307 of high-efficiency drift eliminators have been shown to drastically reduce community outbreaks
308 and colonization rates [21].
- 309 4. **Targeted Healthcare Guidance:** Requiring hospitals and long-term care facilities to conduct
310 routine environmental sampling for *Legionella* in high-risk units provides direct, actionable
311 validation that engineering controls are successfully protecting vulnerable patients [21].

312 4 Scientific Assessment of House Bill 2085

313 A review of House Bill 2085 against the available scientific evidence indicates that while its focus on
314 systematic water management is well founded, its proposed reliance on a fixed, elevated secondary
315 disinfectant residual at the utility boundary lacks strong empirical support as a means of controlling
316 *Legionella* within complex building plumbing systems.

317 4.1 Positive Elements

318 House Bill 2085 represents a highly commendable and much-needed legislative effort to address the
319 leading cause of reportable waterborne disease outbreaks in the United States [21]. By drafting this
320 legislation, the General Assembly of Pennsylvania is taking a proactive step to:

- 321 • **Recognize the Public Health Burden:** The bill directly acknowledges the severe morbidity,
322 mortality, and financial costs associated with Legionnaires' disease, elevating it to a high-
323 priority public health issue in the Commonwealth [21].
- 324 • **Increase Public and Institutional Awareness Beyond the Utility Boundary:** The water
325 industry (utilities and their consultants) has long been aware of the need to control pathogens,
326 including *Legionella*, through drinking water treatment, and water delivered to customers at
327 the point of delivery is designed to be safe and wholesome under the requirements of the Safe
328 Drinking Water Act. The proposed legislation's principal value lies in extending that awareness
329 to those who take custody of the water after delivery and may not otherwise take care to
330 minimize its degradation in quality, such as building owners, industries and facilities that
331 operate cooling towers, and establishments using misters, fountains, or other architectural
332 water features [21].
- 333 • **Mandate Systematic, Building-Level Water Management:** By requiring the owners and
334 operators of buildings meeting the applicability criteria of ASHRAE Standard 188-2021 to im-
335 plement a water management program consistent with that Standard and with ASHRAE Guide-
336 line 12-2023 (§6707), the bill already establishes the building-level management framework
337 that the scientific literature identifies as the primary control point for *Legionella* amplification
338 [21, 8, 11].

- **Promote Systematic Water Management:** By shifting the conversation toward accountability and oversight particularly via end users, the bill aligns with the scientific consensus that active, planned oversight of engineered water systems is required to protect vulnerable populations [8, 11].

4.2 Scientific Questions and Limitations Raised by the Bill

While the intent of House Bill 2085 is scientifically sound, several of its specific mandates raise critical engineering questions and run counter to the latest empirical evidence regarding pathogen behavior in distribution and building plumbing networks.

4.2.1 The Decoupling of Utility Residuals and Building-Level Proliferation

The disinfectant-residual provision in House Bill 2085 presupposes that mandating a specific, elevated secondary disinfectant residual throughout the municipal distribution system will translate into a corresponding reduction of *Legionella* occurrence inside buildings. This presupposition is not supported by the recent, highly detailed study by von Hagen [8], who found a decoupling between residual disinfectant entering the premises of a user and the actual occurrence of *Legionella* at the point of use.

This decoupling occurs because of the specific phenomena noted above, which principally govern the survival and growth of the pathogen [21, 8]:

- **Water Age and Stagnation:** Large buildings, particularly those designed for water conservation, experience extreme water residence times. This stagnation allows secondary disinfectants like free chlorine or monochloramine to decay to near-zero levels, regardless of the residual concentration delivered at the building's gate [8, 17].
- **Thermal Decay:** The warm ambient temperatures inside building plumbing networks (ranging from 25°C to 43°C) rapidly accelerate biocide decay while simultaneously providing the optimal thermal window for explosive *Legionella* replication within host amoebae [21, 17].
- **Biofilm Shielding:** *Legionella* predominantly replicates as an intracellular parasite inside free-living protozoans embedded in complex pipe biofilms [21]. This parasitic niche shields the bacteria from bulk-water disinfectants, rendering standard distribution residuals ineffective without localized thermal or physical control measures [21, 2].

4.2.2 Potential Unintended Consequences of Rigid Disinfectant Mandates

Mandating water utilities to maintain high numeric residuals (e.g., up to 0.5 mg/L free chlorine or 0.7 mg/L chloramines, as currently discussed in federal regulatory revisions) to solve building-level *Legionella* issues presents significant technical and public health trade-offs [8]:

- **Disinfection By-Product (DBP) Formation:** Under the Safe Drinking Water Act (SDWA), utilities must carefully balance pathogen inactivation with the formation of carcinogenic DBPs, such as trihalomethanes (TTHMs) and haloacetic acids (HAA5). Increasing chlorine residuals at the utility level to address a building-level problem would increase DBP exposure for the general public, potentially above federal water quality standards [8].
- **Corrosion and Iron Release:** Legacy distribution systems in Pennsylvania are heavily composed of unlined cast-iron mains [21]. Elevated free chlorine concentrations can accelerate pipe corrosion, which not only degrades infrastructure but also consumes disinfectant residuals through oxidation chemistry [21]. Crucially, dissolved iron serves as an essential nutrient that actively stimulates the growth of *Legionella* biofilms [21]. This same failure cascade—corrosive water depleting chlorine residuals while stimulating iron-rich *Legionella* growth—has been identified as a major contributing factor in the increase in Legionnaires’ disease cases associated with the Flint, Michigan water crisis, although the full causal chain in that event was never conclusively established [21].
- **Pathogen Selection and Nitrification:** In chloraminated systems, the decay of monochloramine releases free ammonia, which can stimulate nitrifying biofilms under warm, stagnant conditions [17]. This process can deplete the disinfectant residual, leaving the building plumbing highly vulnerable to colonization [17].

4.2.3 Biological Risk Trade-offs: The Mycobacterium Problem

Engineering interventions targeting a single pathogen can inadvertently select for other dangerous waterborne pathogens [21]. For example, while monochloramine is highly effective at controlling *L. pneumophila* in plumbing networks [21, 17], long-term hospital studies have shown that its continuous application can lead to a significant increase in the colonization and positivity rates of *Mycobacterium avium* complex (MAC) [21, 17]. Like *Legionella*, MAC is a severe, opportunistic respiratory pathogen that infects vulnerable and immunocompromised populations through inhaled aerosols [17]. A regulatory framework that requires water systems to adopt specific chemical disinfection regimes without a multi-pathogen risk assessment risks replacing one respiratory pathogen risk with another [21, 17].

4.2.4 Unintended Regulatory Barriers: The "Consecutive System" Obstacle

Under current U.S. Environmental Protection Agency (EPA) interpretations of the Safe Drinking Water Act, if a high-risk building (such as a hospital or senior-care home) installs an on-site secondary disinfection system—such as chlorine dioxide, copper-silver ionization, or chloramine boosting—to protect its occupants, that building is legally classified as a consecutive public water system [21]. This designation instantly subjects the building owner to the full administrative, monitoring, and reporting burdens of a municipal water utility [21]. This regulatory consequence discourages facility

managers from implementing the very on-site engineering controls that the scientific literature demonstrates are the most effective at preventing *Legionella* growth and protecting human lives [21].

4.2.5 Feasibility and Yield of Universal Case Investigation

Section 6706 of House Bill 2085 directs the Department of Health or a local health officer to conduct an epidemiological investigation for every reported diagnosis of Legionnaires' disease in the Commonwealth. This provision merits consideration alongside the point discussed earlier in this testimony: approximately 96% of reported U.S. cases are sporadic, community-acquired infections for which no environmental source is ever identified [21, 22]. A universal, case-by-case investigation requirement will commit public health resources to investigations that, based on national experience, are unlikely to identify a specific environmental source in the large majority of instances. This is not, by itself, a reason to forgo investigation; surveillance data retain value independent of source attribution, and a meaningful subset of sporadic cases may prove traceable given sufficient investigative resources. The Committee may nonetheless wish to consider whether the Department of Health should be given discretion to prioritize investigative intensity toward clusters, outbreaks, and cases involving vulnerable populations, or whether a risk-based tiering of investigative effort would better match the epidemiology of this disease while preserving the surveillance value of universal case reporting [21].

5 Recommendations

A comprehensive regulatory strategy for the Commonwealth should look beyond utility-level disinfectant residuals to address the complex premise plumbing dynamics where *Legionella pneumophila* actually amplifies. Based on the scientific evidence, municipal residuals are substantially decoupled from building-level colonization due to water age, thermal decay, and the protective niche of biofilms. Therefore, Pennsylvania's policy should transition toward a shared-responsibility model that pairs utility-level stability with the building-level water management programs already required in part by §6707, strengthened with numeric action levels and thermal-control standards.

Based on the scientific evidence and the critical assessment of House Bill 2085, I offer the following five key recommendations to the Committee to establish a scientifically defensible and public-health-protective regulatory framework for the Commonwealth:

5.1 Emphasize Proactive, Systems-Level Prevention Over Reactive Measures

Legislation should recognize that *Legionella* species are ubiquitous, naturally occurring aquatic organisms, meaning that "zero" colonization is neither an achievable nor a verifiable target in engineered water systems [21]. Instead of reacting only after disease cases are clinically identified—a method that leaves the silent majority of sporadic, community-acquired cases unaddressed—the

Commonwealth should establish proactive, process-based risk management as the state standard [11]. A system of checks, including routine flushing, biological monitoring, and physical barriers, should be applied systematically to prevent rapid intracellular amplification of *Legionella* inside protozoan hosts before it can reach water users [2]. More importantly, while water utilities are already highly regulated, increased emphasis on educating and overseeing what happens to water after it leaves utility control is most needed.

5.2 Base Regulatory Requirements on Rigorous, Multi-Barrier Scientific Evidence

While water utilities should continue to maintain a stable secondary disinfectant residual to ensure overall biological stability in the public distribution system, the General Assembly should not treat utility-level residuals as a single predictor of building-level safety [8, 11]. The 2026 GSA-based study of approximately 5,600 buildings demonstrated that building-specific variables—such as water age, plumbing materials, and local stagnation—substantially decouple municipal residuals from building colonization [8]. Rather than mandating elevated residuals that risk increasing public exposure to carcinogenic disinfection by-products (DBPs) and stimulating corrosive iron release, which can in turn stimulate *Legionella* biofilm growth, regulations should focus on building-level controls [21].

5.3 Reform the Consecutive System Rule to Empower Localized Engineering Controls

A significant regulatory barrier currently exists under the Safe Drinking Water Act: if a high-risk facility, such as a hospital or long-term care home, installs an on-site secondary disinfection booster system to protect its vulnerable residents, it is legally classified as a “consecutive public water system” [21]. This designation penalizes proactive facility managers by subjecting them to the administrative, monitoring, and financial burdens of a municipal water utility [21]. The Commonwealth should utilize federal provisions (such as 40 CFR §141.29) to combine or exempt consecutive systems, streamlining the regulatory pathway for high-risk buildings to safely implement on-site engineering controls without administrative penalties [21]. Because this classification arises under federal Safe Drinking Water Act regulations rather than state law, the Commonwealth’s ability to act on this recommendation runs through the Department of Environmental Protection’s exercise of its primacy authority to apply 40 C.F.R. §141.29, or through engagement with the U.S. Environmental Protection Agency, rather than through amendment of Title 27 alone. I raise it here because it bears directly on the scientific case for enabling building-level engineering controls, even though its resolution may lie partly outside this Committee’s direct statutory authority.

5.4 Codify Comprehensive Water Management Plans, Thermal Barriers, and Risk-Based Action Levels

Rather than relying on chemical residuals alone, Pennsylvania should build on the water management program requirement already established in §6707 by adding the following enforceable components:

- **Confirm and, if Necessary, Broaden WMP Scope:** House Bill 2085 ties its water management program requirement to the applicability criteria specified within ASHRAE Standard 188-2021 itself. The Committee should confirm that this scope reaches the full range of public and commercial buildings (excluding single-family homes) where sporadic, community-acquired cases are believed to originate, and specify minimum plan content—control points, validation frequency, and documentation—beyond a general reference to the Standard [21].
- **Strict Thermal Barriers:** Mandate that hot water heaters and storage reservoirs be maintained at a minimum of 60°C (140°F) and circulated to ensure temperatures exceed 55°C (131°F) at distal outlets, which represents the single most effective physical control against pathogen amplification [21].
- **Risk-Based Numeric Action Levels:** Replace the historically controversial and unvalidated “30% site positivity” rule with a strict numeric action level [21]. Following the NASEM scientific consensus, the Commonwealth should establish a concentration of **50,000 CFU/L (50 CFU/mL)** of culturable *L. pneumophila* **at the point of end use where aerosolization could occur** as the legal action level that immediately triggers system review, intensive flushing, and localized disinfection [21, 17].

5.5 Support Enhanced Surveillance, Diagnostic Culturing, and Applied Research

To successfully trace and interrupt community-acquired infections, the Commonwealth should expand clinical and environmental diagnostic capacity [21]. Sole reliance on the clinical urinary antigen test (UAT) is highly problematic; it is highly specific to *L. pneumophila* serogroup 1, thereby failing to detect up to 20–40% of cases caused by other serogroups and species, and it does not yield the bacterial isolates required for epidemiological traceback investigations [21]. The Commonwealth should incentivize clinicians to perform lower respiratory sputum cultures and equip public health laboratories with the resources to perform whole-genome sequencing (WGS) and quantitative PCR (qPCR) to match clinical isolates directly with environmental reservoirs [21, 11].

6 Conclusions

In conclusion, controlling *Legionella pneumophila* requires a fundamental shift from treating water safety as a localized, utility-boundary issue to managing the entire engineered water system [8, 11]. House Bill 2085 represents an important step toward addressing the public health burden of Legionnaires’ disease in Pennsylvania [21]. However, mandating specific, elevated secondary disinfectant residuals at the utility level lacks scientific support as a standalone solution for buildings [8]. To protect public health effectively, the Commonwealth should adopt a comprehensive, multi-barrier framework that combines stable municipal delivery with adequately specified building water management plans, thermal controls, reformed consecutive-system regulations, and advanced diagnostic surveillance [21, 11].

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House Bill 2085 and Legionnaires' Disease

Scientific Considerations for the Pennsylvania House Consumer Protection, Technology & Utilities Committee

Charles N. Haas, Ph.D., NAE

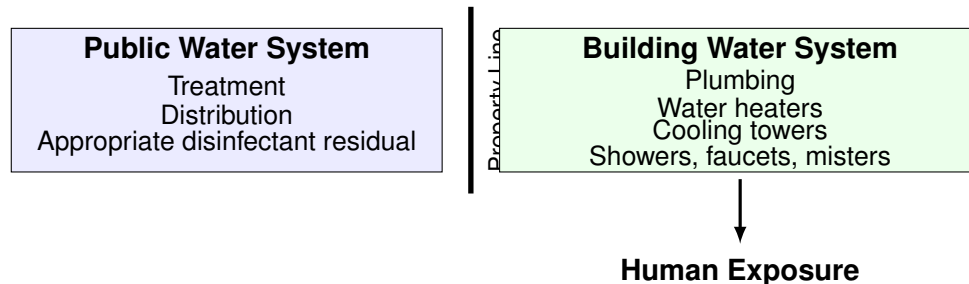
Betz Chair Professor of Environmental Engineering

Distinguished Professor, Drexel University

Why This Matters

- Reported U.S. cases of Legionnaires' disease have increased more than six-fold since 2000.
- Approximately **96%** of reported cases are sporadic, with no environmental source ever identified.
- Prevention therefore requires controlling the conditions that allow *Legionella* to multiply before disease occurs.

Shared Responsibility for Prevention



Public Water Suppliers

- Deliver biologically stable drinking water
- Maintain distribution-system integrity
- Maintain appropriate disinfectant residuals

Building Owners and Operators

- Reduce stagnation and water age
- Maintain appropriate temperatures
- Implement ASHRAE 188 water management programs
- Control aerosol-generating systems

What Current Scientific Evidence Indicates

- Maintaining an adequate disinfectant residual throughout the public distribution system is essential.
- Building conditions—not the disinfectant residual entering the building—are usually the dominant determinants of *Legionella* amplification.
- Water management programs provide the strongest evidence-based approach for reducing building-associated Legionnaires' disease.

Scientific Considerations Regarding HB 2085

The bill appropriately emphasizes building water management.

Current evidence also suggests that increasing distribution-system disinfectant residuals alone is unlikely to substantially reduce *Legionella* occurrence inside buildings while potentially increasing

- regulated disinfection by-products,
- corrosion of aging infrastructure,
- utility operating costs, and
- operational complexity.

Recommendations

1. Continue emphasizing proactive prevention.
2. Maintain a multi-barrier approach to risk management.
3. Encourage building-level engineering controls.
4. Strengthen implementation of water management programs.
5. Enhance surveillance, diagnostics, and environmental investigations.

Bottom Line

House Bill 2085 addresses an important public health problem.

The strongest scientific evidence supports a shared-responsibility framework:

Public water systems deliver biologically stable water.

Building owners manage the conditions that permit *Legionella* growth.

Effective prevention requires both.



**Testimony before the Pennsylvania House Consumer Protection, Technology and Utilities Committee
Hearing on Water Management Systems and the Prevention of Legionnaires' Disease.
July 20, 2026**

Chairman Burgos and Members of the Committee, thank you for the opportunity to provide testimony at this important hearing regarding water management systems and the prevention of Legionnaires' disease. My name is Dr. Hung Cheung. I am a board-certified physician in preventative and internal medicine, professor at the University of Pennsylvania Pearlman School of Medicine and faculty at The Johns Hopkins Bloomberg School of Public Health. I am a former Medical Director for the State of Maryland and the owner of Cogency, an organization which specializes in investigation and response to waterborne disease cases and environmental outbreaks.

I also serve on the Board of the Alliance to Prevent Legionnaires' Disease, a national non-profit public health advocacy group dedicated to reducing the occurrence of Legionnaires' disease by promoting public research, education, best practices for water management, and advocating for comprehensive policies to combat and investigate this preventable disease.

I am very pleased to testify before the Committee regarding this important public health matter and I am in strong support of House Bill 2085 which provides a comprehensive framework to prevent Legionnaires' disease in Pennsylvania through a source to tap approach focused on the quality of water throughout our public water systems and in building plumbing systems as well as greater transparency and public awareness.

Legionnaires' disease is a severe form of pneumonia caused by a naturally occurring waterborne bacteria known as *legionella*. On average there are 400-600 cases of Legionnaires' diseases reported in Pennsylvania each year and it has a fatality rate of 10% which means 40-60 residents on average die from Legionnaires' annually. The fatality rate is higher among those who are more susceptible including those over age 50, smokers, those with impaired lung function or who are immune compromised such a patient who may be undergoing cancer treatment. Legionnaires' cases are known to be underreported due to misdiagnoses, lack of distinct clinical features and other factors so in actuality its impact is even greater.

Legionnaires' disease is the leading cause of waterborne illness and death in our country and *legionella* is readily found in plumbing systems and in equipment in homes, facilities and buildings, which are seeded with the bacteria from the public water distribution system. This month marks the 50th Anniversary from when Legionnaires' disease first emerged in July 1976 during an American Legion convention, here in Philadelphia. While our knowledge and understanding of this serious disease has progressed in the last five decades, unfortunately we also continue to see year over year increases in disease rates across the country. In fact, cases have increased five-fold since 2000. If we are going to effectively turn the tide on

disease rates, it is urgent that we take a new and comprehensive approach focused on Legionnaires' prevention as provided by House bill 2085.

House Bill 2085 Provisions

The key provisions of House Bill 2085 include:

- **Improved monitoring, management and treatment of water throughout public water distribution systems** including a provision to prevent the growth and proliferation of *legionella* bacteria by requiring most water suppliers to maintain a minimum disinfectant residual of free chlorine of 0.5 mg/L or 1.0 mg/L of chloramine in all active parts of the system. This ensures the water is of the same quality at the start of the system leaving the treatment plant as when it enters all homes, facilities and public places for human use. Importantly, these levels are in agreement with the 2023 National Drinking Water Advisory Council's Microbial Disinfectant Byproduct Rule Revisions working group's recommendations, and are well below the EPA maximum level of 4.0 mg/L and builds on a Pennsylvania Department of Environmental Protection policy that became effective in 2019 establishing a disinfectant residual of 0.2mg/L.
- **A provision to require water utilities to notify water users when there may be elevated risks in their communities** due to planned and unplanned water system events or disruptions which can release legionella from the biofilm in the piping of the distribution system and push it downstream in the water entering our homes and buildings. Included would be information on actions for building owners and individuals to take if there is elevated risk of exposure. Such disruption events would be reported and tracked by state agencies to be used for case and outbreak investigations.
- **A requirement for buildings of a certain size, occupancy or those containing particular equipment to have a water management plan**, following ASHRAE Standard 188-2021, the leading global standard for *legionella* risk management in buildings.
- **Strengthened investigations** to thoroughly review all reported Legionnaires' cases to determine the source to help prevent further incidences. The bill also calls for greater transparency notifying the community when there are single cases and outbreaks through a state dashboard of Legionnaires' cases.
- **Increased public education** around Legionnaires' disease so residents are more aware of increased risks, signs and symptoms and when to seek treatment, as well as steps that can be taken to reduce one's risks.

Ecology of *Legionella* Bacteria

To understand the focus of this legislation, it is important to establish an understanding of Legionnaires' disease. It is a waterborne illness caused by *legionella* bacteria which is commonly found in our environment in water and soil. The bacteria are present in our water sources and is introduced into our public water system. As drinking water travels from reservoirs and other water sources to treatment plants and into what can be miles of piping in water distribution systems before reaching our homes, facilities and workplaces for human use, *legionella* bacteria can survive and thrive in this system. In fact, there are many factors that can cause the bacteria to proliferate in the public water distribution system including biofilm which houses the bacteria and serves as its food source, water temperature, stagnation, depleted disinfectant, water treatment changes and others. Disruptive events, such as source water changes, water main breaks, service interruptions, construction, and heavy rainfall can cause *legionella* bacteria to become dislodged and enter premise plumbing in facilities, buildings and homes.

Legionella thrive in water between 77-122 degrees Fahrenheit and can be inhaled through water droplets in mist released from water-using equipment like showers, sinks, hot tubs, fountains, pools, misters, HVAC equipment and others. Humans can also be exposed to the bacteria when drinking water if they aspirate (when water goes down the wrong pipe). Given the ecology of *legionella* and the potential points for human exposure, proper monitoring, management and treatment throughout the system are required for effective prevention.

96% of Legionnaires' Disease Cases are Sporadic

According to the Centers for Disease Control and Prevention (CDC), 96% of Legionnaires' disease cases are sporadic and isolated from larger outbreaks. US Environmental Protection Agency (EPA) studies and [one](#) recently completed in the state of New Jersey by the Department of Health have found that approximately 50% of all household taps tested positive for *legionella*.

A review of available literature of sporadic cases identified "definite" and "probable" sources of sporadic cases as including potable water from single family homes and apartment buildings, potable water used in humidifiers, home spas, and potable water from other sites (i.e. dental office, etc.) [Environmental sources of community-acquired legionnaires' disease: A review](#) (2018 Orkis et al.)

Upstream Management

Given the fact that *legionella* exists in the source water and public water distribution system, it is important to properly manage, treat and monitor water in the public distribution system to kill and starve the pathogen to try to prevent infection of the plumbing systems of homes and buildings.

In a letter to the US Environmental Protection Agency sent in 2016, R. Ellingboe, Supervisor of the Drinking Water Protections Section of the Environmental Health Division at Minnesota Department of Health warned, *"Nationally, we continue to see an increase in Legionella disease outbreaks... from exposures within premise plumbing. Are water systems providing a continual "seeding" of Legionella bacteria and the bacteria getting into premise plumbing...?"*

Further, in 2016 a CDC [Morbidity and Mortality \(MMWR\) Weekly Report](#) found that 35% of the outbreaks they investigated were attributed to unmanaged external changes including nearby construction and problems with water mains and 70% of investigations reported inadequate water disinfectant levels. Such external changes or system upsets like construction, water main breaks, water treatment changes, heavy rainfall and others can disrupt *legionella* bacteria stored in the biofilm of public water distribution system piping and send the bacteria downstream into homes and public places. It is important for such disruption events to be better monitored and for notification given to surrounding communities, so they are aware of increased risks. This is particularly important for those most at-risk of contracting the disease.

When increasing its minimal residual disinfectant level in regulations that became effective in 2019, the Pennsylvania Environmental Review Board stated, *"Maintenance of an adequate disinfectant residual (treatment) throughout the water distribution system plays a key role in controlling the growth of pathogens and biofilms and is a treatment technique that serves as one of the final barriers to protect public health. Lack of an adequate residual may increase the likelihood that disease-causing organisms such as E. Coli and Legionella are present."* [Disinfection Requirements Rule](#), 2/20/16

Efforts to date have proven ineffective as cases continue to increase. This requires a holistic approach that includes improved water quality management "upstream" as discussed above, as well as risk mitigation efforts in complex buildings, premise plumbing systems and with water-using equipment.

Legionella Found in the Water in Philadelphia through Prior Testing

It is with irony that this hearing is being held in City Hall. Not only because of the 50-year Anniversary, but eight years ago, as part of a public water testing program in Philadelphia, I took many drinking water samples in this very location that were positive for Legionella Pneumophila Serogroup 1. This is the serogroup responsible for more than 80% of LD cases, and associated deaths. Found right here in City Hall at a level that would require immediate remediation. Overall, we took 155 samples in 35 locations across the city including City Hall, 31 samples were positive for Legionella, 4 samples were positive for Legionella Pneumophila Serogroup 1 and 27 samples positive for other Legionella species. And these samples were taken during late Fall, when Legionella activity tends to slow down. Obviously, the importance of this legislation is paramount to ensure that Philadelphia does not experience a repeat of 1976.

Building Management

This legislation would require building owners and operators to follow the ASHRAE 188 standard for *legionella* risk mitigation which calls for a water management plan for their building, premise plumbing system and water using equipment. This ensures that buildings are closely monitored and managed to address issues that can increase *legionella* growth including water stagnation, dead legs, ensuring proper treatment of water using equipment where indicated and other measures. ASHRAE Standard 188, *Legionellosis: Risk Management for Building Water Systems*, launched in 2015 and updated in 2021 is the leading, national standard developed over 15 years via the ANSI standard development processes and involved all stakeholders – from the CDC to public health officials, microbiologists, chemists, engineers, water treatment professionals, and water management experts.

Case Investigations and Public Education

While outbreaks often receive the attention, single and sporadic cases often go uninvestigated despite comprising the overwhelming majority of cases. When health officials only take action when there are 2 or more cases in a common location or time period, we are missing the opportunity to intervene early and prevent future incidence. Thorough investigations of all cases which look at all potential sources, exposure points and the potential impact of public water system disruptions that may have preceded cases are critical to better understand the source of disease, mitigate risks and prevent future cases.

Increased public education and awareness is also critical for disease prevention and reducing mortality and morbidity caused by this waterborne illness. Having residents better informed about Legionnaires' disease, what makes individuals more susceptible, and its signs and symptoms, will enable those who may have been exposed to seek early treatment, and to enable individuals to take steps to reduce their risks where possible. For instance, experts recommend that hot water heaters be set to a minimum of 130 degree Fahrenheit and systems should distribute water at a minimum of 122-124 degrees. And cold water systems should be maintained below 68-77 degrees Fahrenheit. More education is needed to help home and building owners to reduce risks.

National Recommendations

In November 2023, after an 18 month process with a working group of experts and stakeholders, the US EPA issued a [final report](#) on Microbial and Disinfection Byproducts Rule Revisions recommendations. This report recommended improvements in water treatment by establishing a minimum residual disinfectant treatment (chlorine or chloramine), better public water system monitoring/ management and building water management programs, which this bill includes. And in 2024, the CDC released a [report](#) on drinking water outbreaks and found that *legionella* was a leading cause of public water system and biofilm-related

outbreaks. The report calls for the need for water source-to-tap prevention strategies, consistent with this legislation.

In sum, House bill 2085 takes a comprehensive approach to preventing Legionnaires' disease, modeled after national recommendations, a 2024 law passed by New Jersey and effective policies in other states like Illinois and Louisiana while also codifying the ASHRAE 188 Standard to mitigate *legionella* risks in buildings. Together, this approach follows the latest science and data around the need to properly monitor and manage water to mitigate risks posed by *legionella* bacteria throughout the enter water system. Of note, there are also similar bills pending in New York and Maryland.

I applaud the committee for taking a leadership role in holding this hearing and commend Representatives Smith-Wade-El, Neilson and all cosponsors for championing state legislation to effectively reduce cases associated with this serious waterborne disease through improved water quality management throughout water systems. I look forward to continuing to work with you to achieve its enactment.

Pennsylvania House Consumer Protection, Technology and Utilities Committee
Public Hearing on Legionella Tracking and Public Reporting and HB 2085
Written Statement Pa Department of Health
July 20, 2026

Good morning/afternoon, Chairman Cruz and members of the Consumer Protection, Technology and Utilities committee. Thank you for the opportunity to testify today regarding House Bill 2085. My name is Kristina Zwolenik, and I am a Waterborne Epidemiology Research Associate at the Pennsylvania Department of Health (PA DOH). My role centers on tracking, analyzing, and investigating pathogens that compromise public health through water exposure, including *Legionella*.

My goal today is to inform the legislative discussion using the latest epidemiological data from the Pennsylvania Department of Health's Legionella 2021-2023 Report and to walk through how PA DOH's work protects the public from Legionella.

How Legionella Spreads:

Before diving into the data, it helps to understand how *Legionella* behaves as a public health threat. In nature, this bacteria lives harmlessly at low levels in freshwater lakes and streams. However, man-made water systems can accidentally act as incubators that allow the bacteria to grow. *Legionella* thrives in warm, stagnant water, growing within the protective slime or biofilms that coat complex pipe networks. People contract the infection by breathing in fine mists or vapors containing the bacteria, such as those from showers, hot tubs, decorative water fountains, or cooling towers. Infection can also occur through aspiration, which happens when a person accidentally chokes on water, sending it directly into the lungs instead of the stomach. It is important to note; the infection is not contagious and cannot be transmitted from person to person.

There are two primary forms of this infection. The mild form, Pontiac fever, a brief, flu-like illness that resolves on its own without causing pneumonia. The severe form and the one we track most closely is Legionnaires' disease, which presents as a serious type of pneumonia. Its main symptoms include a cough, shortness of breath, fever, headache, and muscle aches. Because these symptoms are similar to other types of pneumonia, confirming a diagnosis requires specific laboratory testing. This means that some cases can go undetected if health care providers do not properly recognize and test for the bacteria.

Those most vulnerable to the disease include older adults, individuals with chronic lung conditions, and people with weakened immune systems.

The Data:

Data from our recent multi-year report show that *Legionella* remains a significant and persistent public health burden in Pennsylvania. Between 2021 and 2023, Pennsylvania recorded 1,231 confirmed or probable cases of *Legionella* infection. Annually, this broke down to 417 cases in 2021, 416 cases in 2022, and 398 cases in 2023, averaging 410 cases per year.

To put these numbers into perspective, Pennsylvania's annual infection rate consistently hovers at nearly double the national average reported by the CDC. This disproportionate burden is part of a well-documented regional trend, as many of the Mid-Atlantic states consistently report some of the highest counts of Legionnaires' disease in the entire country. While not included in this report, more recent provisional state data continue to support the disease burden with 337 cases in 2024 and 450 cases in 2025.

Looking closer at the clinical outcomes of these cases, the severity of the illness is obvious. Of those 1,231 cases that occurred from 2021 to 2023, an average of 86% required hospitalization, meaning roughly 353 Pennsylvanians were hospitalized each year for a *Legionella* infection. Furthermore, the disease carries an almost 5% mortality rate within the Commonwealth, resulting in an average of 19 deaths annually over this three-year period.

When we look closer at the data, a few distinct demographic and geographic trends emerge:

- **Age and Sex:** While the highest total number of infections occurred in individuals aged 55 to 64, the trend shifts when adjusted for population. Older adults aged 75 to 84 experience the highest incidence rate. Additionally, males accounted for approximately 63% of all tracked cases.
- **Geography:** While cases occurred statewide, regional distribution varies. The highest annual volumes were concentrated in the Southeast and Southwest regions. However, when adjusted for population size, the Northeast region actually experienced the highest incidence rate in the state.
- **Healthcare Exposure:** A significant portion of these infections are linked to health care settings. Over this three-year period, an average of 11% of all tracked cases were classified as healthcare-associated, meaning the individual spent time at a health care facility during their incubation period. This trend is concerning for two reasons. First, patients in hospitals and long-term care facilities often have underlying health conditions that put them at higher risk. Second, these facilities are typically large buildings with complex water systems, creating the exact environment where *Legionella* can easily grow and hide.

How Pennsylvania Investigates Legionella Cases:

Now that we have discussed the numbers, let's look at how we investigate each reported case.

Case Detection and Reporting

Diagnosing a *Legionella* infection requires specific laboratory testing, typically completed via a urinary antigen test or a respiratory culture. Once a laboratory confirms a positive result, the case is reportable to the Pennsylvania Department of Health by law, which immediately initiates our official public health response.

Epidemiologic Interview and Exposure History

As soon as a report comes in, our priority shifts to finding out where the exposure occurred. Our investigators interview the patient to map out their exposure history over the previous 14 days, which is the incubation period for *Legionella* infection. The incubation period is the time from when a person is first exposed to the bacteria to when they develop their first symptom. During this two-week window, we ask about:

- Workplace settings and occupational exposures
- Travel and day trips, both within and outside of Pennsylvania
- Exposure to high-risk water features, such as hot tubs, decorative fountains, and misting systems
- Exposure to respiratory equipment, including CPAP (continuous positive airway pressure) machines or nebulizers
- Recent visits to dental offices, hospitals, or long-term care facilities
- Home water details, including their residential water source and the specific name of their public water utility provider

Routine Tracking and Facility Investigation

Once we gather individual histories, our focus shifts to detecting patterns. Each week, we analyze the data and use a spatial program called SaTScan to identify cases clustering close together in time and place. This can help us determine if cases share a common exposure. If cases overlap geographically but lack an obvious common exposure, we complete a specialized cluster interview to probe deeper into specific activities and exposures.

Importantly, we do not always wait for a cluster to form. If a single case is identified that spent 10 or more continuous days during their incubation period in a high-risk setting, such as a hospital or long-term care facility, that triggers an immediate investigation, regardless of whether other cases are linked to the facility.

When the data or our routine tracking identifies a specific building as a potential area of concern, we recommend that a qualified water consultant conduct a comprehensive environmental sampling protocol to help identify the source. Rather than testing a single tap, this protocol requires evaluating the entire building. That is because the bacteria can live in areas of the building that are infrequently used and a thorough building assessment is needed. The consultant samples foundational hot- and cold-water systems, storage tanks, and incoming lines, before moving to room endpoints,

low-use piping loops, and cooling towers. After sampling, we conduct enhanced case research to look for more cases tied to the same water system, recommend system remediation, and advise on follow-up testing.

Coordination with DEP

If the building we are investigating receives water from a public water supplier, we immediately engage the Pennsylvania Department of Environmental Protection (DEP) for awareness. DEP then works directly with the public water supplier to check treatment performance, evaluate distribution lines, and address any issues on the utility side.

This collaboration allows us to look at all potential sources, both inside the building and within the public water system.

This brings us directly to the specific framework proposed in House Bill 2085.

Epidemiological Considerations for House Bill 2085:

We share the committee's goal of protecting Pennsylvanians from *Legionella*, and we hope that our investigation history offers useful context on how *Legionella* behaves inside building water systems. In the majority of outbreaks where we have successfully identified the source of exposure, the root cause has been poor maintenance inside the building itself. We routinely trace cases back to poor, irregular, or non-existent maintenance of hot tubs, ice machines, and cooling towers, as well as building renovations that leave water stagnant in unused spaces, just to name a few. Public health data consistently show that *Legionella* growth is primarily driven by conditions inside a building's own plumbing network. Specifically, when water stagnates and enters an optimal temperature range, it creates the ideal environment for biofilm to form and the bacteria to multiply.

House Bill 2085 places a significant emphasis on monitoring public water before it hits these facilities. However, while public utilities safely deliver treated, cold water to a property line, water chemistry inevitably changes once it enters a building. The disinfectants used to treat our water naturally break down when they sit stagnant in internal plumbing networks or pass through a facility's boilers. Because these disinfectants dissipate over time, simply increasing chemical treatment at a municipal water plant will not prevent bacterial growth occurring deep within a complex building's internal plumbing.

As a result, while the proposed bill sets strict metrics for public water distribution networks, public health data show that the primary risk factors are found after the property line, within the plumbing of the buildings themselves.

House Bill 2085 also places new operational expectations on the Department. As such, the volume of work proposed by this legislation exceeds our current capacity and would require the department to increase staffing dedicated to this program. To successfully implement these

mandates, a stable, ongoing funding source would be required to support the necessary investigations, education, and tracking infrastructure.

Conclusion:

In closing, the Department appreciates the committee's proactive focus on this issue. As you move forward with your deliberations, we hope these insights into the behavior of *Legionella* within buildings, alongside the operational needs of our team, help inform your work. Successfully managing this public health risk requires balancing the scope of the bill with the long-term, stable resources needed to sustain it.

The Department is ready to assist the Committee with any additional data or technical feedback you may need. Thank you for your time and dedication to public health, and I would be glad to answer any questions you might have.

J. Clancy & Associates, LLC
223 W Durand Street
Philadelphia, PA 19119
802-393-0024
jenclancy001@gmail.com

12 July 2026

The Honorable Danilo Burgos, Chairman
House Consumer Protection, Technology & Utilities
P.O. Box 202197
Harrisburg, PA 17120-2197

The Honorable Carl Metzgar, Chairman
House Consumer Protection, Technology & Utilities
P.O. Box 202069
Harrisburg, PA 17120-2069

RE: House Bill 2085 – Legionnaires’ Disease Risk Management

Dear Chairs:

I am president of J. Clancy & Associates, LLC located in Philadelphia, Pennsylvania. I am an expert in the field of environmental microbiology, with specific expertise in water microbiology and water treatment. My CV is attached. My Ph.D. training was in medical microbiology, and I have been working on microbiological water quality issues since 1987. I have worked with *Legionella* for over 46 years. I was one of the early researchers working on *Legionella pneumophila* and Legionnaires’ disease (LD) in 1980 at the U. of Vermont Department of Medicine. That National Science Foundation-funded project developed an animal model of Legionnaires’ disease using guinea pigs. The work involved isolation of *Legionella pneumophila* from human lung tissue at autopsy, *L. pneumophila* culture, animal infectivity in guinea pigs, and animal autopsy and organ culture to determine the model of infection.

Over the decades I have worked with state and federal agencies, building owners and managers, hotels, hospitals and real estate developers on detection and control of *Legionella pneumophila* in premise plumbing. Premise plumbing includes all engineered water systems associated with a specific property, including building water supply, plumbing and fixtures, cooling towers, pools, hot tubs, spas, fountains, water coolers, decorative water features and any fixture where water is used. I serve as a

consultant and expert witness in both sporadic cases and outbreaks of legionellosis. I am an expert in recreational water (water parks, spray parks) and water contamination and remediation issues. I conduct on-site investigations, sampling and analysis, remediation, and ongoing assessments of *Legionella pneumophila* and other opportunistic waterborne pathogens (*Pseudomonas aeruginosa*, *Naegleria fowleri*) that contaminate and persist in recreational water and building water. I am a co-author of a Water Research Foundation publication on research needs for pathogens in premise plumbing. I served on the expert panel of the American Academy of Microbiology and am a co-author of the report on microbiological issues of the built environment.

I was the principal investigator (PI) on a project developing communications tools for water utilities to use in working with their customers on *Legionella* and Legionnaires' disease messaging. I was the PI on a project developing sampling strategies and methods to test for *Legionella* and other opportunistic pathogens in drinking water distribution systems. I was a PI on a national occurrence survey of *L. pneumophila* in US drinking water systems. I was a participant in the National Academies of Science, Engineering and Medicine workshops that developed the expert report on "Management of *Legionella* in Water Systems" and served as reviewer of the final report.

I served on the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) committee 514: *Prevention of Injury and Disease Associated with Building Water Systems*, which includes all water features associated with a property. The standard addresses development and management of building water safety plans to control harm from waterborne pathogens (biological), chemical, and physical hazards. I am a voting member of the American Public Health Association Standard Methods for the Examination of Water and Wastewater, Section 9000 Microbiology since 1998. I served on the American Industrial Hygiene Association (AIHA) Body of Knowledge committee that developed standards for professionals for *Legionella* control in building water systems. I am an invited member on the Council of State and Territorial Epidemiologists committee on Legionnaires' disease surveillance.

In my role as Executive Director and founding fellow of the Environmental Science, Policy, and Research Institute (ESPRI), I directed applied research focused on building plumbing pathogens including *Legionella*). Partnering with Drexel University, ESPRI was awarded a \$2 million EPA grant titled "Water Conservation and Water Quality: Understanding the Impacts of New Technologies and New Operational

Strategies”, the first building water quality research funded by the USEPA. Control of *L. pneumophila* in building water systems was a major focus of this project. Current building water quality clients include large private hospitals, office buildings, and US Navy campuses in the US and overseas.

I have 75+ peer-reviewed publications in internationally recognized journals and have authored several book chapters on water microbiology and treatment. I was the 2012 recipient of the Water Research Foundation’s Research Innovation Award for my work on UV inactivation of *Cryptosporidium* in water and I am the 2014 recipient of the American Water Works Association’s prestigious A.P. Black Research Award for excellence in water supply research. I was recently elected to the US National Academy of Engineering for significant recent contributions to the field of engineering.

I am writing to you to provide comments on HB2085 which, as written, will not provide public health protection from LD because it focuses on public water systems as the control point for *L. pneumophila*. To prevent LD, which the US CDC considers the number one cause of waterborne disease in the US, the focus must be on premise plumbing. This includes all engineered water systems associated with a specific property, including building water supply, plumbing and fixtures, cooling towers, pools, hot tubs, spas, fountains, water coolers, decorative water features and any fixture where water is used. Small number of *Legionella* in a water become a health risk and lead to disease when they attach and multiply in engineered water systems.

Legionnaires’ disease is a result of poorly managed water quality in a built environment (ASHRAE 188; ASHRAE Guideline 12; NASEM, 2019; and CDC Toolkit, 2021, and WHO, 2007) and is not due to the presence of low levels of *L. pneumophila* that may be present in public water systems.

Legionellae (all the species of the genus *Legionella*) were first isolated and identified as part of the investigation of respiratory illness in persons attending an American Legion convention in 1976 in Philadelphia. Legionellae are associated with two forms of respiratory illness referred to as legionellosis. Legionnaires’ disease is the pneumonic and more severe form of legionellosis with a low attack rate but a 3 to 33% mortality rate. While Legionnaires’ disease is an acute form of pneumonia, it is also known to affect the nervous, gastrointestinal, and urinary systems. The incubation period is usually between 2 and 14 days with the infection lasting weeks to months. The symptoms of infection include pneumonia with anorexia, malaise, myalgia, headache, rapid fever, chills, coughing, chest pain, abdominal pain, diarrhea, and memory loss (NASEM, 2019).

Legionellae are small, Gram negative, rod-shaped aerobic bacteria; there are currently 61 species and over 60 serologically distinct groups within the genus. A single species of *Legionella*, *L. pneumophila*, causes approximately 98% of all documented cases of legionellosis. While there are 15 serogroups of *L. pneumophila*, 85% of all legionellosis cases are caused by serogroup 1. Approximately 25 species have been associated with human disease. *L. pneumophila* is a significant human pathogen that can cause disease through transmission via water. Water is the major reservoir for *Legionella*, and the bacteria are found in fresh waters, including drinking water, worldwide.

Legionnaires' disease occurs when the bacteria are disseminated from a reservoir and inhaled by a person susceptible to infection. Susceptible individuals include individuals who are 50 years of age or older, smokers, people with chronic lung disease, and individuals with weakened immune systems, although people of any age can contract infection, including babies.

Legionellae are often present in low concentrations in natural ground and surface water sources and can survive drinking water treatment. Like most pathogens in water, water treatment reduces the levels of pathogens but does not provide sterility. Under certain conditions in engineered water systems, e.g., building plumbing, pools, spas, fountains, water coolers, etc., the concentration of *Legionella* can increase markedly. Amplification (growth) and dissemination in building water systems is a well-recognized source of *L. pneumophila* infection. Amplification is favored by several factors, including sediment or other contaminants, insufficient disinfectant residual, water age and temperature. Legionellae grow best at elevated temperatures and multiply in water at temperatures of 25-50°C, [77-122°F], but can survive and grow in cold water as well.

Inhalation of aerosolized droplets, 1 to 5 µm in size, is the primary means of transmission for legionellosis. Sources known to transmit legionellae via aerosols include potable and non-potable water sources: potable sources include showers, water taps, water coolers, respiratory therapy equipment; non-potable sources include cooling towers, evaporative condensers, decorative fountains, water coolers, humidifiers, whirlpool spas, and hot tubs.

Engineered water systems are recognized as amplifiers of *Legionella* bacteria and may serve as sources for outbreaks or sporadic cases. For control of legionellae, specific management practices of a water system should be implemented. *Legionella* management in water systems is done through the development of a water management plan (WMP) or water safety plan (WSP). There are many

organizations that publish detailed information on how to develop and implement a WMP including the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE, the US CDC, the American Industrial Hygiene Association (AIHA), the World Health Organization (WHO), and the European Union (EU). Many regulatory agencies require WMPs focused on *Legionella* control for buildings or their associated water systems such as cooling towers, including the Centers for Medicare and Medicaid Services (CMS), the Province of Quebec, New York State and New York City.

The most widely used standard for WMPs is the ASHRAE guideline and standards to control *Legionella* in water systems. These include: ASHRAE Guideline 12, Managing the Risk of Legionellosis Associated with Building Water Systems; ANSI/ ASHRAE Standard 188, Legionellosis: Risk Management for Building Water Systems; and ANSI/ASHRAE Standard 514, Risk Management for Building Water Systems: Physical, Chemical, and Microbial Hazards. I am an author of Standard 514. These documents are considered the authority on how to manage and prevent Legionnaires' disease in building water plumbing. Management of building water quality is done through a program that involves identification of potential hazards from source to fixture, development of critical control points and measurements metrics at these points to prevent amplification and dissemination of *Legionella*, a monitoring plan to measure water quality, and verification and validation that the plan is working as described. The US CDC, the CMS and the Occupational Safety and Health Administration (OSHA) rely on development and implementation of water management plans as laid out in the ASHRAE standards to protect the public from exposure to Legionnaires' disease. Any device which dispenses water can be a source of potential contamination, amplification, and aerosolization of *Legionella*, and a plan to routinely flush, clean and test these fixtures is necessary to ensure health protection.

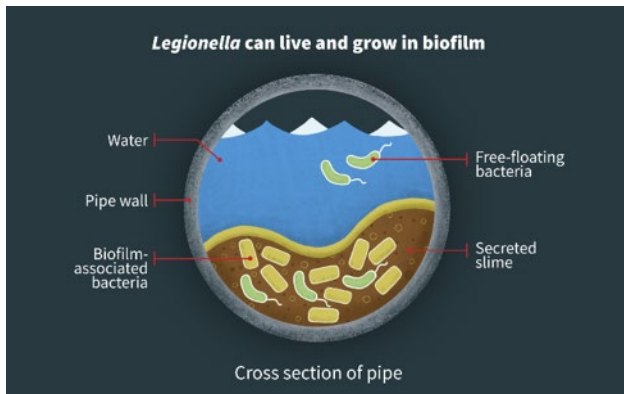
Water management planning includes identification of hazards; characterization and mitigation of risks that can cause harm; identification of critical control points, regular inspection, effective treatment, routine cleaning of the engineered water system structures, and constant application of adequate disinfectant to prevent the amplification of *Legionella* leading to human disease (ASHRAE, 2021. Standard 188-2021 -- Legionellosis: Risk Management for Building Water Systems [ANSI Approved], CDC Toolkit, 2021).

Most of the amplification of *L. pneumophila* occurs within biofilms (NASEM, 2019). Biofilms form on all moist surfaces when microorganisms contact the surface, allowing them to attach and grow

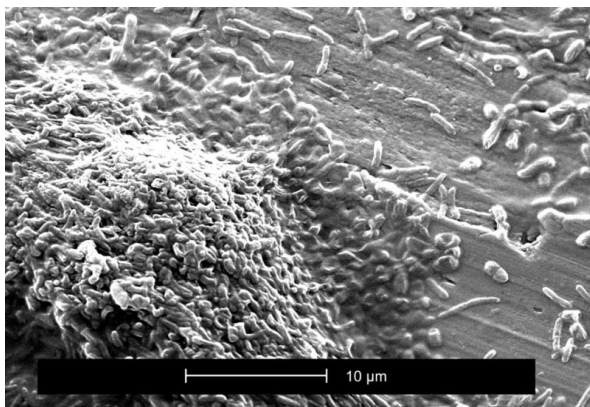
(amplify). Biofilms are a mix of organic and inorganic compounds, bacteria, amoebae, fungi and other organisms present in the water that form a sticky matrix, the biofilm. The biofilm is a unique ecosystem strongly attached to the solid surface and is difficult to remove once established. The most common biofilm we all deal with daily is the plaque that forms on our teeth. For good oral hygiene we are advised to brush and floss regularly and visit the dentist annually or more often to have a deep clean to remove biofilm that is strongly attached and cannot be removed simply by brushing and flossing. Plaque biofilm harbors bacteria that can cause tooth decay and gum disease if not properly managed. Likewise, care must be taken to minimize biofilms in water systems to control *Legionella*. Once formed, biofilms cannot be eradicated completely, but can be temporarily disrupted by raising water temperature, flushing, increasing disinfectant residual and combinations of these interventions. WMPs incorporate these interventions as part of biofilm control.

It is well understood that the primary growth habitat of *L. pneumophila* is within amoebae or other free-living protozoa associated with biofilm (NASEM, 2019, p.50; *Legionella* Control: What is Biofilm & How is it Linked to *Legionella* Bacteria? <https://legionellacontrol.com/legionella/what-is-and-biofilm-how-linked-to-legionella/>).

These surfaces include all those from the POE of a water supply (storage, piping, valves, taps, etc.). Sediment, rust, and sludge in water pipes and tanks serve as nutrient sources and substrates for *Legionella* in the development of biofilm. Biofilms will consist of many species of bacteria, as well as fungi, algae, protozoa, debris, and corrosion products. As biofilm forms it develops a sticky physical matrix that adheres to the surface and allows it to persist as an independent ecosystem that develops its own characteristics. For example, the biofilm matrix shields the microorganisms within it from outside stressors such as disinfectants. Even in water that has a disinfectant residual, *Legionella* can grow because the disinfectant may not be able to penetrate the biofilm effectively to kill the bacteria. If low or no disinfectant is present, the biofilm bacteria will grow exponentially. Depending on usage, water may sit stagnant for hours or days with little to no turnover, allowing bacteria on surfaces in biofilms to grow. The diagram below shows biofilm formation in a water pipe. The bacteria in the biofilm layer are protected from activity in the bulk water phase.



The photomicrograph below shows *Legionella* colonizing a pipe surface. When surfaces are corroded the surface area available for colonization is increased and allows more biofilm to form.



Exposure to *L. pneumophila* entrained within the biofilm occurs when biofilm is subsequently sloughed into the bulk water when the water is aerosolized, such as opening a spigot on a hot or cold-water tap.

In addition to scholarly papers on this topic, many trade organizations publish documents that are widely circulated outside of the research world so that it is available to audiences that need to know the information and put the concepts into practice. The following excerpt from the Plumbing Manufacturers International (PMI) is an example.

(<https://www.safeplumbing.org/advocacy/health-safety/legionella#:~:text=Inadequate%20corrosion%20control.%20Corrosion%20can%20occur%20in%20system,can%20create%20the%20ideal%20environment%20for%20Legionella%20growth.%C2%B9%C2%B9>).

“There are several key elements that can promote the growth of *Legionella* bacteria in a water supply system, including:

- Excessive water age. The longer water sits in a system or piping in a system, the greater likelihood the water disinfectant will dissipate over time, leading to pathogen growth.⁸
- Biofilm. When biofilm, a sticky substance created by bacteria, forms on the inside wall of water supply piping, it protects *Legionella* from heat and disinfectant.⁹
- Lukewarm water. *Legionella* growth is enabled by lukewarm water temperatures, usually in the range of 77 degrees Fahrenheit to 108 degrees Fahrenheit.⁹
- Dead legs. A “dead leg” is caused by no flow or rare flow of water in pipes.⁹
- Insufficient disinfectant. Effective water disinfectant strategies are necessary to control *Legionella* in a water system. For example, chlorination is one method used by water districts to disinfect drinking water that provides a lasting residual disinfectant.¹⁰
- Inadequate corrosion control. Corrosion can occur in system pipes, depending on water quality variables, including disinfectants used, water temperature and pH levels. Improper corrosion control can create the ideal environment for *Legionella* growth.¹¹
- Cross connections. Cross connections between potable and non-potable water can introduce *Legionella* into the potable water supply system.^{12”}

Water temperature plays a significant role in *Legionella* management. *L. pneumophila* can grow in cold or hot water, with optimal growth temperatures from between 68°F and 122°F (20°C and 50°C). The NASEM (2019) report recommends water heater temperatures to be maintained above 60°C (140°F), with hot water temperatures to distal points to exceed 55°C (131°F). Depending on the plumbing design, hot and cold-water pipes are often next to one another and not insulated, meaning that in part of the system from the heater to the tap the water in both pipes will be lukewarm. For reference, a comfortable range for taking a shower is between 98°F and 104°F. Water temperature in many jurisdictions is regulated in plumbing codes to be kept at no greater than 120°F to prevent scalding. Note that 120°F is a perfect growth temperature for *Legionella*. This is in direct conflict with good *Legionella* management practices. Part of a WMP for *Legionella* control will include how to balance lower water temperatures to prevent scalding while minimizing *Legionella* growth, e.g., location of mixing valves, weekly flushing in

low use taps, cleaning, and maintenance of system components (valves, aerators, shower heads, hoses, etc.).

In 2022 my research team undertook the largest study of *L. pneumophila* in US drinking water distribution systems to fill in data gaps on occurrence (Bartrand et al, 2024; [5156 Lp Occurrence in US DWDSs.pdf](#)). The key findings of our research were:

1. Observed *Legionella pneumophila* occurrence in distribution systems of well-run utilities is, on average, very low (around 1% positive samples out of more than 9000 samples), and positive samples have concentrations far below any current level of public health concern.
2. A conservative estimate of baseline *L. pneumophila* occurrence in distribution systems of individual utilities is <5% of samples. Baseline occurrence refers to the rate of *L. pneumophila* positive samples for a well-run utility. The baseline occurrence rate differs for individual utilities and depends upon their source waters, disinfectant types, water temperatures, pipe materials, and other conditions. As additional data are collected and utilities undertake deliberate *L. pneumophila* management, this estimate is likely to decrease.
3. A minimum disinfectant residual concentration of 0.2 mg/L (as total chlorine) in chloramine systems provides the same benefit and level of *L. pneumophila* control as a minimum disinfectant residual concentration of 0.2 mg/L for free chlorine systems; this project's data do not indicate that a higher disinfectant concentration is needed for chloramine systems than for free chlorine systems.
4. *L. pneumophila* monitoring is both feasible and beneficial for utilities. Fifty-seven systems conducted two years of monitoring, mostly analyzing samples in their own laboratories, with a very small proportion of samples excluded from analysis because they did not meet quality control criteria. Utilities with positive samples in the first year of monitoring were able to conduct assessments and reduce the occurrence and abundance of *L. pneumophila* in their systems in the study's second year. No surrogate measure would have alerted the utilities with positive samples to the presence of *L. pneumophila* in their systems.
5. Widespread adoption of monitoring will require development of a protocol for responding to positive *L. pneumophila* detections, including reporting and communication responsibilities. A

protocol developed and used in this study can be a starting point for developing a framework that may be used by utilities, regulators, and public health authorities.

6. A side-by-side comparison of 143 samples analyzed using the Legiolert, ISO 11731, and viability qPCR methods resulted in equivalent results for detection of *L. pneumophila* via Legiolert, and viability qPCR and did not support the common belief that molecular methods are intrinsically superior to culture methods for detection of *L. pneumophila* in water samples.

For nearly a decade my research team has focused on many aspects of *Legionella* occurrence and control in DW systems. Our peer-reviewed publications are listed below.

LeChevallier, M.L, T.A. Bartrand, and J.L. Clancy. 2025. Risk Assessment of *Legionella pneumophila* in Drinking Water Distribution Systems. AWWA Water Science 7:4-e70028. <https://doi.org/10.1002/aws2.70028>.

Burlingame, G.A., T. Bartrand, W. LeChevallier, and J.L. Clancy. 2025. Routine Monitoring for *Legionella pneumophila* in Drinking Water Distribution Systems. 113: 6-15. <https://doi.org/10.1002/awwa.2415>.

Bartrand, T.A., M.W. LeChevallier, J.L. Clancy. 2024. Protocol for Responding to the Detection of *Legionella pneumophila* in Drinking Water Distribution Systems. AWWA Water Sci. 6:2:e1370. <https://doi.org/10.1002/aws2.1370>.

Bartrand, T.A., M.W. LeChevallier, J.L. Clancy, G.A. Burlingame, and R.M. McCuin 2024. Occurrence of *Legionella pneumophila* In Drinking Water Distribution Systems. Denver, Colo.: WRF.

McCuin, R. M., S. Masters, T. Bartrand, and J.L. Clancy. 2022. Impact of Pipe Material, Operation and Disinfectant on Cold Water Plumbing Microbiology. Water Science. <https://doi.org/10.1002/aws2.1306>.

McCuin, R.M., T. A Bartrand, and J.L. Clancy. 2021. *Legionella pneumophila* Recovery Using Legiolert® and a Traditional Culture Method. Water Science. <https://doi.org/10.1002/aws2.1228>.

Ragain, L.J., S. Masters, T.A. Bartrand, J. Clancy, and A.J. Whelton. 2019. Analysis of Building Plumbing System Flushing Practices and Communications. J. Water & Health. 17:2: 196-203.

Masters, S., J.L. Clancy, S. Villegas, M. LeChevallier, and Z. Bukhari. 2018. Customer Messaging on Premise Plumbing Issues. Denver, Colo.: WRF.

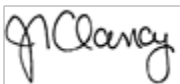
Bartrand, T., S. Masters, J. Clancy, L. Ragain, A.J. Whelton, and K. Casteloos. 2018. Flushing Guidance for Premise Plumbing and Service Lines to Avoid or Address a Drinking Water Advisory. Denver, Colo.: WRF.

The drinking water community and USEPA funded this important work to understand and develop solutions to combat the rapid increase in LD over the last 20+ years.

As part of my consulting practice, I have focused on working with clients across the US and Canada on development and implementation of WMPs for management of LD. This is because buildings and their associated plumbing are the source of LD. The focus of any legislation to protect public health needs to be directed toward water management planning. Current DW regulations, including the Surface Water Treatment Rule and Revised Total Coliform Rule, manage *L. pneumophila* through treatment and best management practices. This is why the US CDC, WHO, CMS, USEPA, OSHA, the EU, and PMI direct building owners to develop WMPs. Since 2017, CMS has required health care facilities that receive federal funding to develop WMPs to minimize LD in hospitals and facilities with vulnerable populations. Additional drinking water regulations would not reduce LD. The water community including AWWA, ASDWA and the WRF has played an active role in research and education on LD management and continues to partner with their customers in managing water quality from the source to the building.

Thank you for the opportunity to provide comments on HB 2085. Please feel free to contact me if you have any questions. As a new Pennsylvania resident, I would be happy to work with you as you address this important topic.

Sincerely,



Jennifer L. Clancy, Ph.D. MS, Law, BCES
President, J. Clancy & Associates, LLC

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CDC, 2021. Toolkit for Controlling *Legionella* in Common Sources of Exposure (*Legionella* Control Toolkit) <https://www.cdc.gov/control-legionella/media/pdfs/Control-Toolkit-All-Modules.pdf>

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US CDC. [Legionnaires Disease and Pontiac Fever | CDC](#)

US CDC. [Routine *Legionella* Testing: A Multifactorial Approach | CDC](#)

CURRICULUM VITAE

Jennifer L. Clancy, Ph.D., M.S. Law, BCES

223 W Durand Street

Philadelphia, PA 19119

Phone: (802) 393-0024; email: jclancy001@gmail.com

Professional History

Feb 2016 – present	ESPRI, Chief Scientist and Executive Director
Jan 2014 – Dec 2016	Corona Environmental Consulting, LLC, Chief Scientist June 2011
– present	J. Clancy & Associates, LLC, President
1994 - August 2013	Clancy Environmental Consultants, Inc., President
1992 - 1994	Erie County Water Authority, Buffalo, NY; Director of Water Quality 1987 - 1992 IEA, Inc., Essex Junction, VT; Senior Microbiologist/Director of Microbiology

Education

B.S. Microbiology, 1975, Cornell University, Ithaca, NY
M.S. Microbiology and Biochemistry, 1980, University of Vermont, Burlington, VT Ph.D.
Microbiology and Immunology, 1988, McGill University, Montreal, Canada
M.S. Environmental Law, 1992, Vermont Law School, South Royalton, VT

Professional Experience

ESPRI, Narberth, PA

Feb 2016-present

Dr. Clancy is a cofounder of the Environmental Science, Policy, and Research Institute (ESPRI). Her current work focuses on opportunistic premise plumbing pathogens, and she provides consulting services to building owners and managers for control of pathogens in building water systems.

J Clancy & Associates, LLC, Saint Albans, VT

Jun 2012-present

Dr. Clancy provides litigation support on environmental issues.

Corona Environmental Consulting, LLC, Saint Albans, VT

Jan 2014-2016

Dr. Clancy served as chief scientist at Corona Environmental Consulting where she focused on drinking water quality and treatment. She oversaw the applied research program and managed the research laboratory. She led the firm's practice on premise plumbing covering both microbiological and corrosion issues.

Clancy Environmental Consultants, Inc., Saint Albans, VT

1994-2013

Dr. Clancy was co-founder and president of Clancy Environmental Consultants, Inc. (CEC), which provided microbiological consulting and testing services to the water and wastewater industries. These services included testing for microbiological contaminants and surrogates both for regulatory purposes and water quality assurance. Consulting services included treatment process reviews for microbiological control, laboratory audits and training,

taste and odor control, filtration performance, regulatory assessments and impacts, waterborne disease outbreaks, and issues related to environmental law.

CEC made important contributions to the drinking water field including 1) development of improved testing methods for the pathogenic protozoa (*Giardia* and *Cryptosporidium*) that are now USEPA standards and that have been adopted by regulatory agencies worldwide; 2) over a decade of laboratory studies of ground water quality, resulting in a broader understanding of the natural occurrence of microbiota in groundwaters and aquifers. This has led EPA to adopt a more flexible approach in assessing groundwater under the influence of surface water and riverbank filtration; 3) the discovery that *Cryptosporidium* oocysts are highly susceptible to UV light. The widely held theory was that *Giardia* cysts and *Cryptosporidium* oocysts were resistant to UV light. Work by Dr. Clancy and her team demonstrated that not only were oocysts susceptible to UV light, but these protozoa are easily killed at low UV doses. This work led to the inclusion of UV as a primary tool for control of this parasite in the Long Term 2 Enhanced Surface Water Treatment Rule and adoption worldwide of UV for primary disinfection of drinking water for *Cryptosporidium* control.

Erie County Water Authority, Buffalo, NY

1992-1994

As Director of Water Quality, Dr. Clancy administered the Water Quality Department which was responsible for assuring that the water quality produced by the Authority's two treatment plants (serving 500,000 customers in suburban Buffalo, NY.) met or exceeded all state and federal standards. This included directing the in-house laboratory, setting treatment standards for process control, directing the pilot plant research facility, and acting as the liaison between the Authority and various regulatory agencies (NYS Departments of Health and Environmental Conservation and the USEPA). She served on several national and state committees, both scientific and regulatory.

IEA, Inc., Essex Junction, VT

1987-1992

Dr Clancy was Senior Microbiologist from 1987-1990 and served as Director of Microbiology from 1990 to 1992. Her responsibilities included the operation of IEA's environmental microbiology laboratory. This included all technical and administrative aspects of the lab operation. The technical aspects included hiring, training and supervising staff; scheduling, reviewing, and performing some laboratory work to maintain protocol and turn-around times; maintaining laboratory records, equipment, and supplies; selecting and purchasing new equipment; directing field operations pertaining to microbiological services; interfacing with clients, and preparation of capital plans and budget requests. During this time, she attended Vermont Law School and earned a master's degree in environmental law.

Specific Expertise with *Legionella pneumophila* and Legionnaires' Disease

Dr. Clancy has been working with *Legionella* for 44 years. She was one of the early researchers on *Legionella pneumophila* and Legionnaires' disease in 1980 at the U. of Vermont Department of Medicine, shortly after the Burlington, VT outbreak linked to a cooling tower at the hospital. The NSF- funded project developed an animal model of Legionnaires' disease using guinea pigs. The work involved isolation of *Legionella pneumophila* from human lung tissue at autopsy, *L. pneumophila* culture, animal infectivity in guinea pigs, and animal autopsy and organ culture to determine the model of infection.

Dr. Clancy currently works with state agencies, building owners and managers, hotels, hospitals and real estate developers on detection and control of *L. pneumophila* in building water supplies, cooling towers, and decorative water features. She serves as a consultant and expert witness in both sporadic cases and outbreaks of Legionnaires' disease and as an expert in building plumbing contamination issues. She conducts on-site investigations, sampling and analysis, remediation, and ongoing assessments of *Legionella* and other pathogens (*Pseudomonas aeruginosa*,

Naegleria fowleri, and nontuberculous mycobacteria) that contaminate and persist in building plumbing. She is a co-author of a Water Research Foundation publication on research needs for pathogens in premise plumbing. She served on the expert panel of the American Academy of Microbiology and is a co-author of the report on microbiological issues of the built environment.

In her role as Executive Director and founding member of the Environmental Science, Policy, and Research Institute (ESPRI) in 2016, Dr. Clancy directed the applied research laboratory which focused on opportunistic premise plumbing pathogens. From 2020 she has served as ESPRI Chief Scientist. ESPRI was awarded a \$2 million US EPA grant titled “Water Conservation and Water Quality: Understanding the Impacts of New Technologies and New Operational Strategies” as part of a Drexel research team. Control of *L. pneumophila* and other opportunistic pathogens in building plumbing systems was a major focus of this project. In March 2022 EPSRI was awarded a Water Research Foundation project on “*Legionella* Occurrence in Drinking Water Distribution Systems”, and Dr. Clancy is co-PI for this study.

Dr. Clancy is an invited member of the Council of State and Territorial Epidemiologists’ Legionnaires’ disease surveillance workgroup. This group meets monthly and discusses Legionnaires’ disease outbreaks in the US. Cruise ship outbreaks are of particular concern as 10 to 15% of all LD outbreaks are on cruise ships. Dr. Clancy provides water quality and treatment expertise to this group whose background is clinical microbiology and epidemiology.

Waterborne Disease Outbreak Investigations

Dr. Clancy has been the onsite investigator for several waterborne disease outbreaks including those caused by *Giardia lamblia*, *Cryptosporidium parvum*, *E. coli* O157:H7, *Legionella pneumophila*, *Naegleria fowleri*, and acute gastrointestinal disease (AGI) in the US, Canada, and Botswana.

Presentations/Workshops

Dr. Clancy has presented hundreds of papers at local, national and international conferences on water microbiology and treatment. She has conducted over 60 training workshops on protozoan methods for the USEPA, AWWA, and the American Society for Testing and Materials (ASTM), and the US Navy. She has conducted workshops on the use of UV for drinking water disinfection in the US, UK, Australia, Canada, Japan, and South Africa. She trains building owners and operators, regulators, and public health professionals in the US and Canada in building water management planning.

Visiting University Lecturer

U. of Colorado – Boulder; U. of New Hampshire - Durham; U. of Massachusetts – Amherst; Virginia Tech, Blacksburg; U. of Vermont - Burlington; Vermont Law School – South Royalton; Boston School of Public Health; U. of Pretoria, South Africa; U. of Toronto, Ontario, Canada; Universidad de Interamericana – Puerto Rico; U. of New South Wales - Sydney, Australia.

Ph.D. Student Committees

Caitlin Rose Proctor, ETH Zurich, Switzerland, Ph.D. 2017.
“Microbiology of Household Plumbing Causes and Consequences”

Brenda McGrath, University of Birmingham, Ph.D., 2007.
“Characterization of the Bacterial Population in RO Distribution Systems and their Ability to Form Biofilms on Pipe Surfaces”

Zoe Matheson, University of Cardiff, Wales, Ph.D., 2000.

Peer Reviewed Publications

- LeChevallier, M.L., T.A. Bartrand, and **J.L. Clancy**. 2025. Risk Assessment of *Legionella pneumophila* in Drinking Water Distribution Systems. AWWA Water Science 7:4-e70028. <https://doi.org/10.1002/aws2.70028>.
- Burlingame, G.A., T. Bartrand, W. LeChevallier, and J.L. Clancy. 2025. Routine Monitoring for *Legionella pneumophila* in Drinking Water Distribution Systems. 113: 6-15. <https://doi.org/10.1002/awwa.2415>.
- Bartrand, T.A., M.W. LeChevallier, **J.L. Clancy**. 2024. Protocol for Responding to the Detection of *Legionella pneumophila* in Drinking Water Distribution Systems. AWWA Water Sci. 6:2:e1370. <https://doi.org/10.1002/aws2.1370>.
- Bartrand, T.A., M.W. LeChevallier, **J.L. Clancy**, G.A. Burlingame, and R.M. McCuin 2024. Occurrence of *Legionella pneumophila* In Drinking Water Distribution Systems. Denver, Colo.: WRF.
- McCuin, R. M., S. Masters, T. Bartrand, and **J.L. Clancy**. 2022. Impact of Pipe Material, Operation and Disinfectant on Cold Water Plumbing Microbiology. Water Science. <https://doi.org/10.1002/aws2.1306>.
- McCuin, R.M., T. A Bartrand, and **J.L. Clancy**. 2021. *Legionella pneumophila* Recovery Using Legiolert® and a Traditional Culture Method. Water Science. <https://doi.org/10.1002/aws2.1228>.
- Ragain, L.J., S. Masters, T.A. Bartrand, **J. Clancy**, and A.J. Whelton. 2019. Analysis of Building Plumbing System Flushing Practices and Communications. J. Water & Health. 17:2: 196-203.
- Masters, S., **J.L. Clancy**, S. Villegas, M. LeChevallier, and Z. Bukhari. 2018. Customer Messaging on Premise Plumbing Issues. Denver, Colo.: WRF.
- Bartrand, T., S. Masters, **J. Clancy**, L. Ragain, A.J. Whelton, and K. Casteloes. 2018. Flushing Guidance for Premise Plumbing and Service Lines to Avoid or Address a Drinking Water Advisory. Denver, Colo.: WRF.
- Soller, J., S. Eftim, T.J. Wade, A. Ichida, **J. Clancy**, T. Johnson, K. Schwab, G. Ramirez-Toro, S. Nappier, J. Ravenscroft. 2016. Use of Quantitative Microbial Risk Assessment to Improve Interpretation of a Recreational Water Epidemiological Study. Microbial Risk Analysis 1:2- 11.
- Bartrand, T.A., J.J. Causey, and **J.L. Clancy**. 2014. *Naegleria fowleri*: An Emerging Drinking Water Pathogen. J. Am. Water Works Assoc. 106:10: E418-E432. **Received the 2015 AWWA Water Quality and Technology Division Best Paper Award.**
- Rosen, J.S., A.J. Whelton, M.J. McGuire, **J.L. Clancy**, T. Bartrand, A. Eaton, J. Patterson, M. Dourson, P. Nance, and C. Adams. 2014. The Crude MCHM Chemical Spill in Charleston, W.VA. J. Am Water Works Assoc. 106:9:65-74.
- Allen, M.J., S. Edberg, **J.L. Clancy**, and S.E. Hrudey. 2013. Drinking Water Microbial Myths. Crit. Rev Microbiol. IBSN 1040-X814 (print); 1549-7828 (electronic).
- Pruden, A., M.A. Edwards, J.O. Falkinham, III. 2013. Research Needs for Opportunistic Pathogens in Premise Plumbing. Denver, Colo.: AwwaRF and AWWA. (**J. Clancy** contributing author).
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- Hargy, T.M., **J.L. Clancy** and L.P. Landry. 2009. Control of *Cryptosporidium* and *Giardia* in Surface Water by Disinfection. *In Giardia and Cryptosporidium from Molecules to Disease* (Ortega-Pierres, G. et al, eds.) CABI, Cambridge, MA.

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- Fallon, K.S., T.M. Hargy, E.D. Mackey, H.B. Wright, and J.L. Clancy. 2007. Development and characterization of nonpathogenic surrogates for UV reactor validation. J. Am. Water Works. Assoc. 93 (3) 73-82. **Received the 2007 AWWA Water Science & Research Division Best Paper Award.**
- Wright, H., E.D. Mackey, D. Gaithuma, C. Fonseca, L. Baumberger, T. Dzurny, J. Clancy, T. Hargy, K. Fallon, A. Cabaj, A. Schmalweiser, A. Bierman, and C. Gribbin. 2007. Optimization of UV Disinfection. Denver, Colo.: AwwaRF and AWWA.
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- Gollnitz, W.D., J.L. Clancy, B.L. Whitteberry, and J. A. Vogt. 2003. Riverbank filtration as a microbial treatment process. J. Am. Water Works Assoc. 95(12) 56-66. **Journal AWWA received the Bronze Award from the Society of National Association Publications in the Scholarly Journals, Feature Article Category, for this paper.**
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- Clancy, J.L., R.M. McCuin, and T.M. Hargy. 2003. Recovery of *Cryptosporidium* oocysts from high volume water samples. Denver, Colo.: AwwaRF and AWWA.
- Clancy, J.L., T.M. Hargy, M.M. Marshall, D.G. Korich and W.L. Nicholson. 2002. Susceptibility of multiple strains of *Cryptosporidium parvum* oocysts to UV light. Denver, Colo.: AwwaRF and AWWA.
- Widmer, G., C.A. Bowman, G. Batzer, B. Stein, C. Pearson, M.A. Buckholt, S. Tzipori, T. Clancy, Z. Bukhari, D. Miller, J.L. Clancy, H.D. Ward. 2002. Molecular mechanisms of chemical inactivation of *Cryptosporidium* oocysts and *Giardia* cysts. Denver, Colo.: AwwaRF and AWWA.
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- McCuin, R.M., Z. Bukhari, J. Sobrinho, and J.L. Clancy. 2001. Recovery of *Cryptosporidium* oocysts and *Giardia* cysts from source water concentrates using immunomagnetic separation. J. Microbiol. Methods 45(2) 69-76.
- Allen, M.J., J.L. Clancy, and E.W. Rice. 2000. The plain, hard truth about pathogen monitoring. J. Am. Water Works Assoc. 92(9):64-76. **Received the 2001 AWWA Water Quality & Technology Division Best Paper Award and Journal AWWA Best Paper Award.**

- Clancy, J.L.,** Z. Bukhari, T.M. Hargy, J.R. Bolton, B. Dussert, and M.M. Marshall. 2000. Using UV to inactivate *Cryptosporidium*. J. Am. Water Works Assoc. 92 (9) 97-104.
- McCuin, R.M., Z. Bukhari, and **J.L. Clancy**. 2000. Recovery and viability of *Cryptosporidium parvum* oocysts and *Giardia intestinalis* cysts using the membrane dissolution procedure. Can. J. Microbiol. 46: 700-707.
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- Clancy, J.L.,** Z. Bukhari, R.M. McCuin, Z. Matheson, and C.R. Fricker. 1999. USEPA method 1622. J. Am. Water Works Assoc. 91(9):60-67.
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- Bukhari, Z., W.G. Glen, and **J.L. Clancy**. 1999. Effects of pH on a fluorogenic vital dyes assay (4', 6'-diamidino-2-phenyl-indole and propidium iodide) for *Cryptosporidium* sp. oocysts. Water Research 33 (13):3037-3039
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SHORT PAPERS/BOOKS

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GRANT AWARDS

The Water Research Foundation

- “*Legionella* Occurrence in Drinking Water Distribution Systems”. 2021-2023. \$500,000.
- “Sampling and Monitoring Strategies for Opportunistic Pathogens in Drinking Water Distribution Systems”. 2018-2020. \$481,000.
- “Customer Messaging on Premise Plumbing Issues”. 2016-2018. \$421,000.
- “Flushing Guidance for Consumer Premise Plumbing and Service Lines to Avoid or Address a Drinking Water Advisory” 2014-2015, \$144,000.
- “Use of a Newly Developed QMRA Probabilistic Model to Estimate Annual Risk of Illness and Disability Adjusted Life Years (DALYs) Based on Source Water Pathogen Concentrations and Treatment Barriers”. 2012-2015, \$472,000.
- “Research Needs for Opportunistic Pathogens in Premise Plumbing”. 2011-2012.
- “Matrix Effects on *Cryptosporidium* Recovery in Bull Run Watershed”. 2010-2013, \$445,000.
- “Optimization of UV Reactor Validation”. 2002-2004, \$213,000.
- “Development of a Method for Recovery of Microsporidia from Source and Finished Waters”. 2001-2004, \$250,000.
- “Susceptibility of Multiple Strains of *Cryptosporidium parvum* Oocysts to UV Light”. 2001- 2003, \$187,500.
- “Evaluation of UV Disinfection Systems for the Inactivation of *Cryptosporidium*”. 2000-2003, \$200,000.
- “Profiling Water Quality Parameters: From Source Water to Household Tap”. 2000-2004, \$634,800.
- “Evaluation of UV Disinfection Systems for the Inactivation of *Cryptosporidium*”. 2000-2001, \$200,000.
- “Recovery of *Cryptosporidium* Oocysts from High Volume Water Samples”. 1999-2000, \$230,000.
- “Modification of Existing and Emerging Methods to Survey *Cryptosporidium* Removal and Disinfection in Wastewater Treatment Systems”. 1998-2004, \$650,000.
- “Source Water Assessment: Variability of Pathogen Concentration”. 1998-2000, \$750,000.
- “Comparative Study of Methods for Assessment of Viability and Infectivity of *Cryptosporidium* in the U.S. and U.K.”. 1996-1999. \$600,000.
- “New Approaches for Isolation of *Cryptosporidium* and *Giardia*”. 1996-1999, \$350,000.
- “Innovative Electrotechnologies for Inactivation of *Cryptosporidium*”. 1996-1998. \$220,000.
- “National Assessment of Particle Removal by Filtration”. 1995-1998. \$286,000.

US EPA

- “Water Conservation and Water Quality: Understanding the Impacts of New Technologies and New Operational Strategies” 2016-2020. \$2 million.
- "Technical and Regulatory Support for the Development of Criteria for Water Media (Microbiology Emphasis)" 2007-2010. \$3,904,079.
- "Recovery Protocol Validation of USEPA Method 1622-*Cryptosporidium* in Water by a Filtration /IMS/ IFA and Viability by DAPI/PI". 1997. \$235,000.
- "Development and Validation of USEPA Method 1622 - *Cryptosporidium* in Water by a Filtration/ IMS/ IFA and Viability by DAPI/PI". 1997, \$185,000.
- "Evaluation of Protozoa Sampling and Processing Methods for Near Term Monitoring Requirements". 1997 \$155,000.
- "Protocol for Determining the Field Recovery of Protozoan Cysts from Source and Treated Drinking Waters".

1995-1996, \$330,000.

"Development of Performance Evaluation Sample Protocols for *Giardia* and *Cryptosporidium* for the Information Collection Rule. 1994-1996. \$374,000.

PEER REVIEW

Water Research Foundation
Water Environment Research Foundation
USEPA STAR Grant Program
Natural Sciences and Engineering Research Council (Canada)
The National Academies of Sciences, Engineering, and Medicine

COUNTRY EXPERIENCE

Australia, Botswana, Brazil, British West Indies, Canada, France, Germany, Ireland, Israel, Japan, Jordan, Kenya, People's Republic of China, South Africa, United Kingdom, United States.

PROFESSIONAL AFFILIATIONS

American Industrial Hygiene Association (2019-present)
 Legionella Body of Knowledge Workgroup
American Society for Microbiology (1971 - present)
American Society for Testing and Materials (1993 – present)
 Chair, D19.24 Water Microbiology (1993 - 2004) American
Water Works Association, 1988 - present) American Water Works
Association Committees:
 Water Quality Division Trustee (1999 - 2004)
 AWWA Technical Advisory Workgroup on Disinfection & Microbials (1996 – present)
 Publications Award Committee Member (2004 - 2007)
Canadian Water and Wastewater Association (1990 – present)
Council of State and Territorial Epidemiologists (2019-present)
 Legionnaires' Disease Surveillance Workgroup
International UV Association
 International President (2001 - 2003) Editorial Board, IUVA News (1999 - 2002)
National Water Research Institute Research Advisory Board (1994 - 2001) New
England Water Works Association (1988 – present)
Standard Methods for the Examination of Water and Wastewater, Microbiology Section (1998- present)
Water Environment Federation (1994 – 2012)

SPECIAL HONORS

National Academy of Engineering, Fellow (2026)
American Water Works Association A.P. Black Research Award for excellence in water supply research (2014).
Water Research Foundation Dr. Pankaj Parekh Research Innovation Award for contributing to the knowledge of
UV disinfection of *Cryptosporidium* (2012).
Classic UV Paper Award, 2011 from the International UV Association for "Medium-pressure UV light for oocyst
inactivation". Journal AWWA. 1999. 91(3):86-94.
American Council of Engineering Companies, 2005 Grand Conceptor Award winner for "Evaluation of Ozone
and Ultraviolet Light". Member of Massachusetts Water Resources Authority team piloting the use of ozone
and UV for *Cryptosporidium* control in the unfiltered Quabbin Reservoir water supply.
Journal AWWA received the Bronze Award from the Society of National Association Publications in the

Scholarly Journals, Feature Article Category, for: Gollnitz, W.D., **J.L. Clancy**, B.L. Whitteberry, and J.A. Vogt. 2003. Riverbank filtration as a microbial treatment process. J. Am. Water Works Assoc. 95(12) 56-66.
Best Paper Award, 2001, American Water Works Association Water Quality and Technology Division and Journal
AWWA. The plain, hard truth about pathogen monitoring. J. Am. Water Works Assoc. 92(9):64-76.
Chair, AWWA Water Quality Technology Conference, 2001.
Chair, 1st International Congress of the International UV Association, June 2001 President, International
Ultraviolet Association, 2001-2003.
Best Paper Award, 1999, American Water Works Association Water Quality Division Chair, AWWA
International Symposium on Waterborne Pathogens, 1998-99.



Written Testimony of
Charlotte Katzenmoyer, CEO
in Opposition to House Bill 2085
Before the
Pennsylvania House Consumer Protection,
Technology and Utilities Committee
Public Hearing on Water Management Systems
and the Prevention of Legionnaires' Disease

July 20, 2025

Capital Region Water
3003 North Front Street,
Harrisburg, PA 17110

888-510-0606
capitalregionwater.com

Written Testimony of Charlotte Katzenmoyer, CEO, Capital Region Water, in Opposition to House Bill 2085

Chairman Burgos, Chairman Metzgar, and members of the House Consumer Protection, Technology and Utilities Committee, thank you for the opportunity to provide testimony regarding House Bill 2085 and the important public health goal of preventing Legionnaires' disease. My name is Charlotte Katzenmoyer, and I serve as Chief Executive Officer of Capital Region Water, the municipal water, wastewater, and stormwater utility serving Pennsylvania's capital city and surrounding communities.

Capital Region Water shares the Committee's commitment to protecting public health. Every day, public water systems across the Commonwealth treat, monitor, and deliver safe drinking water under extensive federal and state regulatory requirements. We also recognize the seriousness of Legionnaires' disease and the need for sound, effective risk-management strategies. However, for the reasons outlined below, I respectfully oppose House Bill 2085 as currently drafted.

Legionella Risk Is Primarily a Building Water System Issue

Legionella is an opportunistic premise-plumbing pathogen. While it may be present in low levels in natural and engineered water environments, the conditions that allow *Legionella pneumophila* to grow to levels of public health concern are most commonly found inside buildings: warm water temperatures, stagnation, low flow, complex plumbing configurations, dead legs, sediment, biofilm, distal fixtures, cooling towers, humidifiers, and other aerosol-generating devices.

Public water systems do not own, operate, maintain, or control private plumbing systems, hot-water systems, cooling towers, or closed-loop mechanical systems. We also do not have routine legal authority to enter private buildings, inspect premise plumbing, adjust building temperatures, remediate biofilm, replace fixtures, manage cooling towers, or implement facility-specific water management plans. A mandate that places responsibility on utilities for risks created inside privately owned facilities creates liability without control and blurs accountability for the actions that actually reduce risk.

House Bill 2085 Would Misalign Legal Responsibility and Public Health Accountability

Public water systems are already responsible for treating and distributing drinking water in compliance with the federal Safe Drinking Water Act, the Pennsylvania Safe Drinking Water Act, and DEP regulations. Those requirements focus on water quality within the public system up to the service connection. By contrast, building owners and operators control the internal plumbing and equipment where building-specific water quality conditions develop.

House Bill 2085 would shift responsibility toward public water systems even when the relevant risk is caused by private plumbing design, lack of use, water age inside the building, inadequate flushing, poor temperature control, fixture condition, or failure to maintain cooling towers and closed-loop systems. That approach would make it harder, not easier, to assign responsibility to the party best positioned to prevent exposure.

The Proposed Disinfectant Residual Mandates Are Not the Right Tool

House Bill 2085 would establish minimum detectable disinfectant residuals of 0.5 milligrams per liter of free chlorine and 1.0 milligrams per liter of monochloramine in all active parts of covered public water systems at all times. Those figures should not be set by statute. Drinking water disinfectant requirements involve complex scientific and engineering judgments that must balance microbial control, water age, source water characteristics, corrosion control, distribution system hydraulics, taste and odor concerns, and compliance with disinfection byproduct limits.

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Pennsylvania's existing disinfectant residual standards were developed through a regulatory process that included technical review, public comment, and consideration of system operations and compliance impacts. If the Commonwealth believes those standards should be revised, that evaluation should occur through the scientific and regulatory process, not through a fixed statutory mandate that applies broadly across systems with different source waters, treatment strategies, infrastructure conditions, and customer bases.

Setting these technical requirements in statute would also make future adjustments more difficult. As science evolves, new contaminants emerge, public health concerns change, and best practices are refined, the Commonwealth should be able to update disinfectant requirements through an expert regulatory process. Legislating fixed residual levels could unnecessarily encumber future decision-making and risk politicizing technical public health judgments that should remain grounded in science, engineering, and regulatory expertise.

Increasing disinfectant residuals is not risk-free. Higher chlorine levels can increase the potential formation of regulated disinfection byproducts, affect corrosion control, create taste and odor concerns, and increase operational costs. These tradeoffs are precisely why disinfectant standards should remain grounded in federal and state regulatory expertise and should be evaluated in relation to the full drinking water compliance framework.

This is not merely an operational concern; it is also a public health concern. When chlorine reacts with naturally occurring organic matter in source water, it can form disinfection byproducts such as trihalomethanes and haloacetic acids, which are regulated because long-term exposure above established limits has been associated with increased health risks, including potential cancer and reproductive or developmental effects. Public water systems must therefore carefully balance the need to maintain an effective disinfectant residual with the equally important obligation to minimize the formation of disinfection byproducts. A statutory mandate to increase chlorine residuals across all systems could unintentionally increase exposure to these regulated compounds without providing a commensurate, science-based reduction in Legionella risk.

The Bill Would Create Costly and Duplicative Requirements

House Bill 2085 would require covered public water systems to develop, certify, and implement separate Legionella-focused distribution system maintenance plans and report broadly defined "disruptions" within 72 hours. Public water systems already operate under extensive monitoring, reporting, sanitary survey, treatment, distribution, and operational requirements. DEP sanitary surveys and existing regulatory oversight already examine distribution system operations, maintenance, storage, disinfection, and compliance practices.

Creating a separate statutory plan and annual certification process would add administrative burden without necessarily improving public health outcomes. The bill's broad definition of "disruption" is also problematic because it could capture routine operational events without a demonstrated relationship to increased Legionella risk. Reporting, notification, and enforcement requirements should be tied to scientifically supported risk conditions and clear public health triggers, not undefined or overly broad categories that may generate confusion, unnecessary alarm, and paperwork without meaningful risk reduction.

New Requirements Would Ultimately Fall on Ratepayers

New testing, monitoring, planning, reporting, notification, laboratory analysis, staffing, legal, and recordkeeping obligations would impose real costs on public water systems. For municipal utilities,

Written Testimony of Charlotte Katzenmoyer, CEO, Capital Region Water, in Opposition to House Bill 2085

those costs are ultimately borne by ratepayers. In communities already facing affordability challenges and major infrastructure investment needs, as we face in the city of Harrisburg, new state-imposed requirements must be carefully evaluated to ensure they deliver measurable public health benefits.

A utility-centered mandate would shift costs and responsibility away from the building owners and facility operators who own and control the systems where the highest risk for *Legionella pneumophila* amplification and exposure occurs. Public funds and ratepayer dollars should be directed toward proven water system investments—such as treatment reliability, corrosion control, distribution system maintenance, lead service line replacement, storage tank management, and infrastructure renewal. To effectively reduce the risk of *Legionella* transmission, building owners and facility operators must also do their part to improve, monitor, repair, and maintain the private systems under their control so the safe, treated water delivered by public water systems is not compromised after it enters the building.

A Better Policy Framework

The Commonwealth can strengthen Legionnaires' disease prevention without misplacing responsibility. A more effective framework should recognize the distinct roles of public water systems, building owners, healthcare and long-term care facilities, schools, public health agencies, and regulators.

- Maintain public water system accountability for treatment, distribution system integrity, compliance monitoring, disinfectant residual management, and cooperation with public health investigations.
- Require or incentivize building water management programs for high-risk facilities to use recognized standards and guidance, including ANSI/ASHRAE Standard 188, as the basis for building-level risk management, maintenance, monitoring, flushing, temperature control, corrective action, and documentation. High-risk facilities include hospitals, nursing homes, large institutional buildings, schools, and facilities with complex plumbing, cooling towers, or closed-loop systems.
- Provide technical assistance, training, and funding opportunities for building owners and operators to improve, monitor, repair, and maintain premise plumbing and related building water systems.
- Strengthen coordination among DEP, the Department of Health, public water systems, and facility operators during public health investigations, with data sharing focused on actionable risk conditions.
- Support public education that helps consumers, facility managers, and building owners understand how *Legionella* grows, where exposures occur, and what practical steps reduce risk.

Conclusion

Legionnaires' disease prevention deserves serious, science-based attention. Capital Region Water supports policies that improve public health, strengthen coordination, and help building owners and facility operators manage the premise plumbing, hot-water systems, cooling towers, closed-loop systems, and other building water systems where *Legionella* amplification and exposure risks most commonly occur. However, House Bill 2085 would impose broad new statutory duties on public water systems—including prescribed disinfectant residual levels, distribution system maintenance plans, disruption reporting, customer notification requirements, and penalties—that are not aligned with

Written Testimony of Charlotte Katzenmoyer, CEO, Capital Region Water, in Opposition to House Bill 2085

the best available science, existing drinking water regulatory frameworks, or the practical realities of Legionella risk management.

For these reasons, I respectfully urge the Committee to oppose House Bill 2085 as currently drafted and instead pursue a targeted framework that aligns responsibility with control, protects ratepayers from unnecessary costs, and focuses resources where they will most effectively reduce risk.

Thank you for the opportunity to provide testimony. I would be pleased to answer any questions and to work with the Committee, DEP, the Department of Health, public water systems, and building-sector stakeholders on a more effective approach to Legionnaires' disease prevention.

Statement

From Bill Murray <Bill.Murray@readingareawater.com>

Date Wed 7/15/2026 1:34 PM

To Ruby, Tara A. <TRuby@pahouse.net>

Tara-

Here is a draft. Some minor edits may occur, but overall the intention will remain in tact after edits. Please feel free to share with your group.

See you Monday,

Bill

The overwhelming majority of Legionnaires' disease outbreaks are traced to building water systems or cooling towers—not failures of municipal water utilities. However, if evidence demonstrates that a utility delivered inadequately disinfected water or otherwise failed to meet its obligations in a manner that materially contributed to an outbreak, it would already be subject to appropriate regulatory scrutiny and accountability.

I stand before you today in strong support of Pennsylvania House Bill 2085.

Make no mistake—Legionnaires' disease is the enemy of every one of us. It is not a partisan issue. It does not distinguish between lawmakers, regulators, utilities, building owners, or citizens. It does not care about titles, jurisdictions, or good intentions. It exploits vulnerabilities wherever they exist, and when it does, families suffer, lives are forever changed, and communities lose confidence in the institutions they depend upon.

That is why we cannot afford complacency.

HB 2085 represents an important first step toward ensuring that accountability exists where preventable failures occur. Accountability is not about assigning blame—it is about creating clarity. It is about ensuring that those with the authority to prevent harm also accept the responsibility to do so.

Responsibility without authority is ineffective. Authority without accountability is unacceptable. Good governance requires all three to work together.

This legislation strengthens the framework that protects public health. It reinforces the principle that every organization entrusted with safeguarding the public must be prepared to answer for its actions and continuously improve its performance.

Public trust is one of our most valuable assets. It cannot be demanded; it must be earned every single day. Trust grows when institutions are transparent, accountable, and willing to confront difficult challenges rather than avoid them. It is strengthened when we acknowledge risks, learn from failures, and take meaningful action to prevent them from happening again.

As water professionals, we understand the tremendous responsibility placed upon us. Every day, millions of Pennsylvanians rely on us to protect one of life's most essential resources. That responsibility is both an honor and an obligation.

Leadership is not demonstrated by resisting change—it is demonstrated by embracing solutions that make our systems safer, stronger, and more resilient.

Accountability does not diminish our profession. It elevates it. It clarifies expectations. It drives better decision-making. It improves performance. Most importantly, it reassures the public that their health and safety will always come before convenience or complacency.

This legislation is not about politics.

It is about people.

It is about the grandmother whose immune system cannot fight this disease. It is about the veteran recovering in a hospital. It is about the child visiting a loved one in a healthcare facility. It is about every Pennsylvanian who expects that the systems designed to protect them are working together to do exactly that.

The intent behind HB 2085 is thoughtful and necessary. Its foundation is built upon sound management principles. As this legislation moves forward, we should continue to refine its language, ensuring that it provides clear accountability while preserving the operational effectiveness needed to protect public health. We must not resolve one problem, by creating another.

At its core, this bill embraces the timeless principles of effective leadership: responsibility, authority, and accountability. These are not merely management concepts—they are the foundation of every organization worthy of the public's trust.

If not us, who?

If not now, when?

Progress has never come from standing still. It comes from recognizing challenges, accepting responsibility, and having the courage to act before tragedy compels us to.

HB 2085 is a constructive, balanced, and necessary step forward. I encourage my fellow water professionals to engage thoughtfully in its refinement, and I respectfully urge this body to support legislation that advances accountability, strengthens public confidence, and better protects the people we are all sworn to serve.

Let us lead with integrity.

Let us strengthen public trust.

And let us ensure that preventable risks are met not with hesitation, but with decisive action—because every life we protect is a promise kept.

Testimony of Dr. Christopher S. Crockett, PE
Vice President, Chief Environmental, Safety & Sustainability Officer
Essential Utilities / Aqua
Regarding House Bill No. 2085: Legionnaires' Disease Risk Management
Submitted for State Committee Hearing

Chair, Members of the Committee, and staff, thank you for the opportunity to provide testimony on House Bill No. 2085, concerning Legionnaires' disease risk management. My name is Dr. Christopher S. Crockett, and I serve as Vice President and Chief Environmental, Safety and Sustainability Officer for Essential Utilities, including Aqua water utilities.

Essential's highest priority is the delivery of safe, reliable drinking water and the protection of public health. Our teams operate every day of the year through storms, droughts, emergencies, and other challenging conditions to maintain resilient water service for the communities we serve. We appreciate the Committee's attention to Legionnaires' disease and share the goal of reducing public health risk.

Essential supports the portions of House Bill No. 2085 that focus on building water management, premise plumbing, cooling towers, healthcare facilities, and other building systems where *Legionella* risk is most directly controlled. However, Essential cannot support the bill in its current form because the provisions directed at public water suppliers are overly prescriptive, scientifically unsupported in key respects, potentially conflicting with existing Pennsylvania Department of Environmental Protection drinking water regulations, and unlikely to produce measurable reductions in Legionnaires' disease risk.

Summary of Essential's Position

Essential respectfully recommends that the Committee amend House Bill No. 2085 to focus on the most effective risk-reduction measures: building water management plans, premise plumbing controls, cooling tower management, healthcare facility water safety planning, and coordinated review by the Pennsylvania Department of Health and PADEP. The bill should not impose new public water system mandates unless those requirements are supported by current science, aligned with Chapter 109, and developed through Pennsylvania's established regulatory review process.

As drafted, the bill would bypass the Commonwealth's established Environmental Quality Board and Independent Regulatory Review Commission process for PADEP drinking water requirements. That process is important because it allows technical review, public comment, cost analysis, stakeholder input, and consistency with existing state and federal drinking water obligations.

Why Building Water Systems Are the Primary Control Point

The available public health evidence indicates that Legionnaires' disease risk is most often associated with building water systems, not the public water distribution system. In Pennsylvania, reported sources and risk settings have included healthcare facility plumbing, building hot water systems, cooling towers and HVAC systems, and stagnant or low-use building water systems. This is consistent with Pennsylvania Department of Health information and with Centers for Disease Control and Prevention guidance indicating that building water systems are the primary point of control for *Legionella* risk.

Recent national research also supports this conclusion. A study of 8,250 General Services Administration buildings found substantial *Legionella* occurrence in building systems and did not identify a clear numeric distribution system disinfectant residual threshold consistently linked to lower building occurrence. This reinforces the need to focus legislation on building-level controls, where temperature, stagnation, premise plumbing configuration, cooling towers, hot water systems, and maintenance practices can directly influence risk.

The Role of Public Water Suppliers

Public water suppliers play an important role in protecting public health by maintaining resilient treatment and distribution systems, stable disinfectant residuals, appropriate water age management, nitrification control, pressure integrity, emergency response capability, and compliance with PADEP drinking water requirements. Essential supports strong distribution system management and already operates under extensive Chapter 109 requirements including.

- Maintaining minimum and stable disinfectant residuals under PADEP's Disinfection Residual Rule.
- Managing water age through routine system operation, flushing, storage management, and hydraulic controls.
- Implementing nitrification control where chloramine is used.
- Responding to pressure loss, treatment interruptions, and emergency conditions under Chapter 109.
- Coordinating with regulators and public health agencies when conditions warrant additional response.

Those responsibilities are important. But the scientific evidence does not support the conclusion that imposing higher, fixed numerical residual requirements on public water suppliers will meaningfully reduce Legionnaires' disease outcomes, particularly when

Legionella growth and amplification frequently occur inside buildings after water has entered premise plumbing.

Scientific Concerns With Prescriptive Residual Requirements

Essential has participated in research with leading national experts to better understand how public water distribution systems can manage *Legionella* risk. Recent Water Research Foundation work by Bartrand and colleagues found that maintaining a disinfectant residual of 0.2 mg/L as total chlorine in chloramine systems provides comparable *L. pneumophila* control to 0.2 mg/L in free chlorine systems. The same research found that increasing residual from below 0.2 mg/L to 0.2 mg/L produced a large reduction in occurrence, while further increases beyond 0.2 mg/L produced progressively smaller benefits.

Those findings align with Pennsylvania’s existing Chapter 109 Disinfection Residual Rule, which has been in place since 2018. A broader distribution system management approach—focused on water age, stable residuals, nitrification control, pressure integrity, and operational response—is more appropriate than legislating narrow residual thresholds that may not correspond to building-level disease risk.

Concerns With Definitions and Regulatory Conflicts

Several provisions in House Bill No. 2085 appear to duplicate or conflict with existing PADEP regulations and guidance. In particular, the bill’s definition of “disruption” is broader and less precise than existing Chapter 109 concepts tied to treatment failure, loss of pressure, emergency conditions, contamination events, public notification, and emergency response obligations.

Under existing PADEP regulations and guidance, public water suppliers already have reporting and notification duties for events that adversely affect the quality or quantity of finished water and may present a significant potential for serious adverse health effects. These requirements include one-hour and 24-hour reporting obligations and emergency response planning requirements under Chapter 109.

The bill’s treatment of routine operational changes and source changes as “disruptions” is also problematic. Water suppliers may lawfully adjust treatment operations or blend sources based on system conditions, water availability, seasonal demands, or approved operating plans. Significant source or treatment changes already require PADEP review where applicable. Recasting routine operational decisions as statutory disruptions would create confusion without a demonstrated *Legionella* risk-reduction benefit.

Recommended Amendments to House Bill No. 2085

Essential respectfully recommends that the Committee amend the bill to retain the provisions that address building water management, while striking or substantially revising the public water supplier provisions that are duplicative, conflicting, or unsupported by the current evidence.

- Retain provisions requiring building water management plans for high-risk facilities and building systems.
- Align any public water supplier requirements with PADEP Chapter 109 and existing public notification, emergency response, and disinfection residual regulations.
- Strike Sections 6703, 6704, and 6705 as currently drafted, or replace them with a science-based review process led by PADEP and the Pennsylvania Department of Health.
- Require PADEP and PADOH to review Pennsylvania Legionnaires' disease case data, distribution system residual performance, existing Chapter 109 requirements, and current scientific literature.
- Require any recommended changes to public water system requirements to proceed through the Environmental Quality Board and Independent Regulatory Review Commission process.

This approach would preserve the bill's public health intent while ensuring that any new drinking water requirements are science-based, technically feasible, cost-effective, and consistent with Pennsylvania's existing regulatory framework.

Conclusion

In closing, Essential shares the Committee's goal of reducing Legionnaires' disease risk and protecting public health. The strongest opportunity for measurable risk reduction is in building water systems, premise plumbing, cooling towers, healthcare facilities, and other building environments where *Legionella* can grow and amplify.

We respectfully urge the Committee to amend House Bill No. 2085 to focus on those building-level controls, remove duplicative or conflicting public water system mandates, and rely on PADEP and PADOH expertise through the Commonwealth's established regulatory review process.

Thank you for the opportunity to provide testimony. Essential looks forward to continuing to work with the Committee, PADEP, PADOH, and other stakeholders to advance practical, science-based measures that protect public health.



Testimony of Benjamin C. Jewell, Commissioner, City of Philadelphia Water Department
Before the Pennsylvania House Consumer Protection, Technology, & Utilities Committee
Regarding House Bill 2085 – Legionnaires Disease Risk Management
Monday, July 20, 2026

Good morning, Chairmen Burgos and Metzgar, and members of the House Consumer Protection, Technology, and Utilities Committee. I am Ben Jewell, Commissioner of the City of Philadelphia Water Department (PWD). Thank you, Chairman Burgos, for inviting PWD to speak today. I appreciate the opportunity to provide comment on House Bill 2085 regarding Legionnaires Disease Risk Management.

I recognize the serious health impacts *Legionella* can have, and nothing in this testimony should be interpreted to minimize those impacts on individuals and families. However, transferring protective obligations from building owners/operators to the commonwealth's drinking water systems will have significant detrimental impacts, several of which are outlined below.

First, some background. PWD is the largest municipal water utility in the Commonwealth of Pennsylvania, providing 1.6 million residents with safe drinking water and more than 2.2 million people with reliable wastewater and stormwater collection and treatment services. PWD uses free chlorine as the primary disinfectant and monochloramine as the secondary disinfectant, through the distribution system, and at all three of our water treatment plants. PWD began chloramination in the late 1960s and 1970s. PWD staff members work steadfastly, 24/7/365, to ensure that water leaving our treatment plants and throughout our distribution system maintains adequate monochloramine residual to prevent bacteria growth and ensure that the water delivered to residents, businesses, and visitors is safe.

Despite its purported goals, PWD **opposes House Bill 2085** and the proposed requirements for public water systems. The bill would establish numerous requirements for public water systems that PWD believes would result in significant costs to Philadelphians (and all Pennsylvanians for that matter), establish poor precedent, be ineffective at achieving its stated purpose, and result in negative impacts on PWD's ability to provide safe drinking water. While PWD supports efforts to improve the management of *Legionella* in building water systems, primarily through establishing individual building water management plans and training, PWD does not believe that the requirements set forth in House Bill 2085 related to public water systems would achieve any significant risk reductions relative to Legionnaires Disease and could have the unintended consequence of increasing public health risk associated with increased disinfection by-products.



In my written submittal, PWD presents several key considerations for why **we respectfully request that H.B. 2085 not advance out of committee**. These include concerns about:

1. Water quality standards, such as treatment techniques, being mandated in legislation rather than following the formal regulatory process.
2. The effectiveness of the proposed requirements on public water systems to provide any additional risk reduction from *Legionella* growth compared to existing requirements from the Pennsylvania Department of Environmental Protection. In fact, a recent study by highly regarded water system associations investigating *Legionella* detections in federal buildings showed that establishing minimum disinfectant residuals has no statistically significant impact on reducing *Legionella* detections. Rather, the more effective prevention method is the establishment of building management plans for individual properties.
3. Significant costs expected to implement required drinking water infrastructure updates to meet the proposed requirements.
4. Operational and safety concerns for successfully operating and maintaining required drinking water infrastructure.
5. The unintended consequences of the proposed minimum disinfectant residual and the likelihood that this will result in Maximum Contaminant Level (MCL) exceedances for other regulated compounds with known adverse health effects.
6. The feasibility of planning, designing, constructing, and commissioning the required drinking water infrastructure in the timeframe set forth in House Bill 2085 in addition to the ongoing capital improvement work that is required to meet competing regulatory requirements as well as ensuring that PWD's drinking water system remains operational.

PWD takes significant pride in providing Philadelphia residents, businesses, and visitors with safe drinking water. **The requirements for public water systems proposed in House Bill 2085 will result in harmful water quality side effects while not effectively providing any additional risk reduction for *Legionella* in premise plumbing and would increase the financial burden on Philadelphians.** Due to these reasons, we again respectfully request that House Bill 2085 not advance containing the additional, ineffective burdens on public water systems, including in Philadelphia.

This concludes my testimony. Again, thank you, and I am happy to answer any questions.



1. **Drinking water regulations should not be established without following the established regulatory process that ensures adequate research and justification for the rulemaking along with a thorough cost benefit analysis and opportunity for public comment.**

The PA Safe Drinking Water Act, enacted by the General Assembly of the Commonwealth of Pennsylvania, does not establish maximum contaminant levels (MCL) or treatment techniques. Rather, it empowers the Environmental Quality Board (EQB) to establish standards, rules, and regulations. This includes MCLs and Treatment Techniques. **Setting a numerical minimum for residual disinfectant in House Bill 2085 amounts to establishing a treatment technique outside of the regulatory process.**

The EQB is comprised of 20 members, providing input to rules and regulations from perspectives of environmental protection, health, community and economic development, transportation, agriculture, labor and industry, and public utility.

There are standard processes and procedures for establishing environmental regulations in PA^{1,2}.

These rulemaking processes allow for the review of current scientific and engineering data by EQB and requires DEP to provide justifications and cost-benefit analysis to support the proposed rules. Additionally, public participation in the regulatory process allows for comments on the proposed rules and published responses.

2. **Current science indicates that requiring water systems to maintain a numeric minimum disinfectant residual greater than 0.2 mg/L, the current PA standard, would have no clear benefit on *Legionella* control.**

Legionella is a premise plumbing issue that must be addressed by individual building managers. Through the establishment of individual building water management plans, building managers can effectively minimize risks from *Legionella*. According to the CDC's 2024 report on the surveillance of waterborne disease outbreaks³, premise plumbing and point-of-use are the most commonly cited contributing factors for *Legionella* associated outbreaks. Efforts to reduce Legionnaires' Disease should be focused on premise plumbing system where this issue arises. The Philadelphia Water Department does not have any authority over building managers to require the establishment of these building management plans.

Further, Pennsylvania's Department of Environmental Protection (DEP) has already established a numeric minimum disinfectant residual of 0.2 mg/L for free or total chlorine. This disinfection level was promulgated in the Disinfection Requirements Rule (DRR) that went through Pennsylvania's



formal regulatory process. This rulemaking included a rigorous research and development process that included scientific review, cost-benefit analysis, and feedback from stakeholders. During this process, it was determined that 0.2 mg/L was an effective minimum disinfectant residual.

Recent research indicates that further increases to the minimum disinfectant residual above 0.2 mg/L would not have a significant impact on reducing *Legionella sp.* occurrence. Water Research Foundation (WRF) project 5156⁴ demonstrated that there was no clear benefit to *Legionella* control from a minimum disinfectant level above 0.2 mg/L. In addition, a recent study by the American Water Works Association (AWWA) and American Metropolitan Water Association (AMWA) investigating *Legionella sp.* detections in federal buildings showed that establishing minimum disinfectant residuals has no statistically significant impact on reducing *Legionella* detections⁵. Rather, the more effective prevention method is the establishment of building management plans for individual properties.

In addition, this bill would require the DEP to establish best management practices for water systems to reduce *Legionella* risks. Many of the required elements of this guidance are redundant to existing requirements in place by the DEP. Rather than improving the management of water systems, this bill would require water systems to develop and certify a redundant system maintenance plan and divert resources away from other critical operations.

3. **It would cost PWD a significant amount of money to make the drinking water infrastructure changes, such as water treatment plant upgrades and/or distribution system booster chloramination, required to meet the minimum disinfectant residual requirements established by House Bill 2085. This cost would ultimately be borne by PWD's ratepayers.**

Implementation of House Bill 2085 would be costly to PWD's customers, and it is uncertain if compliance with the bill is feasible in PWD's large and complex drinking water system. To meet the minimum disinfectant residuals outlined in the draft bill, PWD would be required to make significant changes to the drinking water infrastructure serving the City of Philadelphia.

It could cost PWD tens of millions of dollars, or more, to design, build, operate, and maintain this infrastructure.

Extensive and costly engineering studies at PWD's three drinking water treatment plants, and throughout the drinking water distribution system, would be required to determine the full extent of infrastructure and operational changes required, and to determine if those changes would be adequate to meet compliance to the bill.



4. **There will likely be significant public opposition, and operational and safety challenges, associated with the additional infrastructure needed to achieve the proposed minimum disinfectant residual level.**

It is anticipated that along with infrastructure upgrades at the existing drinking water treatment plants, the creation of numerous chloramination booster stations will be needed throughout the distribution system, including within residential neighborhoods, where **public opposition is expected**.

The creation and operation of these additional chemical receiving, storage, and dosing assets increase the opportunity (e.g. open gates during chemical deliveries) and attack surface for physical and cybersecurity threats, as outlined under Department of Homeland Security and CISA cybersecurity requirements and guidelines for water sector critical infrastructure.

PWD is committed to continue to maintain secondary disinfection in the distribution system through chloramination, for the clear benefits that chloramination presents, such as better chlorine odor control, reduced disinfection byproducts and better control of *Legionella* in PWD's system. However, relative to chlorination, chloramination has more water quality and operational complexity, and those challenges would be amplified at the new chloramination booster stations required to meet the proposed increase in minimum disinfectant residual. Restated, the proposed rule is more difficult to implement in PWD's existing drinking water system than within other systems. The required changes are counter to predictable and resilient drinking water operations.

5. **The proposed increase in minimum chlorine residual would very likely cause PWD to exceed maximum contaminant levels (MCLs) under the federal disinfectant/disinfection byproduct (D/DBP) Rule and may result in other unintended water quality consequences.**

Disinfection Byproducts (DBPs) – The formation of disinfection byproducts is directly proportional to the amount of disinfectant added. Increasing the disinfectant residual in the distribution system increases the potential formation of regulated disinfection byproducts. Exposure to DBPs in drinking water above the MCL are associated with carcinogenic risks – aligned to increased risk of bladder, liver, kidney, and other cancers. While PWD has successfully maintained DBPs below the MCLs established by EPA and DEP, the significant increase in minimum disinfectant residual, a 400% increase from the current minimum, would require PWD to raise or boost disinfectant throughout the system. This will put PWD at increased risk of exceeding the established DBP MCLs with known



health effects and would be putting Philadelphians at increased risk.

Aesthetic Concerns – The aesthetics of drinking water (e.g. smell, taste, etc.) play a major role in customer’s perception of the safety of their drinking water. While many aesthetic issues do not have direct safety impacts, they can lead to distrust among consumers. Increasing disinfectant residuals to meet the proposed minimum disinfectant residual will likely result in increased complaints and concerns caused by the chlorinous taste and odor of the drinking water. Customers often equate this taste and odor with chemicals in their water and wrongly believe that means their water is not safe. In PWD’s 2025 Annual Comprehensive Customer Survey, 68.6% of respondents expressed concerns with drinking water. Of those with concerns about drinking water, the most common concern was aesthetic issues. This is a common concern that PWD customers have expressed in previous annual customer surveys. If PWD is required to further increase its secondary disinfectant level, there is likely to be further damage to customer trust in PWD.

6. **House Bill 2085 would require public water systems to meet the proposed requirements, including the minimum disinfectant residual levels, within two and a half years. This proposed timeline for implementation is not feasible for many public water systems.**

PWD is facing numerous challenges involving aging infrastructure, and existing and new regulatory requirements, such as compliance with the Per- and Polyfluoroalkyl Substances (PFAS) MCLs and customer lead service line removal. We would need to integrate drinking water infrastructure upgrades required to meet the requirements of House Bill 2085 into existing planning, design, and construction projects required to keep the drinking water system operating for our > 1.6 million residents and visitors. In light of these competing priorities, PWD would not be able to plan, design, construct and commission the required infrastructure in the required timeframe proposed by House Bill 2085.



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Committee on Consumer Protection, Technology and Utilities
July 20, 2026

Testimony Provided By:
Steven Chintaman, Vice President of
Government Affairs
Pennsylvania Apartment Association



Committee on Consumer Protection, Technology and Utilities
HB 2085
July 20, 2026

Good morning, Chairman Burgos, Sponsor Representative Izzy, and members of the Committee on Consumer Protection, Technology and Utilities. My name is Steven Chintaman, and I am the Vice President of Government Affairs for the Pennsylvania Apartment Association (PAA) representing over 310,000 units and 316 property management companies across the Commonwealth. I'd like to thank you for the opportunity to testify today on HB 2085.

Protecting the health and safety of Pennsylvania residents remains a top priority for the Pennsylvania Apartment Association (PAA) and the multifamily housing industry. PAA supports reasonable, science-based measures that reduce the risk of Legionella exposure and recognizes the importance of responsible water management practices. We also appreciate that House Bill 2085 incorporates nationally recognized industry standards, including ASHRAE Standard 188 and ASHRAE Guideline 12, rather than creating entirely new Pennsylvania-specific engineering requirements. Likewise, the educational resources and public awareness initiatives assigned to the Department of Environmental Protection (DEP) and Department of Health (DOH) have the potential to strengthen water safety efforts for both public water systems and building owners.

PAA supports the bill's public health objectives and appreciates the sponsor's commitment to preventing Legionella-related illness. At the same time, we believe several targeted amendments would improve the legislation by ensuring compliance requirements are practical, risk-based, and appropriately allocate responsibilities among all parties involved.

One of PAA's primary concerns is that the bill takes a broad, one-size-fits-all approach to water management. By applying its requirements to all buildings meeting the criteria outlined in ASHRAE Standard 188, the legislation could encompass apartment communities, senior housing, student housing, mixed-use developments, and other residential properties regardless of their actual risk profile. Legionella risk varies considerably depending on factors such as building age, plumbing design, water temperatures, occupancy patterns, the presence of cooling towers, and whether a facility provides healthcare services. We respectfully suggest that compliance requirements be tailored to demonstrated risk rather than based solely on building classification or size.

The legislation would also establish significant new compliance obligations for housing providers, including developing comprehensive water management programs, conducting ongoing sampling and testing, maintaining extensive documentation, updating management plans, responding to inspections, and satisfying new reporting requirements. For many owners, particularly those providing affordable and workforce housing, these responsibilities will require the assistance of environmental engineers, industrial hygienists, water consultants, and certified laboratories, resulting in substantial recurring operational costs. We encourage consideration of implementation approaches that achieve the bill's objectives while recognizing the operational realities facing housing providers.

PAA is also concerned that the legislation requires Legionella testing without establishing clear regulatory standards governing implementation. Important questions remain regarding testing frequency, sampling locations, approved laboratory methodologies, action thresholds, remediation requirements, and what constitutes compliance. Providing these standards before implementation would promote consistent statewide enforcement, reduce uncertainty, and help ensure owners understand their obligations.

Additionally, mandatory testing raises important liability considerations. Because Legionella bacteria naturally occur in many water systems, a positive test result alone does not necessarily indicate unsafe conditions or negligence. Without appropriate legal safeguards, testing results could be used in litigation even where no illness or outbreak has occurred. PAA believes the legislation should recognize that owners who implement and maintain industry-accepted water management programs have exercised reasonable care and should receive appropriate legal protections for acting in good faith.

The bill also authorizes inspections and enforcement by multiple agencies while many of the implementing regulations remain undeveloped. Housing providers would benefit from greater clarity regarding inspection procedures, corrective action timelines, appeal rights, and compliance expectations. We respectfully encourage an implementation framework that emphasizes technical assistance, education, and compliance support before penalties are imposed.

In addition, portions of the legislation address issues affecting public water systems, including disinfectant residuals, source water quality, and municipal distribution infrastructure. Apartment owners generally do not control municipal treatment facilities, water mains, or the quality of water entering their properties. Clarifying the respective responsibilities of public water utilities and property owners would help ensure accountability is appropriately assigned.

Finally, as with any new regulatory requirement, implementation costs ultimately affect the cost of providing rental housing. Increased compliance expenses place additional pressure on operating budgets, capital planning, reserve accounts, and long-term housing affordability. These impacts are especially significant for affordable housing providers, workforce housing communities, and owners of older multifamily properties with substantial existing capital needs.

To strengthen the legislation while preserving its important public health goals, PAA respectfully recommends consideration of the following amendments:

- Establish a statutory safe harbor providing that housing providers who adopt and maintain an ASHRAE-compliant water management program are presumed to have exercised reasonable care.
- Limit mandatory water management program requirements to facilities presenting a higher risk of Legionella exposure, such as hospitals, nursing homes, assisted living facilities, buildings with cooling towers, or buildings with centralized hot water systems above specified thresholds, rather than applying identical requirements across all multifamily housing.

- Allow owners a reasonable opportunity to cure identified deficiencies before penalties may be assessed.
- Require DEP and DOH to publish model water management plans, compliance templates, technical guidance, and implementation resources before enforcement begins.
- Clearly establish statewide testing standards, including sampling frequency, approved laboratory methods, action thresholds, reporting requirements, and remediation protocols.
- Clarify that the presence of Legionella bacteria alone does not establish negligence and that compliance with the Act and accepted industry standards may be considered evidence of reasonable care.
- Consider grants, tax incentives, or other financial assistance to help affordable housing providers, workforce housing communities, and older multifamily properties implement these new requirements.

PAA appreciates the opportunity to work collaboratively with the bill sponsor, legislators, and stakeholders to strengthen this legislation. We believe these amendments will better balance the shared goal of protecting public health with practical, effective implementation that supports both residents and the housing providers who serve them.

From: Steve Chintaman <schintaman@paahq.com>

Sent: Tuesday, July 7, 2026 11:14 AM

To: Denisco, Samuel <SDenisco@cozen.com>

Subject: Re: Legionaries Hearing

****EXTERNAL SENDER****

Steven Chintaman, Esq. is an attorney, government affairs executive, and housing policy leader with extensive experience advancing legislative, regulatory, and public policy initiatives across the affordable housing and real estate sectors. As Vice President of Government Affairs for the Pennsylvania Apartment Association, he leads the organization's statewide advocacy strategy, representing the interests of rental housing providers before the Pennsylvania General Assembly, state agencies, and key policymakers.

Steven has built a career at the intersection of law, public policy, and government relations, advising elected officials, trade associations, businesses, and nonprofit organizations on complex legislative and regulatory matters. His expertise spans affordable housing policy, housing finance, landlord-tenant law, eviction and rental assistance policy, regulatory compliance, coalition building, and strategic stakeholder engagement. He is recognized for developing bipartisan policy solutions, strengthening organizational influence, and translating complex policy issues into actionable advocacy strategies.

Before joining the Pennsylvania Apartment Association, Steven served as Senior Associate at Bellevue Strategies, where he advised clients on municipal, state, and federal government affairs, regulatory approvals, and legislative strategy. Earlier in his career, he served as Legislative Counsel in the Philadelphia City Council, where he drafted legislation and advised elected officials on housing, public health, and regulatory policy.

A member of the Pennsylvania Bar, Steven earned his Juris Doctor from Rutgers Law and his Bachelor of Arts from La Salle University. His legal scholarship includes publication in the *Rutgers Journal of Law and Religion*. He has also served as a volunteer attorney with HIAS Pennsylvania and is a Buchholz Fellow with the Committee of Seventy.

Steven has been recognized by *City & State Pennsylvania* as a **40 Under 40 Rising Star** and a **2026 Government Relations Honoree** for his leadership in public affairs and housing policy. Throughout his career, he has remained committed to expanding housing

opportunity, fostering collaboration among public and private stakeholders, and advancing practical policy solutions that strengthen communities across Pennsylvania.



Alliance to Prevent Legionnaires' Disease

Alliance to Prevent Legionnaires' Disease, Inc.
1200 G Street NW, Suite 800 | Washington, DC 20005
preventlegionnaires.org | 1-202-434-8757

Chairman Burgos and members of the Consumer Protection, Technology and Utilities Committee, thank you for the opportunity to testify at this public hearing regarding *Water Management Systems and the Prevention of Legionnaires' Disease*. I will focus my testimony on support for House Bill 2085, which will help address our ongoing issues with *Legionella* bacteria and Legionnaires' Disease in Pennsylvania. My name is Bill McQuade and I am a Pennsylvania resident and the immediate past president of ASHRAE, which is a nonprofit professional and technical society of more than 54,000 members who focus on building systems, energy efficiency, indoor air quality, water system safety, refrigeration, and resiliency within the built environment. Through research, standards development, publishing, certification and continuing education, ASHRAE shapes tomorrow's global built environment today.

Managing building water systems to reduce waterborne disease risk is essential to comprehensive water safety. Multiple ASHRAE standards and guidelines directly address Legionnaires' disease risk.

I am also a proud board member of the Alliance to Prevent Legionnaires' Disease (APLD), a nonprofit public health advocacy group dedicated to reducing the occurrence of Legionnaires' disease by promoting public research, education, best practices for water management, and advocating for comprehensive policies to combat and investigate this preventable disease.

First, I would like to recognize the sponsors of this legislation, Representative Smith-Wade-El and Representative Ed Neilson, and other cosponsors, for their leadership and work put into this bill. We know there has been a considerable amount of time spent reviewing this issue and meeting with stakeholders. We thank everyone for the efforts to protect public health.

I respectfully urge the Committee to advance this legislation because it creates the comprehensive, source-to-tap framework Pennsylvania needs to reduce *Legionella* bacteria in the water systems that serve our residents. Pennsylvania is my home. It is where my family lives, and like everyone else in Pennsylvania, I expect clean water free of *Legionella* bacteria. Prevention requires a comprehensive approach that begins with the source of the water flowing into our homes, buildings and facilities and continues through proper management of distribution and premise plumbing systems and water-using equipment. New Jersey has enacted a comprehensive source-to-tap framework, while states such as Illinois and Louisiana have adopted stronger residual disinfectant requirements and other water quality standards. Now it is time for Pennsylvania to follow suit.

Pennsylvania has a unique place in the history of Legionnaires' disease. The disease was first recognized after the 1976 outbreak in Philadelphia, yet 50 years later, too many public policies and approaches are reactive, going into effect only after a multiple victim outbreak. HB 2085 moves the Commonwealth toward prevention. It recognizes that *Legionella* is a water quality issue, not only a building maintenance problem or an outbreak-response problem. The water that enters a building matters. The condition of the public distribution system matters. The way water

is managed inside buildings matters. The public health response after a case is reported matters. HB 2085 connects each of these responsibilities into one practical framework.

The key aspect of Legionnaires' disease prevention is straightforward. *Legionella* does not spontaneously appear at the showerhead, our faucets, in cooling equipment or at other points of exposure in our homes and buildings. They are exposure points, but they are downstream from the source. The bacteria must first be introduced into an environment where it can survive, multiply in biofilm and eventually become aerosolized or aspirated (when water goes down the wrong pipe). Aging infrastructure, disruptions in treatment, changes in source water, heavy rain and flooding, water age, low flow, stagnation, and inadequate residual disinfectant can all create conditions that allow waterborne pathogens to persist and move through the distribution system into buildings.

That is why a building-only approach is incomplete. It is also why an outbreak-only approach is inadequate. The overwhelming majority of Legionnaires' disease cases (96%) are sporadic (individual), not formally linked to a recognized outbreak of two or more cases. Those individual cases often never receive the level of investigation needed to identify shared water quality conditions or systemwide warning signs. HB 2085 corrects that blind spot by requiring a better understanding of both distribution system conditions and building-level risks.

In 2016, the Centers for Disease Control and Prevention (CDC) declared that Legionnaires' disease is preventable through proper water management. The CDC released a toolkit, *Developing a Water Management Program to Reduce Legionella Growth and Spread*, which is based on the leading global building ANSI-standard, ASHRAE 188 for reducing Legionellosis risk which was first published in 2016 and updated most recently in 2021. Standard 188 and a related Guideline 12-2020 provide detailed guidance on creating building water management programs for managing legionella bacteria risk focused on the types of buildings and facilities, water-using equipment and populations that may utilize or be served by a building. ASHRAE Standard 188 and ASHRAE Guideline 12 are written to be usable and implemented by a broad range of building owners. The standards are the result extensive input from technical experts, academia, and healthcare stakeholders and from city, state, and national public health departments and regulatory authorities including the CDC.

Importantly HB 2085 would codify these standards requiring the owners and operators of covered buildings to create a building water management plan consistent with ASHRAE 188 and Guideline 12. Specifically, a team would develop and implement the plan, ensuring good water quality, removing stagnant pipe sections, monitoring water-using equipment, flushing systems regularly, and having a response plan for potential cases.

In 2016, a CDC study also found that over a third of outbreaks were the result of a disruption in the public water distribution system. Disruptions include planned and unplanned construction and issues in distribution systems like treatment changes and water main breaks. In two-thirds of outbreak investigations there were inadequate water disinfectant levels. These system upsets like construction, water main breaks, water treatment changes, heavy rainfall and others can disrupt *legionella* bacteria stored in the biofilm of public water distribution system piping and send the bacteria downstream into homes and buildings.

Given these factors, HB 2085 appropriately creates additional standards for public water systems because effective prevention must start before water reaches our buildings. For these systems, the bill requires a minimum disinfectant residual of at least 0.5 mg/L of free chlorine, or at least 1.0 mg/L of monochloramine, in all active parts of the public water system at all times. This is not an arbitrary standard. It is a protective floor that helps ensure the last customer on the line receives meaningful pathogen protection, not merely the first customer closest to the treatment plant.

The words 'at all times' are essential. A standard that allows a system to miss the requirement in a percentage of samples may look administratively convenient, but it is not protective for the family at the end of the line, the cancer patient at home, the nursing home resident, the dialysis patient, the hospital patient or the person with chronic lung disease. Legionella risk is not averaged across a spreadsheet; exposure occurs at a specific tap, in a specific building, at a specific time. If residual disinfectant is allowed to disappear in portions of the active distribution system, the public health purpose of the legislation is weakened.

But this legislation importantly recognizes that disinfectant residual alone is not enough. HB 2085 requires best management practices and distribution system maintenance planning; documentation of public water system disruptions; customer notification when disruptions may affect water quality; environmental rules and regulations by our state agencies; and annual reporting so the Governor and General Assembly can evaluate cases, sampling results, violations and whether future legislative action is needed. These provisions are important because disruptions and source changes can loosen biofilm, increase water age, change chemistry and move pathogens or nutrients into homes and buildings.

While the Committee may hear concerns about taste, odor or disinfectant byproducts related to these provisions, they should not be used to avoid reasonable protection. Chlorine and chloramine have been used for decades to protect drinking water from disease-causing organisms. Federal guidance recognizes chlorine and chloramine levels up to 4.0 mg/L as safe in drinking water. HB 2085's residuals are well below that level. Other states have adopted residual requirements at or above levels proposed in this bill, including 0.5 mg/L free chlorine requirements, without evidence of the broad public health or consumer impacts sometimes predicted by opponents. The better policy is not to choose between microbial safety and chemical compliance, but to require competent water quality management that achieves both.

HB 2085 is also cost-effective when compared with the human and financial cost of preventable disease. Legionnaires' disease can mean hospitalization, intensive care, long recovery, permanent health consequences and death. Every case also triggers public health work, medical expense, building response costs and loss of public confidence. Preventing risk before an outbreak is more effective than waiting to test water systems after people are sick.

HB 2085's public awareness provisions are particularly important for vulnerable residents, many of whom live at home or spend time in facilities with complex water systems. They deserve notice when disruptions may affect water quality and practical information to reduce exposure. The dashboard and annual reports will help communities, health care providers and policymakers identify patterns earlier and evaluate whether the program is working.

We must recognize that every water system is different. That is precisely why Pennsylvania needs a framework that combines clear minimum standards with a source to tap approach that manages both the water source and distribution system, as well as the buildings and homes that use it.

I was encouraged by New Jersey's 2024 law, which raises disinfectant levels throughout water systems, requires notifications for at-risk populations, mandates thorough investigations of cases, and ensures buildings fully follow ASHRAE Standard 188 and Guideline 12. A comprehensive source-to-tap approach is the only way to effectively protect vulnerable people.

For nearly five decades, public health policy has too often chased Legionella after it has already reached the end of the system and after people have already become sick. Pennsylvania can lead by rejecting that reactive model. HB 2085 follows the water, follows the science and focuses on prevention. It will help protect seniors, patients, immune-compromised residents, workers, students and families across the Commonwealth. For these reasons, I respectfully urges the Committee to report House Bill 2085 favorably and move Pennsylvania toward a comprehensive source-to-tap strategy to prevent Legionnaires' disease.



Good afternoon, Chairman Burgos, Chairman Walker-Metzgar, and other members of the House Consumer Protection, Technology and Utilities Committee. Thank you for holding this hearing. I appreciate the opportunity to testify today on the important topic of fighting Legionnaires' Disease.

My name is Steve Hvozdoch and I'm the Pennsylvania Campaigns Director for Clean Water Action. Clean Water Action is a national non-profit environmental organization with a little over 95,000 members across Pennsylvania. Since our founding during the campaign to pass the landmark Clean Water Act in 1972, we've worked to enact strong protections for our health and environment by bringing issue expertise, solution-oriented thinking and people power to the table.

Legionella bacteria, especially *Legionella pneumophila*, are naturally occurring worldwide, usually in warm freshwater environments. Legionella tends to proliferate in water temperatures between 77 and 113°F but can survive at temperatures as low as 68°F and grow in temperatures up to 120°F.

Climate change is fueling the greater proliferation of these conditions. A 2025 [Penn State University study](#) found that heat waves in water are increasing between two to four times as rapidly as heat waves in air. Heat waves in water also persist longer and have a greater intensity. The study highlights a 2025 heat wave that occurred across much of Pennsylvania where daily high temperatures in southeastern Pennsylvania ranged from 86 to 101 degrees for thirteen days between June 18th and June 26th. Near the end of the heat wave, the water temperature of the Schuylkill River, measured at the United States Geological Survey gauge at Norristown, reached 85°F on June 26, and for five days, water temperatures remained above 80 degrees, which is right in that desirable threshold for Legionella to proliferate. A typical June temperature at this gauge under normal summer conditions would be in the low to mid-70s. But let's be clear, what we considered normal summer conditions are a thing of the past, just see the recent we experienced which mirrored our same experience last year.

In Pennsylvania, over 8 million people receive drinking water from public water systems that rely at least in part on surface water sources.

While Legionella occurs naturally in our environment, Legionella growth can also occur in water systems. Let's touch upon several key factors known to affect this.

Water stagnation in closed units, including but not limited to water towers and storage tanks, can contribute to the potential proliferation of pathogens.

Biofilms and sediments in drinking water systems provide habitats that can support the proliferation and survival of opportunistic pathogens like Legionella. Older infrastructure



carries a greater risk because biofilms accumulate more readily on pipes with greater wetted surfaces and low flow conditions. In other words, iron or copper infrastructure that has deteriorated due to oxidation. Free-living amoebae within the biofilms are their preferred environmental host. Legionella have demonstrated their ability to survive and multiply within different amoebae and thus may resist disinfection.

Conditions that exert a demand on disinfectants limit the system's ability to maintain a disinfectant residual. For example: biofilms and sediments in piping and tank surfaces can harbor microorganisms that consume the disinfectant. Corrosion products and other compounds present in finished water can also react with disinfectants.

The United States Environmental Protection Agency regulates Legionella in public water systems under the Surface Water Treatment Rule via a treatment technique with a maximum contaminant level goal of zero organisms per liter. While there are no monitoring requirements, the Surface Water Treatment Rule does contain a provision for maintenance of a disinfectant residual in distribution systems, which may provide some control of Legionella. Public water systems supplied by or under the direct influence of surface water that disinfect with chlorine must maintain a minimum free chlorine residual of 0.2 mg/L at the entry point and a free chloring residual for water that is delivered to customers through a distribution system. Disinfectant residuals serve three main purposes: to protect against microbial contaminants, to act as an indicator of distribution system upset, and to limit growth of heterotrophic bacteria and Legionella within the distribution system.

In addition, the Revised Total Coliform Rule emphasizes preventive action by requiring water systems to investigate and correct contamination sources rather than solely report maximum contamination level exceedances that include baseline and follow up testing for Legionella.

Between a growth in Legionnaires Disease cases and federal rules for drinking water and water systems remaining static, states are left to decide if the floor set by the federal government is sufficient to ensure the safety and health of its residents.

Pennsylvania has previously decided that they don't go far enough. Currently, Pennsylvania follows the United States Environmental Protection Agency's numerical value of 0.2 mg/L, but Pennsylvania applies it more broadly to all community water systems using chlorine, instead of just surface water systems.

New Jersey decided to go even further. While New Jersey raised the free chlorine standard to 0.3 mg/L free chlorine, the standard is applied at all times to all active parts of chlorine-disinfected systems. The higher requirement means the New Jersey systems must maintain a greater residual to meet the state's minimum. New Jersey also requires regular



testing and investigation of repeated violations. The impenitence for the 2024 adoption of New Jersey's gold standards was confirmed cases as reported by the Center for Disease Control rising to 318 in 2019 or 3.6% of the national total.

Pennsylvania's confirmed cases according to the most recent Center for Disease Control's Surveillance Report were 351 or 5.6% of the national total in 2020 and 454 or 5.4% of the national total in 2021. Only three states had more alarming numbers.

Given what we now know, the question before us today is how will Pennsylvania respond? Will it be with the same urgency and equal fervor as New Jersey?

HB 2085 is the response that says Pennsylvania will!

While Section 6703 (a) (1) of HB 2085 moves the mg/L to .5, it would also adjust the standard to being applied AT ALL TIMES and to ALL ACTIVE PARTS of chlorine-disinfected systems. Like New Jersey, the higher requirement would mean Pennsylvania's systems must maintain a greater residual to meet the state's minimum. The move also remains within the practice of most municipal water systems, according to the World Health Organization, maintaining chlorine residuals between 0.2 and 1.0 mg/L in finished water.

In addition to modifying the application of the standard, there are a series of best management maintenance practices a water system can take to help ensure Legionella doesn't develop. Given disinfections importance in addressing pathogens' growth, mapping disinfectant residuals in the distribution system can be a valuable tool to direct resources to areas that may be dropping below these residuals. Best management maintenance practices should also include:

- conducting an evaluation of their asset inventory to identify old components, dead ends, or pipe materials conducive to Legionella growth.
- cleaning and then installing liners on their water mains to help prevent biofilm adhesion.
- maintaining pre-established flushing schedules to ensure a sufficient disinfectant residual is present throughout the system. Many public community water systems use a combination of conventional, unidirectional, and continuous/blow off flushing for routine flushing activities.
- cleaning storage towers and tanks once every 3-5 years, or whenever an evaluation, sampling, or indication event suggests that pathogens are present in a system that may be impacting a storage tank or tower.

HB 2085 addresses these other areas through the provisions of Section 6703(b).



Legionnaires disease may have a history that's connected to Pennsylvania, but it doesn't have to have a future that does. Pennsylvania can fight back against Legionnaires Disease and the tools to do so are at our fingertips.

That's why Clean Water Action recommends that the General Assembly pursue policies, like HB 2085, that improve standards for our water systems and other pathways in order to better prevent, detect, and control cases of Legionnaires' Disease.

Thank you for your time today!



Pennsylvania
**Department of
Environmental Protection**

Written Testimony
Hearing on *Legionella* Water Management Plans
July 20, 2026

The Pennsylvania Department of Environmental Protection (DEP or Department) would like to thank Chair Burgos, Chair Metzgar, and the members of the Consumer Protection, Technology and Utilities committee for this opportunity to provide written testimony regarding DEP's implementation of our Safe Drinking Water Program as it applies to *Legionella*.

This testimony provides: information regarding the scope and applicability of the Federal and State Safe Drinking Water Acts and safe drinking water regulations relative to *Legionella*, DEP's actions to address *Legionella* in public water systems, and our collaboration with our colleagues from the Pennsylvania Department of Health (DOH) related to *Legionella*. Our testimony concludes with a brief review of House Bill 2085. First, a few facts about DEP's Safe Drinking Water Program...

Safe Drinking Water Program

The principal mission of DEP's Safe Drinking Water Program is public health protection. Safe drinking water is vital to maintaining healthy and sustainable communities. Proactively avoiding incidents such as waterborne disease outbreaks can prevent loss of life, reduce the incidence of illness, and reduce health care costs. Proper investment in water infrastructure and operations helps ensure a continuous supply of safe drinking water, enable communities to plan and build future capacity for economic growth, and ensures their long-term sustainability. The Commonwealth has approximately 8,000 public water systems – which makes us the fourth the largest state drinking water program in the nation. In Pennsylvania, public water systems serve drinking water to approximately 11.4 million people statewide. DEP Safe Drinking Water Program staff take their responsibilities very seriously and are focused on ensuring that all applicable Federal and State requirements are met and the water produced by regulated public water systems is safe to drink. Currently, DEP is working with public water systems to adopt and implement three new and complex Federal drinking water regulations focusing on lead and copper, PFAS, and consumer confidence reports.

Scope and Applicability of the Safe Drinking Water Act and Regulations

The Public Water System Supervision Program is a “delegated” program from the U.S. Environmental Protection Agency (EPA) to DEP in Pennsylvania. The Commonwealth currently has primary enforcement authority (or primacy) for the program per Section 1413 of the Public Health Service Act, which is more commonly referred to as the Federal Safe Drinking Water Act.

The Department's Safe Drinking Water Regulations at 25 Pa. Code Chapter 109 define a public water system as follows:

Public water system—A system which provides water to the public for human consumption which has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. The term includes collection, treatment, storage and distribution facilities under control of the operator of the system

and used in connection with the system. The term includes collection or pretreatment storage facilities not under control of the operator which are used in connection with the system. The term also includes a system which provides water for bottling or bulk hauling for human consumption. Water for human consumption includes water that is used for drinking, bathing and showering, cooking, dishwashing or maintaining oral hygiene.

There are a few regulatory exemptions under the Federal and State Safe Drinking Water Acts as follows:

*Rules and regulations shall apply to each public water system, unless the public water system meets **all** of the following conditions:*

- (1) Consists only of distribution and storage facilities and does not have collection (e.g. sources of supply) and treatment facilities.*
- (2) Obtains all of its water from, but is not owned or operated by, a public water system to which these rules and regulations apply.*
- (3) Does not sell water to any person.*
- (4) Does not provide water for potable purposes to carriers which convey passengers in interstate commerce.*

Per these exemptions, the Federal and State Safe Drinking Water Acts do not apply to buildings that are served by a public water system if the building consists only of distribution and storage facilities (for example, premise plumbing) and the building does not have its own supply of water or its own drinking water treatment facilities. Therefore, DEP does not have regulatory oversight of premise plumbing within buildings that do not meet the definition of a public water system.

Legionella Bacteria

Legionella bacteria can become a health concern when it grows and spreads in potable water systems such as the premise plumbing of large buildings (consisting of hot water heaters, storage tanks and pipes), cooling towers, decorative fountains and hot tubs. The term “premise plumbing” traditionally refers to the portion of the water distribution system from the water meter to the tap in homes and buildings.

Potential pathways of contamination into plumbing systems include:

- Cross connections and backflow
- Leaking pipes, valves, joints and seals
- Water line breaks, repairs, and new construction (includes building renovation projects, new additions)
- Storage tanks (vents allow entry of airborne contaminants, sediment accumulation)

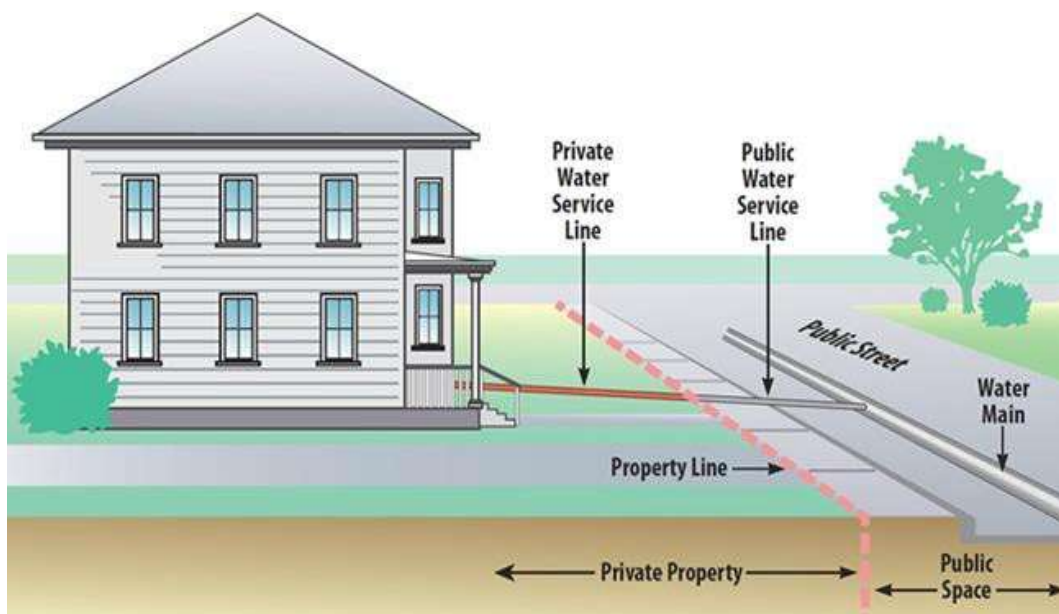
Legionella bacteria become a problem when amplification occurs within building plumbing systems. Conditions that favor amplification of *Legionella* include:

- Low flow (stagnation) and high water age (due to excessive storage, dead ends/legs, low flow fixtures, other water conservation measures)
- Material and condition of water pipes (pipe scale/rust – impacts from corrosion and aging infrastructure), fittings, fixtures (shower heads, faucets), water heaters and treatment devices
- Presence of nutrients (organic and inorganic – iron, manganese, zinc, nitrogen) and sediment
- Warm water temperatures (77 - 108°F)
- Low or no disinfectant residual

Stagnation degrades water quality because it decreases disinfectant residual, increases disinfection byproducts, increases biofilm and microbial growth, decreases pH, increases corrosion and increases chlorine demand. These conditions support the growth of biofilms within hot and cold plumbing systems and the amplification of *Legionella*. In order to control *Legionella*, the underlying conditions that promote amplification must be addressed – water age and water stagnation may be the most important factors.

Distribution Piping vs. Premise Plumbing:

Water quality (and *Legionella* control) is a shared responsibility between the public water system and building owners. More specifically, public water systems are responsible for delivering water to the building that meets drinking water standards. Building owners are responsible for maintaining water quality through the proper design, construction, operation and maintenance of premise plumbing. Below is a visual of where public water system responsibility generally ends, and building owner responsibility generally begins.



There are steps that public water systems and building owners can take to reduce the risks.

Legionella control approaches for public water systems include the following:

- Maintain a disinfectant residual throughout the distribution system that meets current regulatory requirements of at least 0.2 mg/L
- Use best practices and industry standards for distribution system and storage tank operation and maintenance (includes proper main replacement/repair, flushing and cleaning protocols, preventative maintenance)
- Improve hydraulics and reduce water age, increase storage tank turnover (with a goal of 5 days or less of retention time), and eliminate dead ends which will improve overall water quality and control biofilms/microbial regrowth
- Develop proactive messaging for customers regarding pathogens in plumbing systems

The proper design, operation and maintenance of premise plumbing systems is critical to maintaining water quality and controlling *Legionella*. *Legionella* control measures for building owners include the following:

- Develop and implement a water management or water safety plan
- Monitor water quality
- Maintain incoming water quality
- Prevent water stagnation within buildings
- Prevent scaling and corrosion
- Control biofilms within building
- Prevent sanitary defects or pathways of contamination
- Maintain adequate water temperatures
- If needed, maintain or install adequate disinfection

DEP's Approach to Addressing *Legionella*

In 2012, DEP established a protocol to address *Legionella* in public water systems. The protocol includes communication and coordination with DOH and the use of existing authorities under Chapter 109 to require follow up and corrective actions for public water systems regulated by DEP. These authorities include the following:

§ 109.202. State MCLs, MRDLs and treatment technique requirements.

* * *

(c) Treatment technique requirements for pathogenic bacteria, viruses and protozoan cysts. A public water system shall provide adequate treatment to reliably protect users from the adverse health effects of microbiological contaminants, including pathogenic bacteria, viruses and protozoan cysts. The number and type of treatment barriers and the efficacy of treatment provided shall be commensurate with the type, degree and likelihood of contamination in the source water.

* * *

§ 109.4. General requirements.

Public water suppliers shall:

- (1) Protect the water sources under the supplier's control.*
- (2) Provide treatment adequate to assure that the public health is protected.*
- (3) Provide and effectively operate and maintain public water system facilities.*
- (4) Take whatever investigative or corrective action is necessary to assure that safe and potable water is continuously supplied to the users.*

Under these authorities, DEP can require public water systems to complete the following corrective actions if Legionnaires' disease cases are reported or *Legionella* is detected within facilities under the control of a public water system:

- One-hour reporting to DEP under § 109.701(a)(3)
- Tier 1 public notification under §§ 109.408(10) & (11)
- Confirmation and additional sampling under § 109.302
- Additional corrective actions as necessary including remediation, sampling and installation of treatment (§ 109.4)

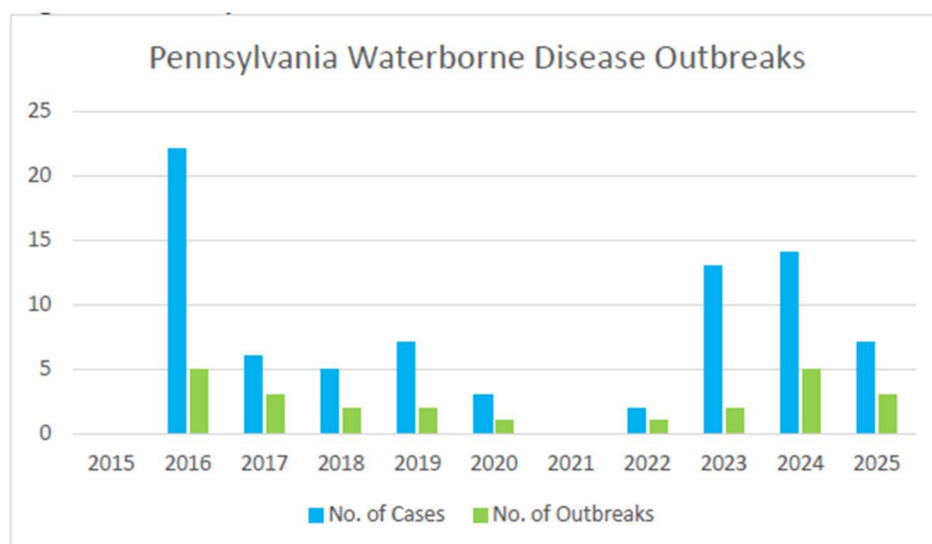
DEP, under the authority of the Pennsylvania Safe Drinking Water Act, requires a permit for installation of permanent treatment for *Legionella* control. The treatment must meet industry standards and be approved by EPA or the state (using third-party validation and certification for efficacy).

It is very important to note that DEP previously engaged with industry experts and the regulated community to develop a Pennsylvania-specific regulation that was and still is more stringent than Federal regulations relative to distribution system disinfectant residuals. After following a detailed regulatory development process, in 2018, DEP finalized the Disinfection Requirements Rule which, among other things, increased the minimum disinfectant residual in the distribution system to 0.2 mg/L. The Disinfection Requirements Rule also improved monitoring by requiring more frequent sampling at representative and worst-case sites within the public water system's distribution system per a sample siting plan. The Disinfection Requirements Rule was intended to strike a balance between the goals of improved microbial inactivation while limiting adverse impacts from disinfection byproducts. Public water systems can achieve both goals by employing effective best management practices, including proper flushing, storage tank maintenance, leak detection and effective pipe replacement and repair practices. This regulation also requires public water systems that use chloramines (instead of chlorine) for disinfection to develop and implement a Nitrification Control Plan which is intended to help reduce the likelihood of *Legionella* growth within the distribution system piping controlled by the public water systems.

Additionally, DEP first established a protocol in 2012 to collaborate with DOH to address *Legionella* in public water systems. DOH initiates communication with DEP whenever an active *Legionella* investigation is initiated by DOH. Once notified by DOH, DEP contacts the public water system serving water to the facility DOH is investigating to gather information regarding any potentially related water quality concerns. DEP also participates in a routine quarterly conference call where DOH takes the lead on providing a verbal overview (while maintaining patient confidentiality) of Legionnaires' cases to DEP from the previous quarter. This communication protocol has been consistently implemented and iteratively improved over the years. In summary, based on these routine communications and investigations, it appears that DOH investigates a considerable number of individual cases, but there are very few instances of multiple related cases that would be considered a waterborne disease outbreak. While DOH is the agency with detailed knowledge of Legionnaires' investigations, DEP's collaboration with DOH indicates that most cases appear to be isolated to premise plumbing within a specific facility and/or portion of that facility which is not a public water system.

***Legionella* Bacteria and Waterborne Disease Outbreaks**

The graphic below summarizes data provided to DEP by DOH related to waterborne disease outbreaks in Pennsylvania since 2015. In 2025, three waterborne disease outbreaks were reported in Pennsylvania. All three were associated with *Legionella* in health care facilities. In Outbreak #1, there were two cases of illness, with two hospitalizations, and no deaths. In Outbreak #2, there were three cases of illness, with three hospitalizations, and one death. In Outbreak #3, there were two cases of illness, with two hospitalizations, and no deaths. In all three cases, after receiving notification from our colleagues at DOH, DEP Safe Drinking Water Program staff contacted the public water system serving water to the health care facilities to ask a series of questions to determine if the public water system experienced any treatment breakdowns or customer complaints in the 8 weeks prior to the event. In all cases, no treatment breakdowns at the public water systems serving water to the health care facilities were identified, and a specific underlying deficiency was ultimately not determined.



Source: DEP Safe Drinking Water Program tracking based on information provided by DOH

Bipartisan Infrastructure Law (BIL) Funding

Via BIL funding to the Drinking Water State Revolving Fund, the Pennsylvania Infrastructure Investment Authority (PENNVEST) has dramatically increased the scope and pace of funding drinking water infrastructure improvement projects for public water systems in Pennsylvania. In approximately the past three years, numerous projects related to distribution water main replacements, lead service line replacements, replacement of aging galvanized service lines, and improvements to drinking water storage tanks have been funded by PENNVEST. While these projects do not specifically target *Legionella* bacteria as the primary reason for the infrastructure improvement, they may have tangential benefits to improving physical distribution system conditions which in turn may also reduce the likelihood for *Legionella* growth.

House Bill 2085

DEP's collaboration with DOH indicates that increased water age and stagnation which occur in premise plumbing may be the most important factors leading to the amplification of *Legionella*. These issues can be addressed through the development and implementation of a water management plan, and better design, operation and maintenance of premise plumbing. Therefore, DEP believes that any efforts/legislation aiming to mitigate risks from *Legionella* are best focused on premise plumbing systems, not on public drinking water systems.

DEP already has ample authority to regulate public water systems under Pennsylvania's Safe Drinking Water Act. To responsibly protect public health, regulation of public water systems needs to consider not only risks from *Legionella* but also needs to balance those risks against risks associated with disinfection byproducts, which also present significant risks to human health. Increasing disinfectant residuals to mitigate risks from *Legionella* (and other microbes) can increase harmful disinfection byproducts. This balancing of risks from microbes and from disinfection byproducts is known as "simultaneous compliance" in the Safe Drinking Water regulatory world. Existing regulatory authority and process for setting drinking water standards for public water systems is sufficient and appropriate to consider these risks holistically.

While DEP has already taken steps to establish state-specific regulations to help reduce Legionnaires' outbreaks in public water systems, additional regulatory considerations are ongoing at the Federal level. For example, EPA continues to review whether amendments to the suite of Microbial and Disinfection/Disinfection Byproducts Rules are necessary. Valuable insights can be gained by allowing EPA to complete their assessments and identify the best path forward to establishing future regulations related to *Legionella* in drinking water while considering simultaneous compliance. Therefore, DEP urges caution when considering broad state-level legislative or regulatory requirements solely to address *Legionella*.

DEP again thanks the committee for the opportunity to provide testimony on this important public health topic.

Written Testimony of Janet E. Stout, PhD Microbiologist

Date: July 13, 2026

Re: HB 2085 Legionnaires' Disease Risk Management

To: Danilo Burgos, Chair, House Consumer Protection, Technology & Utilities, and
Ismail Smith-Wade-El, HB 2085 Sponsor

My name is Dr. Janet E. Stout. I am considered one of the world's authorities on *Legionella* diagnosis, detection, prevention, and control. My first publication was in the New England Journal of Medicine in 1982 and was entitled "The Ubiquitousness of *Legionella* in the Water Supply of a Hospital with Endemic Legionnaires' Disease". Since then, I have authored over 100 publications and book chapters about Legionnaires' disease and its prevention.

I bring this experience to the committee in support of PA House Bill 2085, and the following is my written testimony for the committee hearing on July 20, 2026.

HB 2085 seeks to amend Title 27 (Environmental Resources).

I submit this testimony in favor of HB 2085, but not in its current form.

The Bill currently focuses on municipal (public) water supplies as a significant source of transmission of *Legionella* bacteria and therefore a target for prevention and control efforts. This focus is not supported by most of the scientific research on Legionnaires' disease, including my own. For example, the Bill stipulates a free chlorine level of 0.5 mg/L. There is no evidence that this level is predictive of the absence of *Legionella* in the building water system or in a cooling tower. While requiring these levels of chlorine may have some benefits, prevention of Legionnaires' disease is not one of them.

HB 2085 needs to include specific actions for risk management and testing of building water systems, especially healthcare facilities. Healthcare facilities, including long-term care (nursing homes), have been known to be a significant source of exposure for patients contracting Legionnaires' disease and numerous outbreaks.

Similarly, HB 2085 needs to include specific actions for the management and testing of water- based air-conditioning cooling towers. They have been known to be a significant source of exposure for patients contracting Legionnaires' disease and numerous outbreaks, including one occurring in New York City during July 2026.

HB 2085 includes the water management approach to prevention of building-associated Legionnaires' disease as described in the ASHRAE's Standard 188 and Guideline 12. According to these ASHRAE documents, water systems in certain types of buildings and those with aerosol-generating equipment like cooling towers increase the risk of disease transmission. The owners and operators of these buildings are required to take action to prevent and control cases of Legionnaires' disease.

These recommendations fall short of what is needed to verify the effectiveness of these actions – validation testing of the water systems to show that *Legionella* has been controlled.

This omission can be remedied with the inclusion of the following in HB 2085:

Healthcare facilities

The following are excerpts from the Ohio Code 3701-22-07 for hospital licensure.

Establish and implement an effective water management program to identify hazardous conditions and take steps to manage the risk of occurrence and transmission of Legionella, in building water systems in accordance with guidance from the United States Centers for Disease Control and Prevention. Available at <https://www.cdc.gov/control-legionella/php/toolkit/control-toolkit.html>

(a) Establishing a water management program team that includes representatives from the facility or engaged by the facility necessary to ensure comprehensive and complete actions are implemented to reduce and manage the risk of Legionella and other waterborne pathogens in the building water systems.

(b) A written water management plan, updated annually or when changes are made to the potable water system, which includes all components as identified by the United States Centers for Disease Control and Prevention; and

(c) At least twice-yearly validation testing in the building water system for a set of water samples that is representative of all potable water loops and water sources, including but not limited to cooling towers, therapy spas, decorative fountains or water features where exposure to aerosols may occur to evaluate the performance of the water management program in controlling *Legionella* risk or other waterborne pathogens. Validation testing includes all of the following:

- (i) At least one cold water sample obtained from the incoming water mains from the public water system or the water source;
- (ii) At minimum, representative samples obtained from distal and proximal locations on each hot water loop on the hot water distribution system, to include both a swab or first draw sample, and a bulk or flush water sample from the fixture or location collected after a sustained hot water temperature is obtained; and
- (iii) Measurement of total chlorine residual at the time of sample collection, and the observed sustained maximum temperatures for cold and hot water samples;

Collection of water samples under this paragraph shall conform to the United States Centers for Disease Control and Prevention's guidance documents "Sampling Procedure and Potential Sampling Sites" with collected samples to be analyzed at a laboratory that has been accredited by a national or international accrediting body according to national or internationally recognized standards, that has *Legionella* culture testing included in the laboratory's scope of accreditation and is accredited to a state's environmental laboratory approval program for *Legionella* testing, and deemed proficient in isolating all species of *Legionella* by the CDC's Environmental *Legionella* Isolation Techniques Evaluation (ELITE) program or the Public Health of England's *Legionella* Isolation Scheme (Ohio Code 3701-22-07).

Air-conditioning Cooling Towers

The Cooling Technology Institute (CTI) GL-159 is the most detailed and comprehensive guidance document for managing *Legionella* in cooling towers. Together with water management requirements in ASHRAE Standard 188, these two industry publications will provide building owners with all they need to have a robust *Legionella* prevention program.

Citing this document in its entirety will provide guidance on best practices for operation and maintenance of cooling towers, but also a common-sense guide to performing and interpreting *Legionella* testing to validate the effectiveness of the program. Available at <https://standards.globalspec.com/std/14464568/gdl-159>

Why Is This Legislation Necessary?

1. Legionnaires' disease is increasing. The Centers for Disease Control and Prevention (CDC) has reported increases of over 200%, and Pennsylvania has some of the highest rates of illness year after year.
2. This trend of increasing illness and death from *Legionella* pneumonia has continued despite guidance from the CDC, CMS, The Joint Commission, and voluntary industry standards such as ASHRAE Standard 188.
3. These organizations have opted to leave testing "at the discretion of the facility." When given a choice, building owners opt not to test for *Legionella*, and the risk to patients in hospitals and nursing homes goes undetected until someone contracts the disease. The risk of death is as high as 30% for healthcare-acquired Legionnaires' disease, so leaving testing to the discretion of the facility means a dangerous condition remains undetected.
4. Water treatment professionals that recognize the need to test cooling towers and healthcare facility water systems for *Legionella* are told by their clients not to test. They need the job, so they comply.
5. In 2021, an update to the U.S. Centers for Disease Control (CDC) *Toolkit: Controlling Legionella in Common Sources of Exposure* noted that routine testing for *Legionella* is a valuable part of water management. Specifically, this CDC document stated that "testing may be useful for routine and non-routine purposes, such as:
 - Establishing a baseline measurement for performance indicators
 - Validating a Water Management Program
 - Evaluating potential growth and transmission sources
 - Confirming success or failure of remedial treatment
 - Investigating potential sources of environmental exposure for persons with disease
 - Routine testing may be particularly beneficial for certain types of facilities, such as: facilities that house or treat individuals at increased risk for Legionnaires' disease (e.g., senior communities, outpatient

clinics, facilities unable to meet control limits consistently, or facilities with a history of associated Legionnaires' disease cases.

Personally, I believe that Pennsylvania should adopt proactive preventive legislation for the following reasons:

- a. The disease was discovered after an outbreak among attendees of the American Legion convention in Philadelphia in 1976.**
- b. The first guideline for prevention of healthcare-associated Legionnaires' disease was written in Allegheny County PA and is the basis for other guidance in the U.S. and world-wide.**
- c. PA should continue to lead the nation in *Legionella* prevention.**

I applaud your efforts in working towards making Pennsylvania a safer environment for its vulnerable citizens by requiring action to prevent and control Legionnaires' disease.

Thank you for your time and attention,

A handwritten signature in black ink, appearing to read 'Janet Stout', with a stylized flourish at the end.

Janet E. Stout, PhD
President
Special Pathogens Technology

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MEMORANDUM

To: Representative Smith-Wade-El

From: Jules Zacher Esquire

On behalf of the Kopsi Foundation for the Elimination of Legionnaires' Disease Inc. (Kopsi Foundation)

Date: June 10, 2026

Re: Aligning HB 2085 with Scientific Evidence on Legionnaires' Disease Transmission

Legionnaires' disease is a severe and preventable form of pneumonia caused by *Legionella* bacteria. As the General Assembly considers House Bill 2085, it is essential that the statutory framework reflect the well-established scientific and epidemiological understanding of how this disease occurs. The weight of peer-reviewed literature, public health guidance, and outbreak investigations demonstrates a consistent and critical point: while *Legionella* may be present at low levels in municipal water systems, **human disease occurs only after the bacteria amplify within downstream building water systems or engineered devices.**

This distinction—between background presence and pathogenic amplification—should guide legislative design. As currently structured, HB 2085 risks imposing regulatory obligations on public water suppliers that are not supported by the scientific evidence as primary drivers of disease transmission. Refining the bill to focus on downstream amplification sites will both improve its effectiveness and enhance its prospects for passage.

The scientific consensus on this issue is clear. *Legionella* is ubiquitous in natural aquatic environments and can persist at low concentrations even in treated drinking water. However, infection requires inhalation of aerosolized water droplets containing sufficiently high concentrations of the bacteria. Those

concentrations arise under specific environmental conditions—warm temperatures, stagnation, biofilm formation, and reduced disinfectant residuals—that are characteristic of **premise plumbing systems and engineered water devices**, not properly operated municipal distribution systems.

The National Academy of Sciences, Engineering and Technology has stated in *Management of Legionella in Water Systems* (2020) “However, it is the unchecked growth of pathogenic legionellae in human-made water systems that typically leads to human exposures and causes disease.” These findings are echoed in epidemiological investigations across the United States and internationally, where outbreak sources are consistently identified as cooling towers, healthcare facility plumbing, hotels, and similar downstream systems.

Public health authorities have adopted this scientific understanding in their guidance. The Centers for Disease Control and Prevention emphasizes that *Legionella* “grows best in building water systems” and recommends building-level water management programs as the primary prevention strategy. The World Health Organization similarly identifies “engineered water systems” as the locus of risk, where temperature control, stagnation, and biofilm formation allow bacterial amplification.

Engineering standards reinforce this same conclusion. ASHRAE Standard 188—the leading risk management framework adopted nationwide—focuses exclusively on building water systems and high-risk facilities. It does not impose requirements on municipal water suppliers, reflecting the consensus that amplification, not mere presence, is the operative risk factor.

Against this backdrop, it is important to consider the frequently cited exception of the Flint water crisis. In Flint, a change in water source without appropriate corrosion control altered water chemistry, reduced disinfectant effectiveness, and contributed to conditions that increased *Legionella* risk. However, Flint represents an extraordinary failure of water system management, not the norm for regulated public water suppliers. Even in that case, the mechanism of disease involved the creation of conditions that enabled downstream amplification. Flint does not support the imposition of broad, prospective

regulatory burdens on properly functioning municipal systems across Pennsylvania.

The policy implications for HB 2085 are significant. By directing regulatory attention toward public water suppliers, the bill risks misallocating resources and imposing compliance costs on entities that are not the proximate cause of Legionnaires' disease. Such an approach may also dilute focus on the environments where intervention is most effective—namely, building water systems and engineered devices where amplification occurs. Moreover, including public water suppliers within the bill's regulatory scope is likely to generate opposition from municipal stakeholders, potentially hindering passage without advancing public health outcomes.

A more effective and scientifically grounded approach would align HB 2085 with the established consensus: prevention of Legionnaires' disease depends on controlling conditions that allow *Legionella* to multiply within buildings and devices after water leaves the municipal system. Legislative focus should therefore be directed toward high-risk settings such as healthcare facilities, long-term care facilities, large residential and commercial buildings, and cooling towers. Encouraging or requiring water management programs consistent with ASHRAE 188 and CDC guidance would directly target the environments where disease originates.

Refining HB 2085 to remove or substantially narrow requirements imposed on public water suppliers would not weaken the bill. To the contrary, it would strengthen it—scientifically, practically, and politically. It would align the legislation with peer-reviewed research, established public health guidance, and real-world outbreak data. It would concentrate regulatory efforts where they can have the greatest impact. And it would reduce unnecessary opposition, improving the likelihood of enactment.

In sum, the evidence is clear and consistent: **Legionnaires' disease is a downstream amplification problem, not a source water problem.** Legislation that reflects this reality will be more effective in protecting public health and more likely to achieve passage. HB 2085 presents an important opportunity to do so, provided it is carefully aligned with the scientific record.

MEMORANDUM

TO: Sean W. Gatten

Pennsylvania House Consumer Protection, Technology & Utilities Committee

FROM: Jules Zacher Esquire

On behalf of the Kopsi Foundation for the Elimination of Legionnaires' Disease Inc. (Kopsi Foundation)

DATE: March 6, 2026

RE: HB 2085 – Critical Deficiency Regarding Victim Access to Department of Health Investigation Records; Legal Basis, Resulting Injustice, and Victim-Centered Legislative Fix

I. Purpose of This Memorandum

This memorandum is submitted to assist Committee staff as HB 2085 is considered and refined. While the bill represents a significant effort to improve Legionnaires' disease prevention and investigation in Pennsylvania, it fails to address a fundamental injustice currently embedded in Pennsylvania law and Department of Health practice:

Individuals who contract Legionnaires' disease are not permitted to obtain records of the Department of Health's investigation into their own illness.

This outcome is legally sanctioned under existing law and appellate precedent. However, it is deeply harmful to victims, undermines trust in public health, and is inconsistent with a patient-centered prevention framework. HB 2085 presents a clear opportunity for the General Assembly to correct this problem in a narrow, responsible manner.

II. Existing Law and Practice: Why Victims Are Denied Their Own Records

A. Statutory and Regulatory Framework

Under Pennsylvania's Disease Prevention and Control Law (DPCL), reports of disease and records maintained as a result of communicable-disease investigations are deemed confidential. The Department of Health interprets this confidentiality broadly to prohibit disclosure of investigation records to anyone outside government, including the individual who contracted the disease.

As a result, Legionnaires' disease victims are routinely denied access to:

- epidemiological investigation summaries,
- assessments of potential exposure sites,
- environmental sampling decisions,
- and explanations of investigative conclusions or limitations.

Victims are treated, for disclosure purposes, no differently than members of the general public.

B. Appellate Authority: *Department of Health v. Capouillez*

The Department's position is supported by Pennsylvania appellate precedent.

In *Department of Health v. Capouillez*, 585 C.D. 2021 (Pa. Commw. Ct. Nov. 16, 2022), the Commonwealth Court upheld the Department's authority to withhold disease-related investigatory records as confidential under the DPCL and exempt from disclosure under the Right-to-Know Law.

Although *Capouillez* did not involve a Legionnaires' disease victim seeking records of their own illness, the decision is now relied upon to justify the Department's categorical refusal to provide investigation records to affected individuals.

The practical effect of Capouillez is clear:

- Absent legislative change, victims have no right to see the records of the investigation into how they became seriously ill.

III. Why This Is an Injustice to Legionnaires' Disease Victims

Legionnaires' disease is frequently severe and often life-altering. Victims experience:

- prolonged hospitalization,
- permanent respiratory or neurological effects,
- loss of income,
- and enduring uncertainty regarding exposure and preventability.

Yet under current law:

- victims cannot determine what was investigated,
- cannot know why certain locations were excluded,
- cannot understand whether investigations were constrained by time, data, or authority,
- and cannot obtain a plain-language explanation of findings or uncertainty.

This produces a system in which:

The Commonwealth investigates a person's life-threatening illness, but the person who suffered the illness is barred from seeing the results.

That outcome undermines public confidence, discourages cooperation with public health authorities, and leaves victims without answers, closure, or meaningful participation in prevention.

IV. HB 2085 Expands Investigations but Does Not Address Victim Exclusion

HB 2085:

- mandates investigations for each reported Legionnaires' disease case,
- expands data collection and reporting,
- and contemplates public dashboards and summaries.

However, the bill contains no provision granting victims access to investigation records concerning their own illness.

Without amendment, HB 2085 risks:

- increasing the volume and formality of investigations,
- while preserving a legal regime that excludes victims from the investigative record.

From a policy and implementation standpoint, this is a significant omission.

V. Victim-Centered Legislative Fix (Substance)

The Kopsi Foundation urges consideration of a narrow, carefully tailored amendment that would:

1. Grant a Legionnaires' disease victim (or their authorized representative) the right to obtain records related to the investigation of their own case;
2. Allow appropriate redactions to protect:
 - a. unrelated patient information,
 - b. third-party identities,
 - c. and sensitive security or proprietary details;
3. Require a written explanation, in plain language, of:
 - a. what was investigated,
 - b. what was not,

- c. and why attribution may not have been possible;
- 4. Clarify that disclosure does not constitute a determination of fault or liability, preserving the Department's public-health role.

This approach would override DPCL confidentiality only as to the victim's own case, while leaving the broader public-health confidentiality framework intact.

VI. Role of the Kopsi Foundation and Willingness to Assist the Committee

The Kopsi Foundation represents victims of Legionnaires' disease. It does not represent building owners, utilities, insurers, or other regulated entities.

The Foundation is willing to:

- work with Committee staff and legislative counsel on amendment language,
- provide technical and victim-centered context regarding investigations and attribution,
- identify and support Legionnaires' disease victims willing to appear and testify at any Committee hearings, either publicly or in closed sessions, to explain the real-world impact of being denied access to their own investigation records.

Victim testimony can assist the Committee in understanding:

- how current law affects patients,
- why access to records matters for recovery and prevention,
- and how modest statutory changes can restore fairness without undermining public health.

VII. Conclusion

The current legal framework—validated by *Capouillez*—may be defensible as a matter of statutory interpretation, but it produces an outcome that is unjust, opaque, and harmful to victims.

HB 2085 is the appropriate vehicle for the General Assembly to correct this imbalance by:

- preserving necessary public-health confidentiality,
- while affirming that people who contract Legionnaires' disease have a right to understand what happened to them.

The Kopsi Foundation stands ready to assist the Committee and respectfully urges consideration of a victim-access amendment as HB 2085 moves forward.

Curriculum Vitae

PAUL HERBERT EDELSTEIN, M.D.

July 10, 2026

EDUCATION:

1966-1969	San Jose State College, San Jose, California Chemistry major, no degree
1969-1973	UCLA Medical School, Los Angeles, California, (M.D.)

NON-MEDICAL EMPLOYMENT:

1967-1969	Research Assistant in Physical Chemistry at San Jose State College
1969	Research Chemist in Polymer Chemistry at TRW Systems, Redondo Beach, California

POSTGRADUATE TRAINING AND FELLOWSHIP APPOINTMENTS:

1973-1974	Intern in Internal Medicine, Wadsworth VA Medical Center, Los Angeles (UCLA School of Medicine)
1974-1976	Resident in Internal Medicine, Wadsworth VA Medical Center (UCLA School of Medicine)
1976-1978	Fellow in Infectious Diseases, Wadsworth VA Medical Center (UCLA School of Medicine)
1977-1978	Chief Medical Resident, Wadsworth VA Medical Center

MILITARY SERVICE: None

FACULTY APPOINTMENTS:

1978-1983	Assistant Professor of Medicine in Residence, UCLA
1983-1986	Associate Professor of Medicine, UCLA
1986-1994	Associate Professor of Pathology and Laboratory Medicine, University of Pennsylvania
1987- 2017	Secondary appointment in the Department of Medicine, University of Pennsylvania
1994- 2017	Professor of Pathology and Laboratory Medicine, University of Pennsylvania
2017-	Emeritus Professor of Pathology and Laboratory Medicine, University of Pennsylvania
9/95-6/96	Visiting Scholar, Department of Microbiology and Immunology, Stanford University School of Medicine (Laboratory of Stanley

6/15 -	Falkow) Honorary Senior Research Fellow, Department of Medicine, University of Cambridge (Laboratory of Lalita Ramakrishnan)
2/24-	Fellow, UK Medical Research Council Laboratory of Molecular Biology

HOSPITAL AND ADMINISTRATIVE APPOINTMENTS:

1978-1980	Associate Investigator, Wadsworth VA Medical Center
1980-1982	Research Associate, Wadsworth VA Medical Center
1983-1984	Director, Medical Intensive Care Unit, Wadsworth VA Medical Center
1978-1986	Director of Legionnaires' Disease Laboratory, Wadsworth VA Medical Center
1986- 2017	Director of Clinical Microbiology Laboratory, Hospital of the University of Pennsylvania

SPECIALTY CERTIFICATIONS:

1973	National Board of Medical Examiners #131761
1976	American Board of Internal Medicine #055675 in Internal Medicine
1978	American Board of Internal Medicine #055675 in Infectious Diseases
1985	Diplomat of American Board of Medical Microbiology in Public Health and Medical and Molecular Microbiology

LICENSURE: California (1974) G27347 (inactive)
Pennsylvania (1986) MD035963E (active-retired)

AWARDS, HONORS, AND MEMBERSHIP IN HONORARY SOCIETIES:

1967-1969	National Science Foundation Fellowship in Physical Chemistry Research
1969	Elected member of Phi Kappa Phi, National Scientific Fraternity
1981	Burroughs-Wellcome Traveling Fellowship to Great Britain
1982	Japan Society for the Promotion of Science Scholar Traveling Fellowship to Japan
1985	Lowbury Lecturer, Hospital Infection Society of Britain, London
1989	W. G. Smith Memorial Lecturer, University of Western Australia Medical School

MEMBERSHIPS IN PROFESSIONAL AND SCIENTIFIC SOCIETIES:

1967-1970	American Chemical Society
1977-2000	Member, American College of Physicians
1976- 2017	Member, American Society for Microbiology
2018-	Emeritus Member, American Society for Microbiology
1976-1984	Associate, American Thoracic Society

1984-2004	Member, American Thoracic Society
1979-1994	Member, American Federation for Clinical Research
1981-1984	Member, Infectious Diseases Society of America
1984- 2017	Fellow, Infectious Diseases Society of America
2018-	Emeritus Fellow, Infectious Diseases Society of America
1998-	Member, British Society for Antimicrobial Chemotherapy
2002-	Fellow, American Academy of Microbiology
2012-	Member, International Union Against Tuberculosis and Lung Disease
2018-	Associate Member, Clare Hall College, University of Cambridge, UK
2024-	Fellow, Medical Research Council Laboratory of Molecular Biology, Cambridge, UK

MEMBERSHIPS ON NATIONAL and INTERNATIONAL COMMITTEES

1983	Organizing committee of the 1983 International Conference on Legionella.
1991	Organizing committee of the 1992 International Conference on Legionella.
1991-1994	American Board of Medical Microbiology Part I examination committee.
1993-1994	Chair organizing committee Medical Microbiology Interdisciplinary Commission symposium on pneumonia, Prague 7/94
2000-2005	Organizing committee of the 2005 International Conference on Legionella
2005-2009	Scientific committee of the 2009 International Conference on Legionella
2011-2013	Scientific committee of the 2013 International Conference on Legionella
2022	Scientific committee of the 2022 International Conference on Legionella

EDITORIAL BOARDS:

1986-1994	Journal of Clinical Microbiology
1987-2000	Enfermedades Infecciosas y Microbiologia Clinica
1988-1991	Diagnostic Testing Alert
1992-1996	Clinical Microbiology Reports
1995-2000	Journal of Infection and Chemotherapy
2005-2008	Laboratory Errors and Patient Safety
2006-2009	Editorial Advisory Board Journal of Infectious Diseases

AD HOC REVIEWER FOR:

- Annals of Internal Medicine
- New England Journal of Medicine
- Antimicrobial Agents and Chemotherapy
- Journal of Clinical Microbiology
- European Journal of Clinical Microbiology
- Clinical Infectious Diseases
- Archives of Internal Medicine

- Journal of Antimicrobial Chemotherapy
- Infection Control and Hospital Epidemiology
- Journal of Medical Microbiology
- Science
- Infection and Immunity
- Clinical Microbiology and Infectious Diseases
- Clinical Microbiology Reviews
- Journal of Infectious Diseases
- Molecular Microbiology
- Applied and Environmental Microbiology
- Journal of Medical Microbiology
- PLOS One
- Scandinavian Journal of Infectious Diseases
- Diagnostic Microbiology and Infectious Diseases
- Infection and Immunity
- European Journal of Clinical Microbiology and Infectious Diseases
- Annals of Applied Statistics
- International Journal of Systematic and Evolutionary Microbiology
- Emerging Infectious Diseases
- American Journal of Respiratory and Critical Care Medicine
- Lancet Infectious Diseases
- Lancet
- Transplant Infectious Diseases
- Nature Medicine
- Water Research
- Proceedings of the National Academy of Science, USA
- Elife
- Journal of Clinical Investigation
- Emerging Infectious Diseases
- Infectious Diseases Clinical Practice
- Journal of Antimicrobial Chemotherapy
- Cell
- Epidemiology and Infection
- Infectious Diseases Clinical Practice
- Germs

CONSULTANCIES AND EXTERNAL COMMITTEE MEMBERSHIPS:

1989-1991	Special Consultant, US FDA Panel on Microbiologic Diagnostic Devices
1991-2000	Voting Member, US FDA Panel on Microbiologic Diagnostic Devices and the Medical Devices Advisory Committee
1994-1995	Chair, US FDA Panel on Microbiologic Diagnostic Devices and the Medical Devices Advisory Committee
1991-1994	Chair, Electric Power Research Institute Advisory Committee on a Prospective Study of Legionnaires' Disease in Ohio

1990	Technical consultant to NJ State Dept of Health and CDC in the investigation of an outbreak of Legionnaires' disease in an elementary school.
1991	Consultant to NJ State Dept of Health in the investigation of a suspected outbreak of Legionnaires' disease in the Lincoln Tunnel.
1992	Consultant to CDC and the Pennsylvania Dept of Health in the investigation of an industrial outbreak of Legionnaires' disease in suburban Philadelphia.
1989- 2012	Consultant to various hospitals and industrial concerns regarding suspected or actual outbreaks of Legionnaires' disease.
1993	Consultant to the Hospital Infections Branch of the Centers for Disease Control on the development of a national policy for the control of nosocomial Legionnaires' disease.
1993	Consultant to the Respiratory Diseases Branch of the Centers for Disease Control on the development of a national policy for the control of occupational Legionnaires' disease.
1993-1999	Consultant to CDC concerning outbreaks of Legionnaires' disease
2004	Chair, NIH U01 Special Emphasis Panel, RFA AI03-28, Partnerships for Vaccine and Diagnostic Development (Feb 12th, 2004)
2005	Member, NIH U54 Special Panel, (RFA) AI-04-018: Regional Centers of Excellence for Biodefense and Emerging Infectious Diseases Research (January 2005)
2007	Reviewed Botswana National Microbiology and Tuberculosis Laboratories for Univ of Pennsylvania
2014-2020	Member, Clinical Laboratory Standards Institute Ad Hoc Working Group on Molecular Detection of Antimicrobial Resistance
2015	Member, British Medical Research Council Grant Review Panel, Antimicrobial Resistance Themes 2 and 3 (September 2015)
2015	Member, British Medical Research Council Meeting on Antimicrobial Resistance, Berlin (October 2015)
2018-2021	Member, Clinical Laboratory Standards Institute Ad Hoc Working Group on Epidemiologic Cut-off Values for Antimicrobial Susceptibility Testing
2019-2021	Chair, Clinical Laboratory Standards Institute Ad Hoc Working Group on Aminopenicillin Breakpoints
2020-2021	Member, U.K. Royal Society DELVE (Data Evaluation and Learning for Viral Epidemics) Scientific Advisory Group on Covid-19

MAJOR TEACHING AND CLINICAL RESPONSIBILITIES FOR THE UNIVERSITY OF PENNSYLVANIA:

1. Supervision of Pathology Fellow training in Clinical Microbiology 1 day per week.

LECTURES BY INVITATION:

1. September 5-6, 1989. Visiting Lecturer, Victoria General Hospital, Dalhousie University Halifax, Nova Scotia, Canada. Legionnaires' disease - Medical Grand Rounds. "Virulence of L. pneumophila is modulated by growth temperature."
2. September 18-28, 1989. Visiting Lecturer (W.G. Smith Memorial Lecturer), Department of Microbiology, Queen Elizabeth II Medical Center, University of Western Australia Medical School, Perth, Australia.
Pathogenesis of Legionnaires' disease
Experimental models of Legionnaires' disease
Clinical aspects of Legionnaires' disease
Experimental therapy of Legionnaires' disease
Pneumocystis carinii pneumonia
Environmental aspects of Legionnaires' disease
3. March 8, 1990. "Legionnaires' disease." Claifornia Thoracic Society Meeting, Hawaii.
4. August 7, 1990. "Legionnaires' disease and water heaters." National Rural Electrification Cooperative Research Group. San Diego, California.
5. September 19, 1990. "Temperature-associated virulence of L. pneumophila." Department of Microbiology and Infectious Diseases Lecture Series, University of Calgary Medical School, Calgary.
6. February 20, 1991. "Infections caused by free-living amoebae." Infectious Diseases Grand Rounds, Cedars-Sinai Medical Center, Los Angeles, California.
7. January 8, 1992. "Interaction of L. pneumophila with complement system." Dalhousie University Department of Microbiology Lecture Series. Halifax.
8. January 8, 1992. "Infections caused by free-living amoebae." Dalhousie University Department of Medicine/Infectious Diseases Lecture Series. Halifax.
9. January 28, 1992. "Laboratory diagnosis of Legionnaires' disease." State of the art lecture for the International Conference on Legionella. Orlando, Florida.

10. September 4, 1992. "Prediction of antimicrobial efficacy for Legionnaires' disease using animal and cell culture studies." "An update on the laboratory diagnosis of Legionnaires' disease." Danish Society of Clinical Microbiologists, Copenhagen.
11. November 9, 1993. "An Update on Community Acquired Pneumonia." Medical Society of Delaware, Wilmington, Delaware.
12. March 31, 1994. "Legionnaires' Disease." Medical Grand Rounds, Asan Medical Center (Ulsan University Hospital), Seoul, Korea.
13. April 1, 1994. "Legionnaires' Disease." Korean Infectious Diseases Society. Seoul, Korea.
14. April 2, 1994. "Laboratory diagnosis of Legionnaires' disease, Epidemiology of Legionnaires' disease, and Ecology of Legionella." Korean Laboratory Workshop on Legionnaires' disease, sponsored by Korean Association of Quality Assurance for Clinical Pathology. Seoul, Korea.
15. April 5, 1994. "Legionnaires' Disease." Kinki University School of Medicine. Osaka, Japan.
16. April 6, 1994. "Legionnaires' Disease." Research Institute for Microbial Diseases, Osaka University. Osaka, Japan.
17. April 7, 1994. "Legionnaires' Disease." Ryuku University School of Medicine. Naha, Okinawa, Japan.
18. July 2, 1994. "Treatment of Legionnaires' Disease." Medical Microbiology Interdisciplinary Commission Meeting on Pneumonia, Prague, Czech Republic.
19. September 1, 1995. "Treatment of Legionnaires' Disease." Advanced Seminar in Infectious Diseases at the Royal Society of Medicine, London
20. September 2, 1995. Participant and lecturer in "Intracellular Infections", West Sussex, England.
21. December 8th, 1995. Special Lecturer, Chemotherapy Society of Western Japan, Naha, Okinawa, Japan
22. February 19th, 1997. "Clinical Microbiology of Legionnaires' Disease". Fundacion de Ciencias de la Salud, Madrid, Spain.
23. January 24th, 1998. "Antimicrobial Chemotherapy of Legionnaires' Disease". Japanese Legionnaires' Disease Symposium, Tokyo, Japan.
24. June 1st, 1998. "Antimicrobial Chemotherapy of Legionnaires' Disease".

European Working Group on Legionella Infections, Helsinki, Finland.

25. June 21st, 1998. "Antimicrobial Chemotherapy of Legionnaires' Disease". 10th International Meeting on Infections in the Immunocompromised Host. Davos, Switzerland.
26. September 29th, 1998. "Signature-tagged mutagenesis of *Legionella pneumophila*". Stanford University Department of Microbiology and Immunology.
27. September 28th, 2000. "Therapy of Legionnaires' disease with newer macrolides and fluoroquinolones. 5th International Conference on Legionella, Ulm, Germany.
28. January 25th, 2001. "Legionnaires' disease" Robert Wood Johnson Hospital, Division of Infectious Diseases. New Brunswick, New Jersey.
29. April 2002. "Treatment of Legionnaires' Disease" Toho University School of Medicine, Tokyo; Legionnaires' disease symposium, Osaka, Japan.
30. April 2002. "Anthrax" Ryukyu University School of Medicine, Okinawa, Japan; Toho University School of Medicine, Tokyo
31. April 2003. "Legionnaires' disease". Okayama University Medical School
32. April 2003. "Clinical Microbiology of Infections Associated with Organ Transplantation". Japanese Infectious Diseases Society Annual Meeting, Fukuoka.
33. June 2004. "Diagnosis and Treatment of Legionnaires' Disease". Japanese Society for Chemotherapy, 52nd annual meeting, Okinawa.
34. May 2005. "An update on Legionnaires' disease." European Working Group on Legionella Infections, Rome.
35. September 2005. "An update on the laboratory diagnosis of Legionnaires' disease." Scott Memorial Symposium, Wilmington, Delaware.
36. September 2005. "Clinical features of Legionnaires' disease." Opening lecture of 2005 International Conference on Legionella, Chicago.
37. June 2009. "Legionnaires' disease". Japanese Society for Chemotherapy Annual Meeting, Tokyo.
38. June 2009. "Swine influenza virus". Japanese Society for Chemotherapy Annual Meeting, Tokyo.
39. October 2009. "Treatment of Legionnaires' disease". 2009 International

Conference on Legionella, Paris.

40. March 2011. "Legionnaires' disease". University of Washington Infectious Diseases Board Review Lecture.
41. September 2011. "Tuberculosis and Efflux Pumps: Can Pump Inhibition Help Shorten TB Therapy, Even with MDR TB?" KwaZuluNatal Research Institute on Tuberculosis and HIV and Nelson Mandela School of Medicine, Durban, South Africa.
42. May 2013. "Clinical Microbiology Laboratory Organization and Regulation", Japanese Adhoc Committee on Clinical Microbiology, Yokohama, Japan.
43. June 2013. "Legionnaires' disease", International Congress of Chemotherapy, Yokohama, Japan.
44. October 2013. "Clinical aspects of Legionnaires' disease", 8th International Conference on Legionella, Melbourne, Australia.
45. February 2016. "Shortening TB treatment through the use of adjunctive efflux pump inhibitors. 14th Annual Christian Medical College Meeting on Tuberculosis Research, Vellore, India.
46. September 2017 "History of Legionnaires' disease", 2017 International Conference on Legionella, Rome, Italy.
47. September 2017, "Clinical aspects of Legionnaires' disease", 2017 International Conference on Legionella, Rome, Italy.
48. August 2018. "Laboratory diagnosis of Legionnaires' disease", 2018 International Conference on Emerging Infectious Diseases, Atlanta, GA.
49. September 2022. "History of Legionnaires' disease", 2022 International Conference on Legionella, Yokohama, Japan.
50. October 2023. "Latent tuberculosis concepts". Special meeting on tuberculosis, Tokyo.

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Original Papers

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- disease in renal-transplant recipients. *Lancet* 1:410-413, 1978.
2. Goldstein EJC, Lewis RP, Martin WJ, Edelstein PH. Infections caused by Klebsiella ozaenae: a changing disease spectrum. *J. Clin. Microbiol.* 8:413, 1978.
 3. Edelstein PH, Meyer RD, Finegold SM. Isolation of a new sero-type of Legionnaires' disease bacterium. *Lancet* 2:1172-1174, 1978.
 4. Edelstein PH, Meyer RD. Netilmicin therapy of serious gram-negative infections. *J. Antimicrob. Chemother.* 4:495-502, 1978.
 5. Edelstein PH, Finegold SM. Isolation of Legionella pneumophila from a transtracheal aspirate. *J. Clin. Microbiol.* 9:457-458, 1979.
 6. Edelstein PH, Meyer RD, Finegold SM. Isolation of Legionella pneumophila from blood. *Lancet* 1:750-751, 1979.
 7. McKinney RM, Thacker L, Harris PP, Lewallen KR, Hebert GA, Edelstein PH, Thomason BM. Four serogroups of Legionnaires' disease bacteria defined by direct immunofluorescence. *Ann. Intern. Med.* 90:621-624, 1979.
 8. Faine S, Edelstein PH, Kirby BD, Finegold SM. Rapid presumptive bacteriological diagnosis of Legionnaires' disease. *J. Clin. Microbiol.* 10:104-105, 1979.
 9. Lewin S, Brettman LR, Goldstein EJC, Holzman RS, Devila H, Taubman F, Sierra MF, Edelstein PH. Legionnaires' disease: A cause of severe abscess-forming pneumonia. *Amer. J. Med.* 67:339-342, 1979.
 10. Edelstein PH, Finegold SM. Use of a semiselective medium to culture Legionella pneumophila from contaminated lung specimens. *J. Clin. Microbiol.* 10:141-143, 1979.
 11. Hernandez FJ, Kirby BD, Stanley TM, Edelstein PH. Legionnaires' disease: Postmortem pathologic findings of 20 cases. *Am. J. Clin. Pathol.* 73:488-495, 1980.
 12. Edelstein PH, Meyer RD, Finegold SM. Laboratory diagnosis of Legionnaires' disease. *Am. Rev. Resp. Dis.* 121:317-327, 1980.
 13. Bock BV, Edelstein PH, Meyer RD. Prospective comparative study of efficacy and toxicity of netilmicin and amikacin. *Antimicrob. Agents Chemother.* 17:217-225, 1980.
 14. Edelstein PH, McKinney RM, Meyer RD, Edelstein MAC, Krause CJ, Finegold SM. Immunologic diagnosis of Legionnaires' disease: Cross-reactions with

- anaerobic and microaerophilic organisms and infections caused by them. J. Infect. Dis. 141:652-655, 1980.
15. Meyer RD, Edelstein PH, Kirby BD, Louie MH, Mulligan ME, Morgenstein AA, Finegold SM. Legionnaires' disease: Unusual clinical and laboratory features. Ann. Intern. Med. 93:240-243, 1980.
 16. Edelstein PH, Meyer RD. Susceptibility of Legionella pneumophila to twenty antimicrobial agents. Antimicrob. Agents Chemother. 18:403-408, 1980.
 17. Kohler RB, Zimmerman SE, Wilson E, Allen SD, Edelstein PH, Wheat LJ, White A. Rapid radioimmunoassay diagnosis of Legionnaires' disease: Detection and partial characterization of urinary antigen. Ann. Intern. Med. 94:601-605, 1981.
 18. Serota AI, Meyer RD, Wilson SE, Edelstein PH, Finegold SM. Legionnaires' disease in the postoperative patient. J. Surg. Research. 30:417-427, 1981.
 19. McKinney RM, Porschen RK, Edelstein PH, Bissett MC, Harris PP, Bondell SP, Steigerwalt AG, Weaver RE, Ein ME, Lindquist DS, Kops RS, Brenner DJ. Legionella longbeachae species nova: Another etiologic agent of human pneumonia. Ann. Intern. Med. 94:739-743, 1981.
 20. Edelstein PH, Meyer RD, Finegold SM. Long-term follow-up of two patients with pulmonary cavitation caused by Legionella pneumophila. Am. Rev. Resp. Dis. 124:90-93, 1981.
 21. Edelstein PH. Improved semiselective medium for isolation of Legionella pneumophila from contaminated clinical environmental specimens. J. Clin. Microbiol. 14:298-303, 1981.
 22. Saito A, Rolfe RD, Edelstein PH, Finegold SM. Comparison of liquid growth media for Legionella pneumophila. J. Clin. Microbiol. 14:623-627, 1981.
 23. Sathapatayavongs B, Kohler RB, Wheat LJ, White A, Winn WC Jr, Girod JC, Edelstein PH. Rapid diagnosis of Legionnaires' disease by urinary antigen detection: Comparison of ELISA and radioimmunoassay. Am.J. Med. 72:576-582, 1982.
 24. Meyer RD, Pasiecznik KA, Yasui VK, Edelstein PH. Susceptibility of Legionella species and nosocomial respiratory tract isolates of Enterobacteriaceae to Sch-29482 and other beta-Lactam agents. J. Antimicrob. Chemother. (Supplement C) 199-202, 1982.
 25. Edelstein PH, Snitzer JB, Finegold SM. Isolation of Legionella pneumophila from hospital potable water specimens: Comparison of direct plating with guinea pig inoculation. J. Clin. Microbiol. 15:1092-1096, 1982.

26. Edelstein PH, Pasiecznik KA, Yasui VK, Meyer RD. Susceptibility of Legionella spp. to mycinamicin I and II and other macrolide antibiotics: Effects of media composition and origin of organisms. *Antimicrob. Agents Chemother.* 22:90-93, 1982.
27. Edelstein PH. Comparative study of selective media for isolation of Legionella pneumophila from potable water. *J. Clin. Microbiol.* 16:697-699, 1982.
28. Edelstein PH, Whittaker RE, Kreiling RL, Howell CL. Efficacy of ozone in eradication of Legionella pneumophila from hospital fixtures. *Appl. Environ. Microbiol.* 44:1330-1333, 1982.
29. Edelstein PH, Brenner DJ, Moss CW, Steigerwalt AG, Francis EM, George WL. Legionella wadsworthii species nova: A cause of human pneumonia. *Ann. Intern. Med.* 97:809-813, 1982.
30. Edelstein PH, Snitzer JB, Bridge JA. Enhancement of recovery of Legionella pneumophila from contaminated respiratory tract specimens by heat. *J. Clin. Microbiol.* 16:1061-1065, 1982.
31. Bridge JA, Edelstein PH. Oropharyngeal colonization with Legionella pneumophila. *J. Clin. Microbiol.* 16:1108-1112, 1983.
32. Edelstein PH. Culture diagnosis of Legionella infections. *Zbl. Bakt. Hyg., I. Abt. Orig. A.* 255:96-101, 1983.
33. Edelstein PH, Bibb WF, Gorman GW, Thacker WL, Brenner DJ, Wilkinson HW, Moss CW, Buddington RS, Dunn CJ, Roos PJ, Meenhorst PL. Legionella pneumophila serogroup 9: a cause of human pneumonia. *Ann. Intern. Med.* 101:196-198, 1984.
34. Edelstein PH, Calarco K, Yasui VK. Antimicrobial therapy of experimentally induced Legionnaires' disease in guinea pigs. *Am. Rev. Resp. Dis.* 130:849-856, 1984.
35. Gorman GW, Feeley JC, Steigerwalt A, Edelstein PH, Moss CW, Brenner DJ. Legionella anisa: A new species of Legionella isolated from potable waters and a cooling tower. *Appl. Environ. Microbiol.* 49:305-309, 1985.
36. Edelstein, PH. Imipenem in Legionnaires' disease. [Letter] *Lancet.* 2:757, 1984.
37. Shands KN, Ho JL, Meyer RD, Gorman GW, Edelstein PH, Mallison GF, Finegold SM, Fraser DW. Potable water as a source of Legionnaires' disease. *JAMA* 253:1412-1416, 1985.
38. Edelstein PH, Pryor E. A new biotype of Legionella dumoffii. *J. Clin. Microbiol.*

21:641-642, 1985.

39. Edelstein PH, Beer KB, Sturge JC, Watson AJ, Goldstein LC. Clinical utility of a monoclonal direct fluorescent reagent specific for Legionella pneumophila: Comparative study with other reagents. J. Clin. Microbiol. 22:419-421, 1985.
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43. Edelstein PH, Nakahama C, Tobin JO, Calarco K, Beer KB, Joly JR, Selander RK. Paleoepidemiologic investigation of Legionnaires' disease at Wadsworth Veterans Administration Hospital by using three typing methods for comparison of legionellae from clinical and environmental sources. J. Clin. Microbiol. 23:1121-1126, 1986.
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48. Cercenado E, Edelstein PH, Gosting LH, Sturge JC. Legionella micdadei and Legionella dumoffii monoclonal antibodies for laboratory diagnosis of Legionella infections. J. Clin. Microbiol. 25:2163-2167, 1987.
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EDITORIALS, REVIEWS, CHAPTERS:

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PA bill 2085 comments

Paul H. Edelstein, M.D.

1) Underemphasis of wet cooling tower regulation

- a. While it is true that Legionnaires' disease (LD) epidemics are rare, when they occur many people may be affected depending on the route of airborne dissemination. Cooling tower outbreaks can be explosive and cause disease in hundreds of people(1, 2), and demand specific language in the bill. The bill currently focuses on potable water as the cause of LD, deemphasizing the critical role of cooling tower management for the potential reduction of LD cases. Proper water treatment, disinfection and distribution cannot prevent cooling tower-caused LD, and in some cases non-potable water, such as river water, is used for cooling towers.
- b. The sources of sporadic LD (usually single unrelated cases) aren't established with certainty, but it is likely that a significant fraction, at least 20%, of these are caused by Legionella-colonized cooling towers(3-5).
- c. The claim that the source of LD is the drinking water supply, and that therefore water supply companies are responsible for LD cases downstream of the water treatment plant is misleading. Additional factors not under the control of the water supply company play a huge role in causing LD (ASHRAE 188-2021 states "The presence of Legionella bacteria in building water systems is not sufficient to cause LD"). These include improper wet cooling tower maintenance and siting, plumbing use and design in buildings and factories, water usage in buildings, use of devices that remove disinfectants from supplied water, improper maintenance of hot tubs, industrial processes that use water and other factors.
- d. Legislation regulating cooling towers comes at high regulatory costs, requiring sufficient public health infrastructure for cooling tower registration, review of periodic culture results and enforcement of infractions. It also comes at high costs to business and governmental bodies. Whether national, regional or local cooling tower regulation has reduced LD incidence is not established, although it is appealing. Regardless, the bill does not establish funding for state and local regulatory agencies and public health departments and must do so.

2) Role of public health agencies

Any regulatory requirement concerning monitoring of water for the presence of Legionella bacteria in homes or other sites, determining the link between a case of LD and bacteriologic and epidemiologic findings, and enforcement of regulations

will increase the workload of state and local public health departments. Funding of public health departments including hiring additional personnel, and delineation of which regulatory authorities will oversee such a scheme needs to be clarified.

3) LD case investigation

The proposed bill calls for epidemiologic investigation of each reported case of LD, and as part of an investigation environmental inspection of homes and other locations of people with LD. This is likely to be unproductive for several reasons:

- a) Linking a positive environmental water culture with a case of LD requires a bacterial isolate from the patient; this occurs in the minority of cases of LD, especially sporadic cases because most hospital laboratories lack the capabilities to isolate the bacterium from LD patients and even if they do culture yield is low. About 4% of reported US LD cases have a positive culture for the bacterium(6), meaning that more than 90% of home or business site surveys will be meaningless because of the inability to link a positive culture to a LD case bacterial isolate. Simply finding *Legionella* bacteria in the home environment does not establish that the bacterium caused the patient's disease because the bacteria are commonly found in homes of those without the disease. A recent study of New Jersey single family residences found that 12 to 53% of homes of people who had no history of LD contained *Legionella* bacteria by culture and DNA detection, respectively. The figures for homes of those with a history of LD were positive 19 and 63%, by culture and DNA detection, respectively(7). The futility of residential, workplace and visited location investigation of sporadic cases of LD is illustrated by the experience of Dutch public health officials; over a ten year period extensive environmental investigations were conducted for the source of LD in 1991 persons; 1.9% of cases implicated an environmental source and when confined to non-health care cases only 1.2% of investigations found a link between the investigated environment and the person's LD(8). Only 0.3% of home investigations found a link between environmental sources and a person's LD. During these investigations, *Legionella* spp. bacteria were found in about 25% of sampled environmental sites, indicating that the presence of the bacterium in the environment can not be used by itself to implicate the site as the source of the disease. Not only is home environmental investigation uninformative more than 99% of the time, so are environmental investigations of locations outside the home. Environmental investigations should be reserved for LD outbreaks where there is solid epidemiologic evidence of a common source outbreak. Only about 5% of US LD cases are linked to a common source outbreak. Investigating unlinked cases of LD is costly and unuseful.
- b) Section 6706 of the bill requires an epidemiologic investigation of each reported case of LD, including determining the potential source of infection. This includes determination of disruption of residential water supplies and investigation of home water fixtures, as well as determining potential water exposures outside the home.

- c) Section 6707 of the bill requires cultures for *L. pneumophila* as part of any water management plan. Water management plan requirements per ASHRAE 188-2021 building water management plans and 12-203.
- d) Unfunded regulatory overreach – requiring owners of all buildings in the state other than single dwelling homes to conduct a risk survey annually per 188-2021. In addition, each time a renovation, addition or modification is made to the building a new survey is required. Every free-standing coffee shop, every shoe repair shop, every gas station, every contractor building a duplex apartment building, every restaurant and bar, etc. Since the standard does not define renovation, addition or modification, it is unclear whether a coffee shop owner adding new countertops, or a car dealer replacing floor tiles would need to perform and certify compliance. How the state will determine the compliance with the code for all these types of buildings, including inspection, etc. is not stated nor funded in the bill.
- e) Free-standing cooling towers are not covered by ASHRAE 188-2021, as they are not in human-occupied buildings. Such cooling towers at power plants, industrial facilities, paper processing plants and other places can be a significant cause of LD(9-11). If the intention of the bill is to reduce the risk of community LD then such sources must be included in the regulations.
- f) ASHRAE 188-2021 does not mention displays of hot tubs at public events, as these are transient events in otherwise compliant buildings. Water spa exhibits at public events can cause large LD outbreaks and require regulation in a bill designed to control LD (12, 13).
- g) Contrary to ASHRAE 188-2021, this bill requires routine environmental cultures to comply with a building water safety plan.

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1) Underemphasis of wet cooling tower regulation

- a. While it is true that Legionnaires' disease (LD) epidemics are rare, when they occur many people may be affected depending on the route of airborne dissemination. Cooling tower outbreaks can be explosive and cause disease in hundreds of people(1, 2), and demand specific language in the bill. The bill currently focuses on potable water as the cause of LD, deemphasizing the critical role of cooling tower management for the potential reduction of LD cases. Proper water treatment, disinfection and distribution cannot prevent cooling tower-caused LD, and in some cases non-potable water, such as river water, is used for cooling towers.
- b. The sources of sporadic LD (usually single unrelated cases) aren't established with certainty, but it is likely that a significant fraction, at least 20%, of these are caused by Legionella-colonized cooling towers(3-5).
- c. The claim that the source of LD is the drinking water supply, and that therefore water supply companies are responsible for LD cases downstream of the water treatment plant is misleading. Additional factors not under the control of the water supply company play a huge role in causing LD (ASHRAE 188-2021 states "The presence of Legionella bacteria in building water systems is not sufficient to cause LD"). These include improper wet cooling tower maintenance and siting, plumbing use and design in buildings and factories, water usage in buildings, use of devices that remove disinfectants from supplied water, improper maintenance of hot tubs, industrial processes that use water and other factors.
- d. Legislation regulating cooling towers comes at high regulatory costs, requiring sufficient public health infrastructure for cooling tower registration, review of periodic culture results and enforcement of infractions. It also comes at high costs to business and governmental bodies. Whether national, regional or local cooling tower regulation has reduced LD incidence is not established, although it is appealing. Regardless, the bill does not establish funding for state and local regulatory agencies and public health departments and must do so.

2) Role of public health agencies

Any regulatory requirement concerning monitoring of water for the presence of Legionella bacteria in homes or other sites, determining the link between a case of LD and bacteriologic and epidemiologic findings, and enforcement of regulations

will increase the workload of state and local public health departments. Funding of public health departments including hiring additional personnel, and delineation of which regulatory authorities will oversee such a scheme needs to be clarified.

3) LD case investigation

The proposed bill calls for epidemiologic investigation of each reported case of LD, and as part of an investigation environmental inspection of homes and other locations of people with LD. This is likely to be unproductive for several reasons:

- a) Linking a positive environmental water culture with a case of LD requires a bacterial isolate from the patient; this occurs in the minority of cases of LD, especially sporadic cases because most hospital laboratories lack the capabilities to isolate the bacterium from LD patients and even if they do culture yield is low. About 4% of reported US LD cases have a positive culture for the bacterium(6), meaning that more than 90% of home or business site surveys will be meaningless because of the inability to link a positive culture to a LD case bacterial isolate. Simply finding *Legionella* bacteria in the home environment does not establish that the bacterium caused the patient's disease because the bacteria are commonly found in homes of those without the disease. A recent study of New Jersey single family residences found that 12 to 53% of homes of people who had no history of LD contained *Legionella* bacteria by culture and DNA detection, respectively. The figures for homes of those with a history of LD were positive 19 and 63%, by culture and DNA detection, respectively(7). The futility of residential, workplace and visited location investigation of sporadic cases of LD is illustrated by the experience of Dutch public health officials; over a ten year period extensive environmental investigations were conducted for the source of LD in 1991 persons; 1.9% of cases implicated an environmental source and when confined to non-health care cases only 1.2% of investigations found a link between the investigated environment and the person's LD(8). Only 0.3% of home investigations found a link between environmental sources and a person's LD. During these investigations, *Legionella* spp. bacteria were found in about 25% of sampled environmental sites, indicating that the presence of the bacterium in the environment can not be used by itself to implicate the site as the source of the disease. Not only is home environmental investigation uninformative more than 99% of the time, so are environmental investigations of locations outside the home. Environmental investigations should be reserved for LD outbreaks where there is solid epidemiologic evidence of a common source outbreak. Only about 5% of US LD cases are linked to a common source outbreak. Investigating unlinked cases of LD is costly and unuseful.
- b) Section 6706 of the bill requires an epidemiologic investigation of each reported case of LD, including determining the potential source of infection. This includes determination of disruption of residential water supplies and investigation of home water fixtures, as well as determining potential water exposures outside the home.

- c) Section 6707 of the bill requires cultures for *L. pneumophila* as part of any water management plan. Water management plan requirements per ASHRAE 188-2021 building water management plans and 12-203.
- d) Unfunded regulatory overreach – requiring owners of all buildings in the state other than single dwelling homes to conduct a risk survey annually per 188-2021. In addition, each time a renovation, addition or modification is made to the building a new survey is required. Every free-standing coffee shop, every shoe repair shop, every gas station, every contractor building a duplex apartment building, every restaurant and bar, etc. Since the standard does not define renovation, addition or modification, it is unclear whether a coffee shop owner adding new countertops, or a car dealer replacing floor tiles would need to perform and certify compliance. How the state will determine the compliance with the code for all these types of buildings, including inspection, etc. is not stated nor funded in the bill.
- e) Free-standing cooling towers are not covered by ASHRAE 188-2021, as they are not in human-occupied buildings. Such cooling towers at power plants, industrial facilities, paper processing plants and other places can be a significant cause of LD(9-11). If the intention of the bill is to reduce the risk of community LD then such sources must be included in the regulations.
- f) ASHRAE 188-2021 does not mention displays of hot tubs at public events, as these are transient events in otherwise compliant buildings. Water spa exhibits at public events can cause large LD outbreaks and require regulation in a bill designed to control LD (12, 13).
- g) Contrary to ASHRAE 188-2021, this bill requires routine environmental cultures to comply with a building water safety plan.

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PENNSYLVANIA AMERICAN WATER

TESTIMONY ON PENNSYLVANIA HOUSE BILL 2085

July 20, 2026

Dear Chairman Burgos & Chairman Metzgar,

American Water appreciates the committee's focus and attention on the control and prevention of waterborne disease in drinking water and the opportunity to provide written feedback on HB2085. American Water provides drinking water and wastewater service to an estimated 14 million people in 14 states, including in Pennsylvania, where we provide homes and businesses with safe, clean, reliable drinking water.

The greatest opportunity to protect public health lies in the portions of this legislation that focus on building management plans and premise plumbing. These risks are recognized and well documented by the U.S. Environmental Protection Agency and the Centers for Disease Control and Prevention and should be the focal point of the final legislation.

However, the sections of the legislation that focus on drinking water systems are not based on sound science, were not developed through established processes, and will place undue burden on drinking water systems without clear improvement in drinking water quality or public health protection. In fact, regulations applicable to drinking water systems are already in place to address the issues raised in the legislation, and processes exist to revise these requirements when appropriate. As such, the final legislation should be amended to recognize the current situation and build upon the existing regulatory requirements and framework.

We believe the purpose of this bill is well-intended and look forward to working with you in the development of final legislation that will lead to improved public health protection in Pennsylvania.

Sincerely,

Matthew J. Corson

Matthew J. Corson, P.E.
Senior Principal, Environmental Policy and Planning

**PENNSYLVANIA AMERICAN WATER
TESTIMONY ON PENNSYLVANIA BILL HB2085
July 20, 2026**

Duties of Building Owners and Operators (Section 6707)

The greatest opportunity to protect public health lies in the portions of the legislation that focus on building management plans and premise plumbing. These risks are recognized and well documented by the U.S. Environmental Protection Agency (U.S. EPA) and the Centers for Disease Control and Prevention (CDC) and should be the focal point of the final legislation.

Specifically, both the U.S. EPA and CDC provide recommendations for building management plants that focus on:

- Managing hot and cold water temperatures
- Preventing water stagnation through regular use and flushing
- Maintaining plumbing fixtures and aerosol-producing devices
- Implementing building-appropriate water management practices

This underscores the importance of requiring building management plans as proposed in the legislation.

However, while the proposed legislation requires building owners to execute plans and make them available for review, it lacks a requirement for the PA Department of Health (PA DOH) to provide direct oversight of the execution of said plans. This is a necessary step for ensuring overall effectiveness of the process.

Investigating Legionella Cases (Section 6706)

The legislation should be revised to retain the requirement for PA DOH to investigate reported cases of Legionnaires Disease while providing them with the necessary flexibility to develop a process that is effective and implementable. The CDC web site *About Legionnaires' Disease Investigations* provides information to be considered when performing such an investigation (link provided below).

PA DOH needs to be very mindful when developing a dashboard on reported legionella cases to ensure that the public can clearly and easily understand the information. This includes what the data represents but also what it does not represent so as to avoid potential misinterpretation or misuse. Water systems and other interested parties should have the opportunity to review and provide feedback on the draft dashboard prior to finalization.

Minimum Numeric Disinfectant Residual Levels (Section 6703) and Response to Low Disinfectant Residuals and Customer Notification (Section 6705)

The Pennsylvania Department of Environmental Protection (PA DEP) currently requires water systems to maintain a minimum numeric disinfectant residual level of 0.2 mg/L. This level was developed through the established regulatory development process. Any changes to the required level should follow the same process which allows for key activities including review of existing science and public review and comment on the proposed rule.

Likewise, PA DEP also has established requirements for responding to low disinfectant residuals, any changes to these requirements should be through the established process to allow for appropriate development, review, and comment.

Any changes to the disinfectant residual requirement would need to consider the total impact of the change and specifically the need to address increases in disinfection byproducts (DBPs) as disinfectant residuals are increased. Costs associated with any changes would include both capital costs for construction as well as on-going operations and maintenance (O&M) costs.

These costs must also be viewed in terms of overall customer affordability. Water systems are working with limited resources and already have multiple priorities, including lead service line replacement and installing treatment to meet the new limits for perfluorinated (PFAS) compounds. Customer affordability remains a priority and key concern, so we must ensure that new requirements that come from this legislation are based on sound science and incorporate best practices. As a water utility regulated by the Pennsylvania Public Service Commission, new costs associated with additional compliance obligations would be included in the cost of service and recoverable in the water rates charged to our customers.

Further, to the extent that any new regulations create additional costs, all water utility providers, regardless of ownership, should have equal access to any and all state and federal funding that may be available to support compliance with new requirements. Customers in all types of systems should have the opportunity to benefit from available funding.

Any provisions related to Best Management Practices (BMPs) and Distribution System Maintenance Plans that are included in the final legislation should require development through existing regulatory processes. The legislation should include examples of what could be included in each (e.g. might or may) without being prescriptive (e.g., will or shall).

Environmental Rules and Regulations – Implementation of Minimum Disinfectant Residual (Section 6705) and Health Rules and Regulations (Section 6709)

The final legislation must include adequate time for water systems to understand the requirements, determine their current situation, make plans for any necessary improvements, and execute said plans (which may include design, permitting, funding, and construction).

The current legislation appears to require the development of regulations to implement the requirements in this bill within 24-month, but the bill is unclear on the amount of time that will be provided to water systems to comply with the new requirements once established in regulation. Although water systems will know the overarching requirements based on the final bill, water systems will not be able to initiate any necessary modifications or improvements until PA DEP finalizes the associated regulations to ensure that they meet the new regulatory requirements. Taking action prior to this risks not meeting the requirement. For proposed new requirements like those contemplated by the legislation, water systems typically need at least 3 years to determine actions needed, design, receive required permits, secure funding, and complete necessary construction. The final compliance deadline must be clearly articulated in the final bill to provide water systems with the time needed to prepare for compliance.

The final legislation must also clearly indicate roles and responsibilities for PA DEP and PA DOH in Sections 6705 and 6709, respectively. As currently written, there could be misinterpretation as to which deadlines apply to which sections.

Definition of *Disruption of Public Water System* (Section 6702) and Reporting Disruptions (Section 6704)

PA DEP has already established definitions for *Disruption of Public Water System* and requirements for reporting disruptions under 25 Pa Code Chapter 109. As such, the proposed definitions should be removed from the final legislation to avoid confusion and potential contradiction with those definitions. Further, PA DEP or PA DOH should use currently reported information to meet any data needs.

In addition to being duplicative to existing definitions, the proposed definitions are unclear and / or unnecessary:

- Paragraph (1) should be clarified to capture significant changes to, or more likely failures in, the water treatment process. This would include challenges related to providing required disinfection and is not intended to capture minor alterations in chemical feed rates or challenges with other chemical feeds, which could be interpreted as “changes in the water treatment process” under the current definition.
- Paragraph (3) is not necessary since changes to source water require review and approval by PA DEP.
- Paragraph (4) should be expanded to clarify that this is focused on risks in water quality related to legionella. This would avoid confusion and misapplication when considering risks from chronic contaminants or other factors that are not related to legionella.

Links

<https://www.epa.gov/indoor-air-quality-iaq/legionella-indoor-environment>

<https://www.ashrae.org/technical-resources/bookstore/ansi-ashrae-standard-188-2021-legionellosis-risk-management-for-building-water-systems>

<https://www.cdc.gov/control-legionella/about/index.html>

<https://www.cdc.gov/legionella/causes/index.html>

Testimony in Support of House Bill 2085

Prepared for the Public Hearing on Water Management Systems and the Prevention of Legionnaires' Disease

Good afternoon, _____. Thank you for the opportunity to speak today.

My name is Rebecca Medvedev. I am a registered nurse of 10 years, a recent Psychiatric Mental Health Nurse Practitioner graduate, and a Lancaster County resident. In 2023, I wrote an article for Lancaster Newspaper urging support for legislation to prevent Legionnaires' disease in Pennsylvania. I'm not an infectious disease expert. I'm here today as an advocate.

I understand this committee is already united on the importance of this issue. The conversation today is more about the "how"... the specifics of implementation, the cost, the timelines. I'm not the right person to argue those details. But I am the right person to ask you not to lose sight of who is waiting on the outcome of that debate.

Consider this: most healthy people exposed to Legionella don't even get sick. Their bodies fight it off without a second thought. So ask yourself... who is left standing when it does take hold? In my career, I have cared for patients with mental health conditions in hospitals and in long-term residential settings, the elderly, people with chronic lung disease, current and former smokers, and people whose immune systems were too weak to fight off an infection a healthy adult might shrug off entirely. These are the people most likely to die from Legionnaires' disease, and the people with the least power to protect themselves from it.

A psychiatric patient in a state facility does not choose their building's plumbing contractor. A nursing home resident cannot get out of bed to inspect a cooling tower. Your grandma who does her pool physical therapy at the local assisted living facility doesn't ask how they prevent Legionella. Your immunocompromised brother doesn't question the ice in the water they hand him during his infusions. A person incarcerated in a Pennsylvania prison has no say in how that facility's water system is maintained. Everyone's safety depends entirely on someone else doing their job correctly, upstream and out of sight, before that water ever reaches a showerhead, a faucet, a whirlpool, or even an ice machine.

That is what makes this a moral issue, not just a technical one. When the people most at risk of dying from something are also the people least able to protect themselves from it, the obligation shifts to us. It shifts to policy, to building owners, to this legislature.

Pennsylvania averaged 400 Legionnaires' cases a year between 2021 and 2023, a rate higher than the national average. The true number is likely higher still since so many cases go undiagnosed. Every one of those cases was preventable. Every debate about how we prevent them is a debate happening in real time, while people remain exposed.

I'm not here to tell you how to work out the details. I'm just here to ask that you do. Whatever form House Bill 2085 ultimately takes, please keep the people with the least power to protect

themselves at the center of that decision. Please don't let the debate over the how become a reason this issue never gets decided at all.

I respectfully urge this committee to advance House Bill 2085. Thank you for your time.

Support state bill aimed at preventing Legionnaires' disease [column]

REBECCA MEDVEDEV | FOR LNP | LANCASTERONLINE
Dec 3, 2023



Submitted

Legionella may sound like a cute baby name, but what it represents is anything but.

Legionella is the family name for more than 50 species of bacteria; it causes Legionnaires' disease, a severe form of pneumonia. Legionella pneumophila is the species that accounts for more than 90% of Legionnaires' disease

cases.

Legionnaires' disease can be fatal, and even those who recover can have lifelong health problems. This is a disease that presents similarly to COVID-19 with symptoms such as cough, fever, headache and fatigue.

Legionnaires' disease is different from COVID-19, however, in that it is caused by bacteria, and it is not contagious from person to person. It is mainly spread because of poor infrastructure. Legionnaires' disease is prevented through laws that enforce proper maintenance of building water and plumbing systems. We need to consider that because of the COVID-19 pandemic, many people already deal with lingering lung damage, ranging from mild to severe. Adding Legionnaires' disease to the mix would be a tragedy.

Legionella grows naturally in the environment, living in freshwater lakes and streams. The levels of the bacteria in natural water are generally too low to cause disease. Legionella becomes dangerous when it enters and multiplies within water and plumbing systems. The contaminated water becomes aerosolized, and we may breathe in these water droplets. Legionella becomes an unwanted guest within our lungs and causes disease.

Consider this: If you were to drink water from a puddle, you wouldn't be surprised to get sick, right? Now think about getting sick after taking a shower in your apartment building. You breathe in the hot water vapor from the showerhead into your lungs. Or imagine sitting by a decorative water fountain in a hotel lobby. How about you visit a spa and get into a contaminated hot tub? You could walk by an industrial air conditioner unit that hasn't been cleaned properly. These are examples that resemble real-life cases of how people have gotten sick with Legionnaires' disease.

In August, [LNP | LancasterOnline reported](#) that an individual who stayed briefly at Lancaster County Prison had been diagnosed with Legionnaires' disease. Fortunately, the infected individual recovered.

I share these examples not to scare, but to inform. The good news is that this disease is preventable through proper maintenance of water systems.

Prevention includes regular testing. Prevention also includes mitigating scale and corrosion within building pipes. Legionella feeds on iron and sludge. Proper disinfection is key. Reducing the odds of standing water is vital. This is done through regular use and flushing. Maintaining appropriate temperatures goes a long way.

Proper maintenance ensures longevity of pipes and prevents a public health nightmare. An established industry standard written by the American Society of Heating, Refrigerating and Air Conditioning Engineers outlines a comprehensive risk management plan for legionella within water systems. The issue today is that guidelines don't help much if building owners are not mandated to follow them. Legislation could help with this.

State Sen. Ryan Aument, R-West Hempfield Township, is the co-prime sponsor, with state Sen. Wayne Fontana, D-Pittsburgh, of Pennsylvania Senate Bill 571 on Legionnaires' disease risk management in public water systems.

This is the third time this bill has been submitted. It is currently sitting in the Senate Environmental Resources and Energy Committee. Hopefully, it moves through the legislative gears before the end of the 2023-24 legislative session; if not, it will die again and will need to be resubmitted.

The legislation would require both drinking water providers and owners of buildings with complex water systems serving the public to have a plan for testing for, and mitigating, legionella.

The main pushback to Senate Bill 571 appears to be cost. There is a concern that fixing a legionella issue can be expensive. But disinfection with chlorine tablets and hot running water will usually kill legionella and reduce its growth. If it is found in a showerhead or water dispenser, point-of-use filters can be installed. Google the average legal settlement for Legionnaires' disease and you'll get a range of \$225,000 to \$5.2 million. Chlorine is much cheaper.

Another potential point of pushback is that chemicals to prevent bacterial growth in water can be harmful to our health. Generally, the levels are too low to cause concern when you drink chlorine-treated water. There are concerns about disinfection byproducts, which are produced when chlorine

is added to drinking water. Chlorine naturally reacts with organic compounds that are already present in the water. Point-of-use filters can help reduce disinfection byproducts.

Why are we not mandating legionella legislation for family homes? The answer is that home water systems tend to be much simpler, with less chance of legionella growth. Single-family homes and vehicle air conditioning units do not use water to cool the air. They are not a risk for legionella growth.

As of January 2022, accredited hospitals and long-term health care facilities are mandated by the Joint Commission on Accreditation of Healthcare Organizations to have legionella management plans. Our focus should be large buildings that have no such mandate.

Please consider contacting your state legislator. Say you support this bill. We currently have guidelines available for legionella prevention, but there is no official legislation. I believe legislation will prevent new Legionnaires' disease cases. You can't treat something you don't know you have. This applies to humans and to water.

Rebecca Medvedev, a Lititz resident and registered nurse, is a student in the University of Pennsylvania Nurse Practitioner Program. She has served on the local health care front lines at Lancaster General Hospital and Lancaster Behavioral Health Hospital.

Submitted to: Representative Ismail Smith-Wade-EL, Pennsylvania House District 49

From: Susan K. Emswiler, Lancaster, PA

Date: July 10, 2026

Re: Patient Testimony in Support of Legionnaires' Disease Investigation and Prevention Legislation

My name is Susan K. Emswiler. I am a resident of Lancaster, Pennsylvania, and I am submitting this testimony as a patient diagnosed with Legionnaires' disease.

1. Displacement and Lodging

Due to heating system failures at my home in late 2025, I was displaced and required temporary lodging. I stayed at the Eden Resort and Suites, 222 Eden Road, Lancaster, PA on: November 22 to 26, 2025; November 30 to December 2, 2025; and December 8 to 9, 2025.

During each stay, I requested the same room due to my husband's disability. It is helpful for him to be familiar with his surroundings. Upon checking into our room, the vanity sink had standing water. I informed the Front Desk but nothing was done. There did not appear to be a drip but the possible cause was water coming up the drain.

2. Diagnosis and Hospitalization

On December 17, 2025, I was admitted to Penn Medicine - Lancaster General Hospital with symptoms of fever, muscle and body pain, headaches, chest pain, cough, weakness, and confusion. Upon admission I was so weak I could not get out of bed and was unable to walk. I was hallucinating and delirious. I had no comprehension of where I was or who I was with.

My family was told I may have been having a stroke because of my confusion. They were also told my infection was worsening and it was critical to find the correct antibiotic, because if sepsis set in, it would be very serious.

I remained hospitalized until December 21, 2025. My discharge diagnoses included Legionnaires Pneumonia, Right Lower Lobe Pneumonia, Acute Encephalopathy, seizure-like activity, and secondary diagnoses of diabetes mellitus, asthma, hypertension, and high cholesterol.

I personally question why both health facilities were not forthcoming about the fact that I had Legionnaires' disease and did not provide information on the physical and mental effects it can have. I only learned of my diagnosis when I read my discharge papers from both facilities. I asked my family if they were ever told my diagnosis or given any information about it, and they said no.

3. Attempts to Report

Following my diagnosis, I made multiple telephone calls to the Eden Resort and Suites to report my illness and my concern about a potential exposure source. I was told the matter would be investigated and that someone would get back to me. I never received any follow-up information, findings, or confirmation that any investigation or remediation was completed.

I also contacted the Pennsylvania Department of Health to report my case. I was told by staff that the Department does nothing with individual reports except forward them to the CDC, and that no contact information for follow up was available.

4. Identified Gap in Public Health Protection

My experience indicates a significant gap in Pennsylvania's public health response. Patients who report a potential commercial source receive no follow up. The Department of Health does not conduct source investigation at the state level. Without investigation, building water systems that may harbor *Legionella* bacteria can remain in operation.

5. Request for Legislative Action

I respectfully request that Representative Smith-Wade-El consider introducing legislation to:

- a. Require the Pennsylvania Department of Health to investigate confirmed cases of Legionnaires' disease to attempt to identify potential sources of exposure;
- b. Establish mandatory inspection, testing, and remediation protocols for facilities linked to confirmed cases;
- c. Create a transparent notification process so that reporting patients and the public are informed that an investigation has occurred and what corrective actions were taken;
- d. Ensure that information regarding Legionnaires' investigations, environmental test results, and remediation actions is accessible to the affected patient and to the public, and that Pennsylvania's Right-to-Know Law shall not be used to deny access to this public health information.

Legionnaires' disease is preventable. Transparency is essential to prevention. Patients and the public should not be blocked from learning whether a facility where they were exposed has been tested or cleaned.

In closing, the aftereffects of Legionnaires' disease remain with you for an indefinite time. It has been seven months for me and some of the side effects that I am suffering from are the following:

- Headaches
- Confusion
- Mood changes, being grouchy and depressed
- Fatigue/insomnia
- Muscle weakness, attended therapy
- Balance issues, attended therapy
- Problems with thinking and remembering
- Passing out with little or no warning

I am willing to provide medical documentation and a log of my communications upon request. Thank you for your consideration.

Respectfully submitted,

Susan K. Emswiler

Lancaster, PA

July 10, 2026

Testimony Attachment

Submitted by: Susan K. Emswiler

To: Representative Ismeal Smith-Wade-El

49th District

Regarding: Metabolic Encephalopathy Associated with Legionnaires' Disease

For: Pennsylvania House of Representatives

Date: July 11, 2026

METABOLIC ENCEPHALOPATHY ASSOCIATED WITH LEGIONNAIRES' DISEASE

OVERVIEW

Metabolic encephalopathy is a condition in which global brain function becomes impaired due to metabolic disturbances in the body, not from a structural brain injury such as a stroke or tumor. It is often reversible if the underlying cause is identified and treated promptly. Legionnaires' disease, a severe pneumonia caused by *Legionella* bacteria, is a documented infectious cause of metabolic encephalopathy.

CAUSES

Any systemic illness that disrupts brain metabolism can cause metabolic encephalopathy. In Legionnaires' disease, multiple mechanisms contribute:

Category: Severe infection / Sepsis

Legionnaires' Disease Mechanism: *Legionella* produces bacterial endotoxins and cytotoxins that can directly affect brain function. The systemic inflammatory response also contributes to cerebral dysfunction.

Category: Organ failure

Legionnaires' Disease Mechanism: Acute kidney injury and rhabdomyolysis occur in Legionnaires' disease and can lead to uremic encephalopathy secondarily.

Category: Electrolyte imbalances

Legionnaires' Disease Mechanism: Hyponatremia is a hallmark of Legionnaires' disease, with sodium levels <130 mEq/L commonly reported. Severe low sodium is a major driver of encephalopathy.

Category: Hypoxia

Legionnaires' Disease Mechanism: Pneumonia in Legionnaires' disease frequently causes hypoxia. Case reports document arterial pO₂ as low as 58.2 mmHg, which impairs cerebral metabolism.

Category: Bacterial toxins

Legionnaires' Disease Mechanism: Legionella produces specific neurotoxins that have been linked to encephalopathy.

Category: Dehydration / Hypotension

Legionnaires' Disease Mechanism: High fever, vomiting, diarrhea, and poor oral intake are common in Legionnaires' disease, leading to volume depletion and low blood pressure.

SYMPTOMS

Symptoms reflect global cerebral dysfunction and related systemic stress. Up to 50% of patients with Legionnaires' disease develop neurologic symptoms during acute illness.

Neurologic symptoms include:

- Confusion and disorientation
- Slurred speech (dysarthria), often an early sign
- Poor balance and coordination (ataxia), which may cause stumbling or falls

- Sleepiness, lethargy, or stupor, progressing to coma in severe cases
- Agitation or personality changes
- Seizures, especially with severe hyponatremia
- Memory deficits, which may persist after recovery

Symptoms related to reduced cerebral blood flow or oxygen:

- Fainting (syncope) or near-fainting — Due to dehydration, sepsis, hyponatremia, or hypoxia. Fever, vomiting, and diarrhea in Legionnaires' disease can cause volume loss and hypotension when standing.
- Dizziness or “graying out,” often preceding fainting
- Generalized weakness from infection, rhabdomyolysis, and electrolyte shifts

Other associated symptoms from Legionnaires' disease:

- High fever, chills, and cough
- Shortness of breath and low oxygen saturation
- Muscle aches and rhabdomyolysis, with creatine kinase levels >15,000 reported

BODY SYSTEMS AFFECTED

1. Neurologic system: Primary site of dysfunction, producing the symptoms listed above.
2. Cardiovascular system: Sepsis and dehydration from Legionnaires' disease cause hypotension and tachycardia, contributing to fainting and reduced cerebral perfusion.
3. Respiratory system: Hypoxia from pneumonia directly worsens encephalopathy.

4. Renal/electrolyte system: Acute kidney injury and hyponatremia are common and directly precipitate encephalopathy.
5. Musculoskeletal system: Rhabdomyolysis and generalized weakness add metabolic stress.

TREATMENT

Treatment targets the underlying cause. For metabolic encephalopathy due to Legionnaires' disease:

1. Treat the infection: Prompt antibiotic therapy with macrolides, quinolones, or tetracyclines. Duration is typically 7–14 days for uncomplicated cases.
2. Correct metabolic derangements: Carefully correct hyponatremia, manage acute kidney injury, and treat rhabdomyolysis. Sodium must be corrected slowly to avoid osmotic demyelination syndrome.
3. Support vital functions: Provide supplemental oxygen for hypoxia, intravenous fluids for dehydration and hypotension, and vasopressors for septic shock if indicated.
4. Prevent secondary brain injury: Control fever and seizures, avoid sedating agents that worsen confusion, and monitor for aspiration risk in patients with reduced consciousness.

PROGNOSIS

Encephalopathy and related symptoms, including fainting, typically resolve as the Legionnaires' disease is treated and metabolic abnormalities are corrected. Neurologic symptoms in Legionnaires' disease are not associated with increased mortality. Some patients report persistent memory deficits, but long-term susceptibility to encephalopathy has not been established in the absence of permanent organ damage.

PATIENT INFORMATION: WHEN TO SEEK URGENT MEDICAL EVALUATION

Seek urgent medical evaluation if you have Legionnaires' disease and experience:

Fainting or passing out — especially if it occurs more than once

Confusion, slurred speech, or behavior changes lasting more than a few minutes

Severe weakness or falling due to balance problems

Trouble breathing, chest pain, or bluish lips/fingertips

High fever over 103°F with vomiting or diarrhea and inability to keep fluids down

Seizure or shaking

Why this matters: Fainting or confusion may indicate dangerously low blood pressure, oxygen, or sodium levels, or that the infection is affecting brain function. These symptoms require prompt hospital evaluation.

CLINICAL INFORMATION: RED FLAGS FOR PROVIDERS

Urgent evaluation is indicated for patients with Legionnaires' disease plus any of the following:

Syncope/Presyncope — May reflect dehydration, sepsis, hyponatremia, hypoxia, or arrhythmia

Acute Altered Mental Status — Confusion, dysarthria, ataxia; consider metabolic encephalopathy

Persistent Neurologic Deficits Post-Syncope — Helps distinguish encephalopathy from simple vasovagal event

Vital Sign Instability — Systolic BP <90 mmHg, HR >120, RR >30, SpO2 <92% on room air, Temp >104°F

Critical Laboratory Findings — Sodium <130 mEq/L, pO2 <60 mmHg, elevated lactate, acute kidney injury, CK >10,000, procalcitonin >5

Clinical Note: Neurologic manifestations occur in approximately 50% of Legionnaires' disease cases and may precede respiratory decompensation. Hyponatremia and hypoxia are common drivers of both syncope and encephalopathy.

STATEMENT FOR THE RECORD

This document is submitted by Susan K. Emswiler as an attachment to formal testimony before the Pennsylvania House of Representatives. It outlines the medical basis for metabolic encephalopathy as a direct complication of Legionnaires' disease, based on peer-reviewed clinical literature.

The intent of this submission is to ensure that the neurologic and systemic impacts of Legionnaires' disease are accurately recognized in public health and legislative discussions.

Submitted by: Susan K. Emswiler

To: Representative Ismeal Smith-Wade-El, 49th District

Location: Lancaster, Pennsylvania

Date: July 11, 2026