Legionella Detection within a Hospital Water Distribution System – Do Contemporary Guidelines for Surveillance Culturing Hold Water?

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Background

Hospital water distribution systems (HWDSs) are sources of Healthcare-associated legionellosis (HAL)[1]. National guidelines advocate surveillance Legionella (Lg) culturing among strategies to reduce the risk of HAL[1,2]. Swab specimens (SS) are recommended to detect biofilm-associated Lg and liter water specimens (WS) planktonic Lg, but a strategy that involves both specimen types is expensive and laborious, and the threshold at which Lg detection should prompt corrective action is unclear. We sought to evaluate the ability to detect Lg in a HWDS using SS and liter WS.

Objective

- Compare the results of 1-liter water specimens with swab specimens when taken from the same sources for cultivation of *Legionella.*

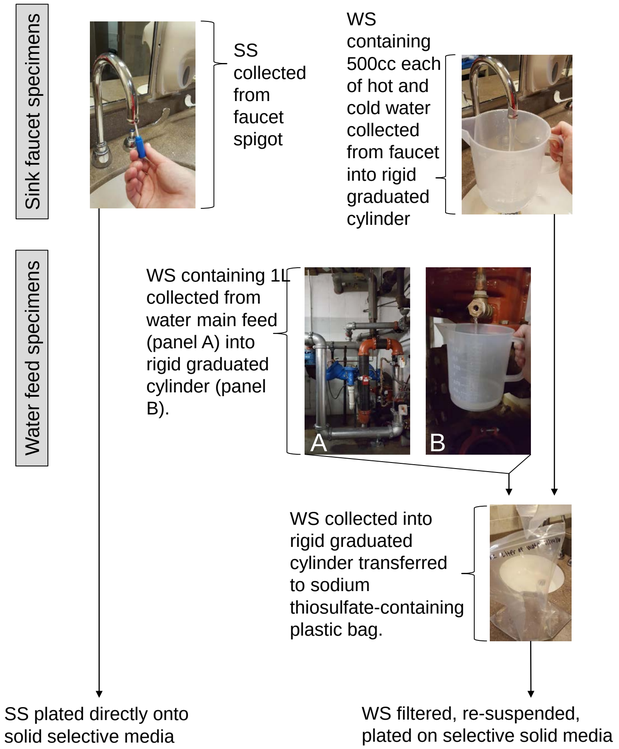
Materials & Methods

Setting: University of Pittsburgh Medical Center (UPMC) Presbyterian Hospital, a 757-bed quaternary care facility whose patient care areas are supplied by 2 municipal water feeds. Hot water is distributed to patient care areas by 8 systems; cold water by a universal system. SS and WS were collected from 33 unique sink faucets, all located in patient care areas. Additionally, WS were collected from the 2 water feeds. Lg disinfection consisted of copper-silver ionization (Dec-May) and monochloramine (Apr-May). HAL was tracked throughout the study period.

Time period: Dec 2014 to May 2015

Microbial methods: SS were obtained by rotating a sterile cotton swab in the spigot of pre-moistened sink faucets (Figure 1). WS were collected in rigid plastic cylinders, transferred to non-sterile, sodium thiosulfate-containing plastic bags, and contained 500mL each of cold and warm water. SS were directly plated onto selective solid media[3]. WS were filtered through a 0.2 µM filter, re-suspended, and plated onto selective solid media[4]. Plates were incubated at 360ºC for 7 days. Presumptive Lg colonies were quantified and confirmed via biochemical testing and matrix-assisted laser desorption/ionization (MALDI).

Figure 1. Swab and water specimen collection scheme



Results

- A total of 576 (288 pairs) SS and WS were collected from sink faucet sites.
- Lg was cultured on a total of 13/288 occasions from 6/33 unique faucet sites and 5/8 hot water systems.
- On only 1 of 13 occasions were SS and WS results congruent (Table 1)
  - Eleven positive WS were accompanied by negative SS, and 1 positive SS was accompanied by a negative WS.
- A total of 15 water feed specimens were collected, 6 of which grew Lg (3 from each feed).
- The median CFU for positive samples was 2 (range 1-63).
- One water main grew *L. pneumophila* twice; all other specimens grew *L. anisa.*
- No HAL was observed.

Growth of Legionella (CFU)				
Date	**Swab Specimen**	**1-L Water Specimen**	**Source**	
12/10/14	1 (*L. anisa)*	1 (*L. anisa)*	Sink 1	Water System*** 1
12/10/14	NG	1 (*L. anisa)*	Sink 2	Water System 1
12/18/14	2 (*L. anisa)*	NG*	Sink 4	Water System 3
12/12/14	NG	10 (*L. anisa)*	Sink 6	Water System 5
12/15/14	NG	1 (*L. anisa)*	Sink 5	Water System 4
12/17/14	NG	2 (*L. anisa)*	Sink 1	Water System 1
12/17/14	**	**7 (*L. pneumophila*)**	Water Feed 1	
1/6/15	NG	1 (*L. anisa)*	Sink 1	Water System 1
1/14/15	NG	1 (*L. anisa)*	Sink 5	Water System 4
1/15/15	NG	4 (*L. anisa)*	Sink 3	Water System 2
1/21/15	NG	3 (*L. anisa)*	Sink 1	Water System 1
1/21/15	**	**63 (*L. pneumophila*)**	Water Feed 1	
2/25/15	NG	2 (*L. anisa)*	Sink 5	Water System 4
2/27/15	**	45 (*L. anisa)*	Water Feed 2	
3/24/15	**	1 (*L. anisa)*	Water Feed 2	
4/15/15	NG	7 (*L. anisa)*	Sink 3	Water System 2
4/16/15	NG	1 (*L. anisa)*	Sink 1	Water System 1
4/16/15	**	10 (*L. anisa)*	Water Feed 2	
5/1/15	**	60 (*L. anisa*)	Water Feed 1	

Table 1. Swab and 1-L specimens yielding growth of *Legionella*.
*No growth **Swab specimens were not collected from water feed sites ***Refers to hot water distribution system

Conclusions

- **WS detected Lg more frequently than SS from the same sites.**
- **Despite the detection of Lg at faucet sites, we observed no HAL.**
- **The optimal strategy to preemptively detect clinically significant Lg requires further study.**

References

[1]Sehulster L, Chinn RY, CDC, HICPAC. Guidelines for environmental infection control in health-care facilities. Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). *MMWR. Recommendations and reports : Morbidity and mortality weekly report. Recommendations and reports / Centers for Disease Control.* 2003;52(RR-10):1-42..

[2]Tablan OC, Anderson LJ, Besser R, et al. Guidelines for preventing health-care--associated pneumonia, 2003: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee. *MMWR. Recommendations and reports : Morbidity and mortality weekly report. Recommendations and reports / Centers for Disease Control.* 2004;53(RR-3):1-36.

[3]Ta AC, Stout JE, Yu VL, Wagener MM. Comparison of culture methods for monitoring Legionella species in hospital potable water systems and recommendations for standardization of such methods. *J. Clin. Microbiol.* 1995;33(8):2118-2123.

[4]Barbaree JM, Gorman GW, Martin WT, Fields BS, Morrill WE. Protocol for sampling environmental sites for legionellae. *Appl. Environ. Microbiol.* 1987;53(7):1454-1458.