

## Increase in pre-seasonal community-acquired Legionnaire's disease due to increased precipitation

B. A. Cunha<sup>1,3</sup>, J. Connolly<sup>1,3</sup> and E. Abruzzo<sup>1,2</sup>

1) Infectious Disease Division, 2) Infection Control Department, Winthrop-University Hospital, Mineola and 3) State University of New York, School of Medicine, Stony Brook, NY, USA

**Original Submission:** 17 February 2015; **Accepted:** 20 February 2015

Editor: D. Raoult

**Article published online:** 2 March 2015

**Corresponding author:** B.A. Cunha, Infectious Disease Division, Winthrop-University Hospital, 222 Station Plaza North (Suite #432), Mineola, NY 11501, USA  
**E-mail:** [bacunha@winthrop.org](mailto:bacunha@winthrop.org)

Sir,

In 2014 we noted a pre-seasonal increase in community-acquired pneumonia due to Legionnaire's disease (LD) compared with the same months in 2012 and 2013 (24 cases in 2014 versus five cases in 2013 and seven cases in 2012). There was an increase in LD cases before the usual LD peak incidence in late summer/early autumn during the swine influenza (H1N1 strain) outbreak, but none had influenza co-infection. Neither we nor others were able to explain the increased incidence of LD during the pandemic [1].

Because of our LD experience during the 2009–2010 influenza pandemic, we compared the incidence of influenza-like illness for the first 7 months of 2013 and 2014, as well as possible influenza and LD co-infection. We conducted an extensive epidemiological investigation to identify potential *Legionella* sp. water aerosol exposures in patients' homes, neighbourhoods, work places, recreational sites and during recreational travel. Local chronic care/nursing home facilities were contacted for possible recent/ongoing LD outbreaks [2]. Lastly, we considered climate change as a potential factor for the unexpected early increase in LD here. We reviewed local climate data, e.g. temperature/precipitation totals for the same periods in 2012–2014.

We reviewed community-acquired LD for 5 months (March–July) of 2014 and found 24 LD in admitted adults. During the same months in 2013 and 2012 there were only

five and seven LD cases, respectively (Fig. 1). During the 2013–2014 flu season 141 adults were hospitalized with influenza. During the 2013 flu season, there were 36 cases and in 2012 there were 131 cases. Charts were reviewed for possible LD influenza co-infection. Influenza was diagnosed by PCR and LD was diagnosed by urinary antigen testing [2]. Investigation revealed that our 24 LD cases were from different ZIP codes within Nassau County, and none were from chronic care/nursing home facilities with recent/ongoing LD outbreaks. We developed an extensive epidemiological LD survey to look for previous *Legionella* sp. water aerosol sources, for example humidifiers, air conditioners, hot tubs, whirlpool baths, towel warmers, camping, water towers, cooling towers, water fountains, supermarkets water misters, windshield wiper aerosols, muddy puddles, potting soil/gardening, open excavation sites, air travel, travel-related hospital visits [2].

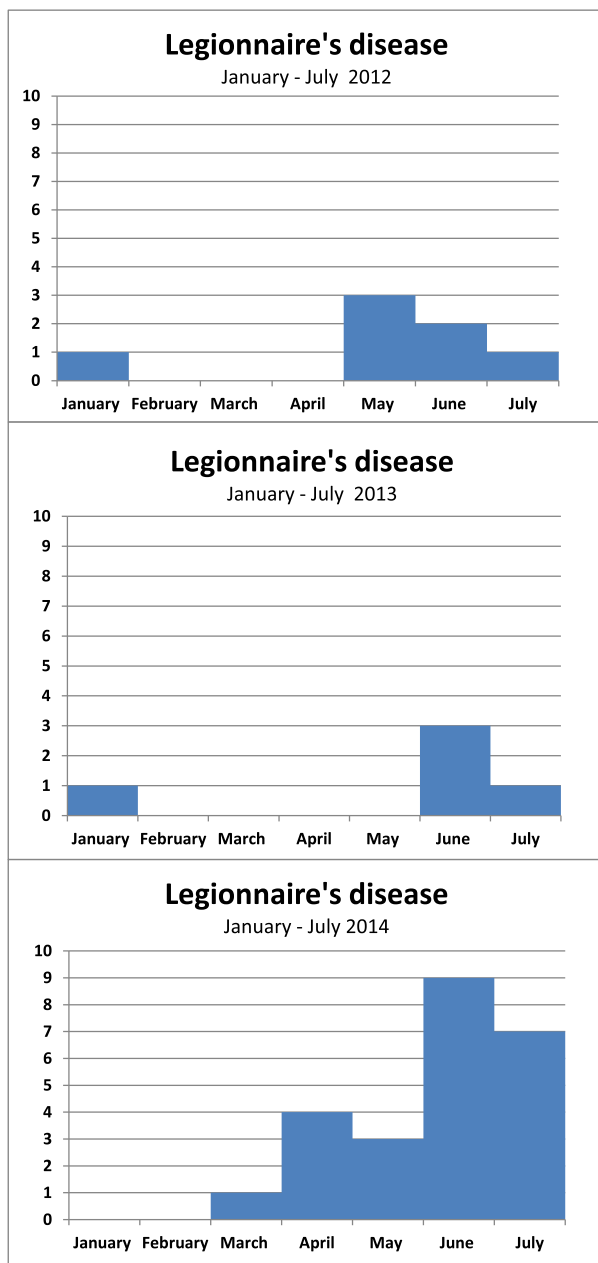
Lastly, we considered climate change to explain increased pre-seasonal LD in 2014 [3–5]. Mean monthly temperatures and precipitation totals for our area were evaluated.

There was no relationship between influenza activity and increased pre-seasonal LD and no LD co-infections. Epidemiological survey revealed no common denominators for LD aerosolized water exposures. Several patients were exposed to supermarket misters in different supermarkets, and two had potting soil/gardening exposures. None were from chronic care/nursing home facilities.

Climate data were obtained from the National Climate Data Center. There was no relationship to temperature. However, total precipitation in 2014 increased by 45% compared with 2012 and by 19% compared with 2013.

*Legionella* sp. are microorganisms widely distributed in freshwater environments. If aerosolized/inhaled, *Legionella*-containing water may result in LD [2]. Community or nosocomial LD outbreaks have been traced to a common water source. Sporadic LD cases/outbreaks in the community have been traced to *Legionella* sp.-contaminated water in windshield wiper fluid, humidifiers, air conditioners, dental water supplies, food market misters, water fountains, whirlpools, spas, cooling towers, muddy puddles, potting soil, construction sites [2].

After noting a dramatic increase in pre-seasonal LD, we investigated several possibilities to explain this increase. First, we considered the potential antecedent/concomitant influenza predisposing to/or presenting with LD (co-infection) [1,2]. LD often presents as an influenza-like illness and often mimics influenza. Only three of the 24 patients had a history of an influenza-like illness, and none had LD co-infection. An extensive epidemiological survey of our cases found no common



**FIG. I.** Increased pre-seasonal Legionnaire's Disease in 2014.

*Legionella* sp. water exposures, and none of our LD cases were from chronic care/nursing home facilities with recent/ongoing LD outbreaks.

Finally, as *Legionella* sp. are water- and temperature-dependent, we considered climate change, i.e. temperatures/precipitation, as a possible explanation. We found no increase in temperature during 2012–2014, but there was a marked increase in precipitation in 2012–2014. Increased LD has been associated with climate change in Europe, e.g. Wales and the Netherlands [3–5]. To the best of our knowledge, this is the first report of increased pre-seasonal LD in the USA due to climate change, i.e. increased precipitation.

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