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Is There a Relationship Between Monthly Rainfall and the Isolation of *Legionella* in Potable Water Systems in Spanish Healthcare Facilities?

To the Editor—A study that explored reported cases of legionellosis in relation to environmental factors in the Philadelphia metropolitan area identified seasonality (summer time) and wet and/or humid weather as predictors of legionellosis.¹ A weak but significant increase in the risk of legionellosis associated with an increase in monthly precipitation was shown in the univariate model, but not when other meteorological exposures were controlled.¹ In a different study, in which our group analyzed *Legionella* isolation in potable water systems of Spanish healthcare facilities, seasonality was also shown to be a predictor, mainly in *Legionella pneumophila* serotypes 2–14.²

The aim of the present study was to explore the relationship between rainfall and the isolation of *Legionella* species from faucets in 21 healthcare facilities, located throughout Spain, from January 2005 through June 2007. A total of 1,412 samples collected from faucets without filters were analyzed. After each valve was opened, a sample of water (100 mL) was collected, and a sterile swab was inserted into the faucet and then placed in a sterile vessel. At this point, the vessel was filled to the 1-liter mark with water. Water samples were concentrated 100-fold immediately on arrival at the labora-

tory. Three 1-mL aliquots were used: 1 untreated, 1 heat-treated (at 50°C for 30 minutes), and 1 acid-treated (in 9 mL of HCl-KCl acid buffer at pH 2.2 for 5 minutes). Then, 0.1 mL of each aliquot was plated onto GVPC (glycine, vancomycin, polymixin B, and cyclohexamide) selective agar medium (Oxoid). Plates were incubated at 36°C for 10 days and examined for growth every 48 hours. Colonies morphologically consistent with *Legionella* species were plated onto buffered charcoal yeast extract (BCYE) agar (Oxoid) and blood agar (Oxoid) and incubated for 48 hours. Colonies that grew on BCYE agar but not on blood agar were definitively identified as *Legionella* by means of a commercially available latex agglutination test (DR0800; Oxoid) that distinguishes *Legionella pneumophila* serogroup 1, *L. pneumophila* serogroups 2–14, and other *Legionella* species (including *L. longbeachae*, *L. bozemannii*, *L. dumoffii*, *L. gormanii*, *L. jordanis*, *L. micdadei*, and *L. anisa*).

The correlation between the amount of monthly precipitation (as recorded by Agencia Estatal de Meteorología³) and the isolation rate was determined by the Spearman correlation test. Figure 1 shows the percentage of all samples that were identified as *L. pneumophila* serogroup 1, *L. pneumophila* serogroups 2–14, and other *Legionella* species per month. In 19 of the 30 months studied, the highest isolation rate corresponded to *L. pneumophila* serogroups 2–14.

Figure 2 shows the relation between the percentage of all samples that were positive for *Legionella* and the amount of precipitation during the study period. A significant correlation ($r = -0.409$; $P = .025$) was found between the amount of precipitation and the proportion of the total rate of *Legionella* species isolation that was due to *L. pneumophila* ($r = -0.459$; $P = .011$). In an analysis of the correlations by serogroup, the correlation was significant for serogroups 2–14 ($r = -0.367$, $P = .046$) but not for serogroup 1 ($r = -0.309$; $P = .096$).

Hospital water supplies can be tested for primary prevention purposes in institutions without documented cases, because nosocomial legionellosis occurs if susceptible hosts aspirate drinking water or inhale aerosols.^{4,5} The risk of nosocomial legionellosis is related to the proportion of distal sites that are positive for *Legionella*^{6,7}; because only a small proportion of exposed patients is susceptible to low levels of contamination (their susceptibility is due to immunosuppression), the number of disseminating points is more important than the infective dose.⁷

In the previous study by our group, the rate of isolation of *Legionella* species in hospital potable water systems (central water tanks together with distal sites) was associated with seasonality.² In the present study, which focused on faucets as distal sites and explored the relationship of the rate of isolation of *Legionella* to the rate of rainfall, the proportion of distal sites that were positive for *Legionella* species was inversely related to the rate of precipitation (Figure 2). The fact that this correlation with precipitation and its seasonality was due to *L. pneumophila* serogroups 2–14 and not to *L. pneumophila* se-

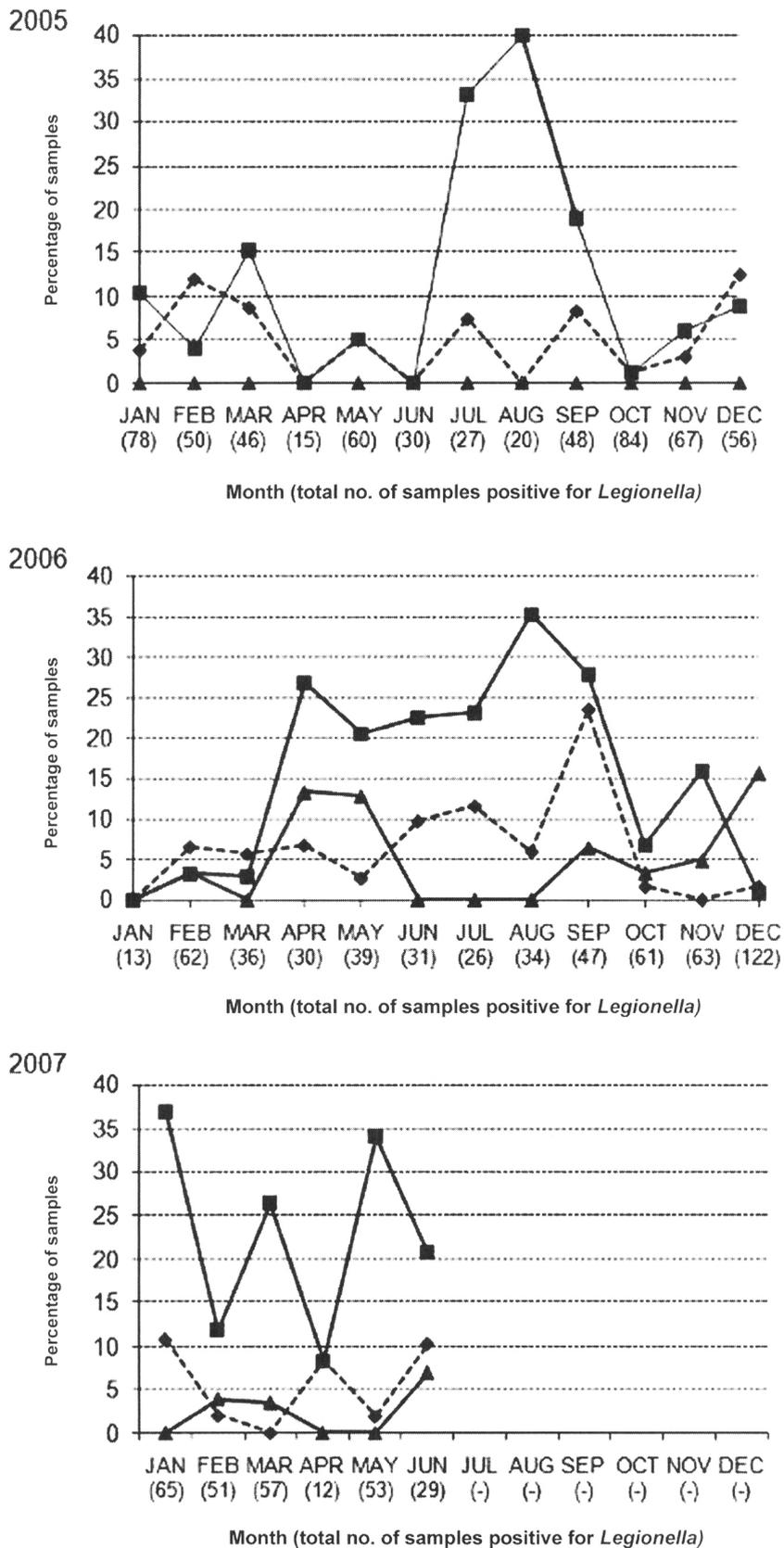


FIGURE 1. Graphs of the distribution of *Legionella* species recovered each month. Dotted line, percentage of samples positive for *L. pneumophila* serogroup 1; continuous line with squares, percentage of samples positive for *L. pneumophila* serogroups 2–14; and continuous line with triangles, percentage of samples positive for other *Legionella* species.

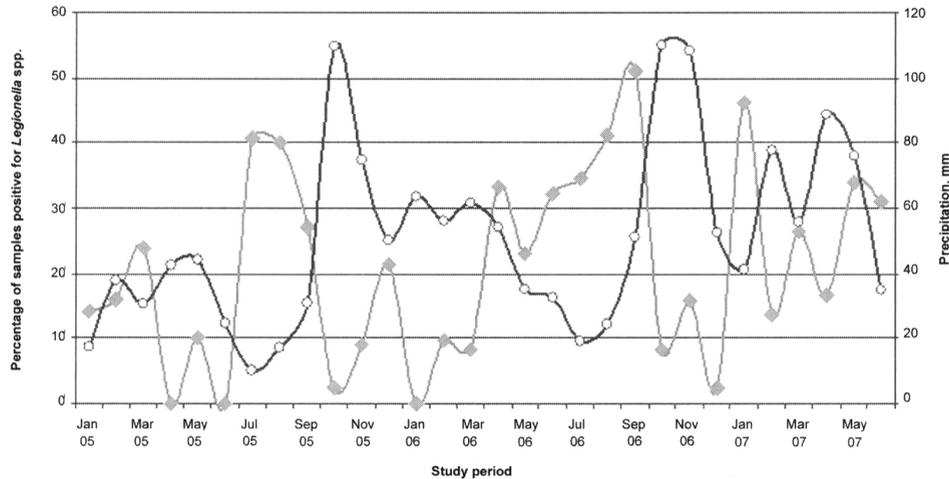


FIGURE 2. Relation between the percentage of all samples that were positive for *Legionella* species and the amount of precipitation during the study period. Gray line with squares, percentage of all samples that were positive for *Legionella* species; black line with circles, amount of precipitation.

group 1 is noticeable and may have clinical translation. In this sense, it has been reported that, among immunocompromised hospitalized patients, at least 20% of *Legionella* infections are caused by strains other than *L. pneumophila* serogroup 1,⁸ but this may be an underestimation, because etiological assignment depends on the *Legionella* urinary antigen test that is specific only for serogroup 1.⁹

In conclusion, in the present study, which was carried out in a country with low precipitation rates (Spain), there was an inverse relationship between the rate of precipitation and the rate of *Legionella* isolation. Further studies are needed to explore the translation of these facts to the clinical epidemiology of nosocomial legionellosis and the importance of its prevention by disinfection, mainly through hyperchlorination,² of potable water systems of healthcare facilities.

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Doctors' Compliance With Hand Hygiene Guidelines in the Surgical Ward

TO THE EDITOR—We read with great interest the study by Duggan et al.¹ suggesting an inverse correlation between healthcare workers' level of professional education and their rate of compliance with hand hygiene guidelines. To inves-