Legionella pneumophila Surveillance in Shanghai: Results and Insights

Environmental water samples were systematically collected from public venues in urban and suburban districts of Shanghai from 2011 to 2020 for Legionella pneumophila (LP) surveillance. All the identified LP isolates underwent a series of testings including serotyping, pulsed field gel electrophoresis (PFGE), sequence-based typing, and antimicrobial susceptibility testing. Among 6 263 water samples, the LP-positive rate was 20.93% (1 311/6 263). The positivity rate decreased from 24.98% (287/1 149) in 2011-2012 to 20.02% (1 024/5 114) in 2013-2020 ($\chi2=13.92$, $P<0.001$), with the highest monthly positivity observed from June to August (23.79%, 745/3 132). A total of 1 365 LP strains were isolated, of which 912 were further characterized, including 10 serotypes, 149 PFGE patterns, and 33 sequence types (ST). The predominant serotype was Lp1 (86.84%, 792/912), and the dominant ST was ST752 (29.50%, 269/912). ST clustering revealed two major clonal groups CG1 and CG2, accounting for 91.12% (831/912) of the isolates. The 190 LPs involved in the drug sensitivity test showed three resistance profiles: azithromycin resistance (31.05%, 59/190), ciprofloxacin resistance (0.53%, 1/190) and azithromycin+ciprofloxacin resistance (0.53%, 1/190). Azithromycin-resistant strains were predominantly ST1 (64.41%, 38/59). The antimicrobial resistance rate showed a significant decline, from 48.65% (18/37) in 2011-2012 to 28.10% (43/153) in 2013-2020 ($\chi2=9.38$, $P=0.002$). In this study, compared to from 2011 to 2012, both the positivity rate and antimicrobial resistance prevalence of LP in public aqueous environments of Shanghai exhibited an overall decline from 2013 to 2020. The predominant types of LP were serotype Lp1 and sequence type ST752, with notable high-level resistance to azithromycin. Measures as enhancing the enforcement of water safety regulations and prioritizing surveillance of azithromycin resistance in LP were recommended to mitigate public health risks.