

Supplementary Information:

Zayed et al. Environmental Drivers of *L. pneumophila* abundance**Table S1.** Correlation Matrix of physico-chemical and bacteriological parameters in water and biofilm of the eight sampling sites.

Correlation matrix (n=630) of physicochemical and bacteriological parameters in water and biofilm of the eight sampling sites. Data on <i>Legionella</i> include culture based and PCR based abundance of <i>L. pneumophila</i> and the most abundant genotypes and clonal complexes (VACC).																																					
Sample type	Parameter	HPC-37C	HPC-25C	Leg count	Temp	pH	Cond	Iron	Chlorine	Nitrate	Ammonia	Zinc	Turb	HCO3	Chlorides	SO4	Hardness	TDS	Fluorides	Mg	Ca	Ca/Mg Ratio	gH4I7	gH4I8	gH4I9	gH4I10	gH4I11	VACC	VACC	VACC	VACC	Positive swabs Culture Based CDA (%)	Leg spp Primer- CDA (%)	Lpn Primer- Based Positive (%)	* CDA- Culture Based Positive (%)		
Water parameter	HPC-37C	1.000																																			
	HPC-25C	0.992	1.000																																		
	Legionella count	0.132	0.158	1.000																																	
	Temperature	0.065	0.010	0.164	1.000																																
	pH	-0.319	-0.275	-0.287	0.082	1.000																															
	Conductivity	-0.039	-0.073	-0.097	-0.143	-0.312	1.000																														
	Iron	0.191	0.201	0.164	-0.142	-0.536	0.479	1.000																													
	Chlorine	-0.137	-0.133	-0.069	0.115	-0.206	-0.403	-0.317	1.000																												
	Nitrate	0.293	0.199	0.046	0.005	-0.216	0.115	0.357	0.045	1.000																											
	Ammonia	0.103	0.143	-0.151	-0.123	-0.041	0.207	-0.546	-0.247	0.169	1.000																										
	Zinc	-0.159	-0.158	-0.188	-0.123	0.092	0.017	-0.048	0.315	0.341	0.132	1.000																									
	Turbidity	0.012	0.008	-0.035	0.137	-0.103	0.159	0.368	-0.271	-0.030	0.287	-0.277	1.000																								
	Bicarbonate	0.176	0.063	0.284	0.070	-0.329	-0.071	0.158	0.084	0.146	-0.178	-0.166	-0.514	1.000																							
	Chlorides	-0.397	-0.460	-0.278	-0.123	-0.025	0.425	-0.119	0.178	-0.113	-0.177	0.009	-0.228	0.210	1.000																						
	Sulfate	-0.033	-0.097	-0.236	-0.085	0.057	0.081	-0.346	0.307	0.090	-0.197	0.366	-0.290	0.251	0.440	1.000																					
	Hardness	-0.320	-0.333	0.074	-0.085	0.225	0.027	0.102	-0.081	-0.002	0.184	-0.097	0.038	0.010	0.153	-0.204	1.000																				
	Total Dissolved Solids	-0.296	-0.287	-0.131	-0.267	0.089	0.247	-0.159	0.178	-0.041	0.002	0.284	-0.608	0.125	0.571	-0.758	0.305	1.000																			
	Fluorides	-0.109	-0.158	-0.079	-0.201	-0.086	0.269	0.111	0.021	0.201	0.032	0.484	-0.104	-0.169	0.173	0.019	-0.099	0.082	1.000																		
	Magnesium	-0.077	-0.022	-0.508	-0.115	0.130	0.269	0.083	-0.175	-0.064	0.287	0.091	0.526	-0.614	0.195	-0.220	0.331	0.041	0.159	1.000																	
Calcium	-0.070	-0.169	-0.090	-0.038	-0.122	0.156	-0.051	0.324	0.154	-0.074	0.185	-0.539	0.438	0.617	0.643	0.113	0.666	-0.032	-0.102	1.000																	
Ca/Mg Ratio	0.056	-0.022	0.499	0.110	-0.176	-0.212	-0.048	0.262	0.135	-0.236	-0.010	-0.598	0.668	-0.028	0.346	-0.255	0.125	-0.150	-0.349	0.380	1.000																
Water + biofilm parameters	gH4I7	0.122	0.120	0.205	-0.185	-0.192	0.112	0.161	0.144	-0.029	-0.058	0.070	0.165	-0.035	0.041	-0.312	0.187	-0.124	0.302	0.215	-0.068	-0.164	1.000														
	gH4I8	-0.044	0.000	-0.038	-0.005	-0.464	-0.222	-0.317	0.630	0.098	-0.071	-0.385	-0.451	-0.003	0.096	-0.509	-0.041	0.410	0.047	-0.170	0.250	0.228	-0.138	1.000													
	gH4I9	0.329	0.315	0.575	0.093	-0.183	-0.324	0.239	-0.091	0.180	0.012	-0.155	-0.047	0.396	-0.581	-0.315	-0.201	-0.488	-0.127	-0.671	-0.305	0.545	-0.065	-0.125	1.000												
	gH4I72	0.129	0.139	0.176	-0.151	-0.147	0.081	0.126	-0.127	0.006	-0.147	0.085	0.019	0.110	-0.092	-0.204	0.171	-0.075	0.135	0.113	0.100	-0.061	0.829	-0.106	-0.058	1.000											
	gH4I92	-0.135	-0.115	-0.085	-0.118	0.109	-0.080	-0.077	-0.087	-0.086	0.229	0.159	0.146	-0.302	-0.028	-0.201	0.185	-0.034	0.346	0.292	-0.264	-0.334	0.359	-0.099	-0.124	0.072	1.000										
	Water + biofilm gH4I141	0.063	0.086	0.252	0.228	-0.229	-0.094	0.123	-0.042	0.035	-0.026	-0.159	0.012	0.180	-0.307	-0.230	-0.123	-0.264	-0.046	-0.527	-0.261	0.474	0.009	-0.065	-0.525	-0.068	-0.064	1.000									
	gH4I11	-0.014	-0.021	0.340	-0.135	-0.200	-0.056	0.111	-0.066	0.031	-0.115	-0.067	-0.160	0.285	0.094	-0.035	0.467	0.337	0.027	0.005	0.375	0.119	0.513	-0.058	-0.073	0.604	0.007	-0.038	1.000								
	VACC1	0.070	0.092	0.154	-0.182	0.073	0.011	-0.016	0.215	0.014	-0.078	0.316	-0.108	-0.050	0.059	0.015	0.147	0.138	0.326	0.108	0.138	-0.029	0.830	-0.140	0.682	0.297	-0.034	0.421	0.421	1.000							
	VACC2	0.097	0.157	0.315	-0.154	-0.161	0.011	0.106	-0.162	-0.040	-0.254	-0.043	-0.021	0.228	-0.238	-0.255	0.095	-0.186	0.030	-0.132	-0.154	0.076	0.575	-0.148	0.162	0.825	-0.009	0.143	0.431	0.426	1.000						
	VACC3	-0.029	-0.007	0.256	-0.033	0.070	-0.028	-0.029	-0.099	0.052	-0.247	0.053	-0.328	0.257	0.107	0.166	0.359	0.407	0.046	-0.039	0.384	0.146	0.345	0.164	-0.122	0.507	-0.097	-0.063	0.739	0.393	0.440	1.000					
	VACC11	0.196	0.208	0.748	0.125	-0.187	-0.271	0.176	-0.109	0.111	0.063	-0.113	0.036	0.211	-0.517	-0.378	-0.109	-0.438	0.021	-0.554	-0.411	0.434	0.099	-0.145	0.839	-0.042	0.272	0.267	0.060	0.009	0.166	-0.142	1.000				
	Biofilm parameters	Positive swabs- Culture Based CDA (%)	0.043	0.087	0.678	0.123	0.040	-0.269	-0.111	0.256	-0.028	-0.253	0.115	-0.158	0.161	-0.200	-0.108	0.025	-0.107	0.064	-0.411	-0.091	0.402	0.508	0.359	0.383	0.389	0.183	0.580	0.256	0.661	0.438	0.277	0.589	1.000		
Legionella spp Primer- CDA (%)		0.247	0.315	0.184	-0.341	-0.072	-0.237	-0.074	0.297	-0.049	0.022	0.179	-0.248	0.071	-0.043	0.102	-0.191	0.068	0.108	-0.247	0.114	0.282	0.234	0.305	0.237	0.130	0.129	0.127	0.090	0.372	0.161	0.042	0.265	0.464	1.000		
L. pneumophila Primer- CDA (%)		0.321	0.355	0.275	-0.183	-0.090	-0.216	-0.046	0.305	-0.043	-0.070	0.136	-0.270	0.154	-0.091	0.189	-0.205	0.110	0.022	-0.305	0.130	0.343	0.267	0.374	0.188	0.188	0.163	0.198	0.159	0.439	0.195	0.130	0.282	0.561	0.346	1.000	
* CDA Culture Based Positive (%)		-0.017	0.051	0.341	-0.051	0.137	-0.368	-0.201	0.356	-0.156	-0.270	0.139	-0.072	0.025	-0.210	-0.144	-0.033	-0.160	0.001	-0.306	-0.209	0.239	0.411	0.335	0.347	0.247	0.274	0.247	0.078	0.569	0.293	0.100	0.448	0.810	0.525	0.557	1.000

Legend: Color code: Red: correlation rs > 0.70-0.9; Orange: correlation rs > 0.50-0.7; and yellow: correlation rs > 0.30-0.5; (Positive/negative); indicate the positive/negative value of r *. additional culture based analysis of samples taken for PCR analysis

Legend: Color code: Red: correlation rs 0.7-0.9, Orange: correlation rs 0.5-0.7 and yellow: correlation rs 0.3-0.5. (positive/negative); indicate the positive/negative value of "r", additional culture based analysis of samples taken for PCR analysis

Table S2. Sampling location and number of isolates obtained from each site from six sampling campaigns in 2012-2014.					
Sampling site (North to South)	Coordina- tes	No. of isolates	Percent of total isolates (%)	No. of geno- types	Ratio: geno- types/ isolates
A Jenin	32°27' N, 35°17' E	28	15.6	5	0.19
B Nablus	32°13' N, 35°14' E	32	17.8	5	0.16
C Nablus	32°13' N, 35°15' E	5	2.8	2	0.4
D Ramallah	31°53' N, 35°12' E	18	10.0	2	0.11
Al-Quds University/ East Jerusalem	31°45' N, 35°15' E	15	8.3	6	0.4
E East Jerusalem	31°46' N, 35°14' E	10	5.6	6	0.6
F Bethlehem	31°42' N, 35°11' E	32	17.8	7	0.22
G Hebron	31°33' N, 35° 04' E	34	18.9	5	0.15
H Hebron	31°31' N, 35° 05' E	6	3.3	4	0.67
Total		180	100	27	

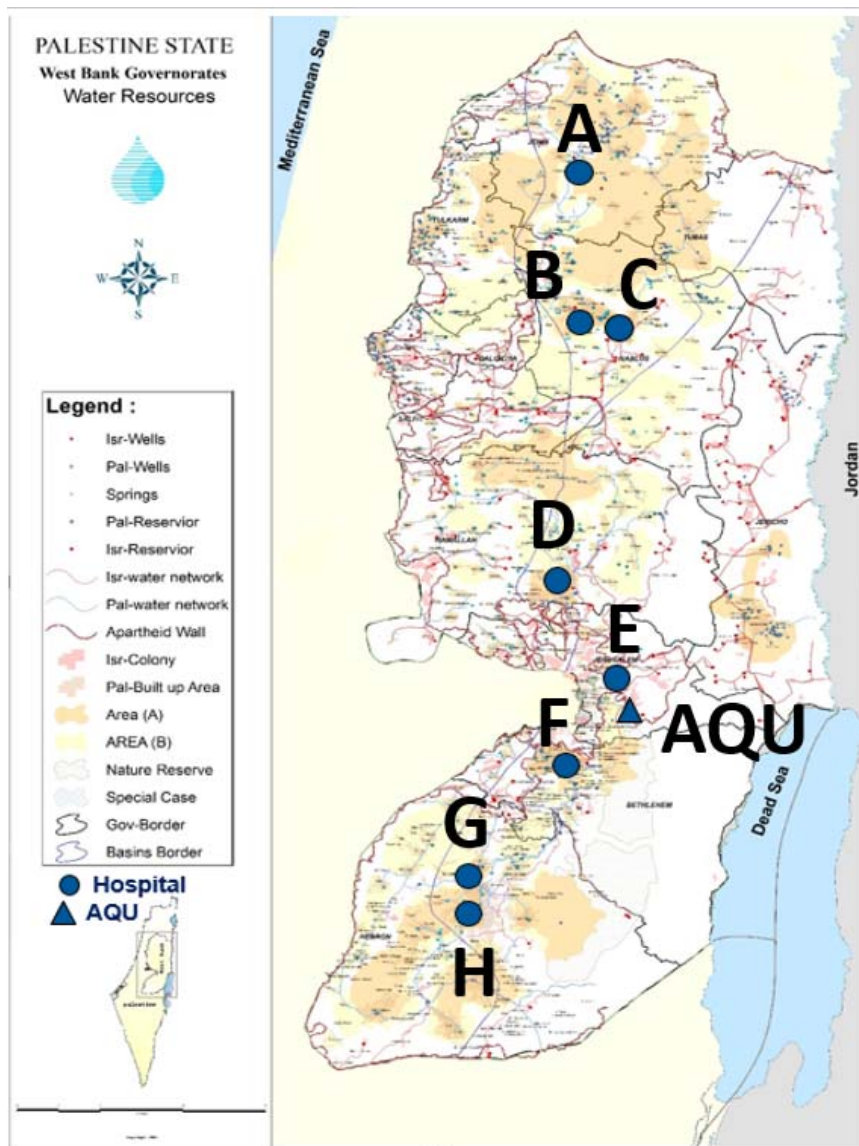


Figure S1

Sampling sites of the eight hospitals (A-H) and Al-Quds University (AQU) in the West Bank, Palestine.

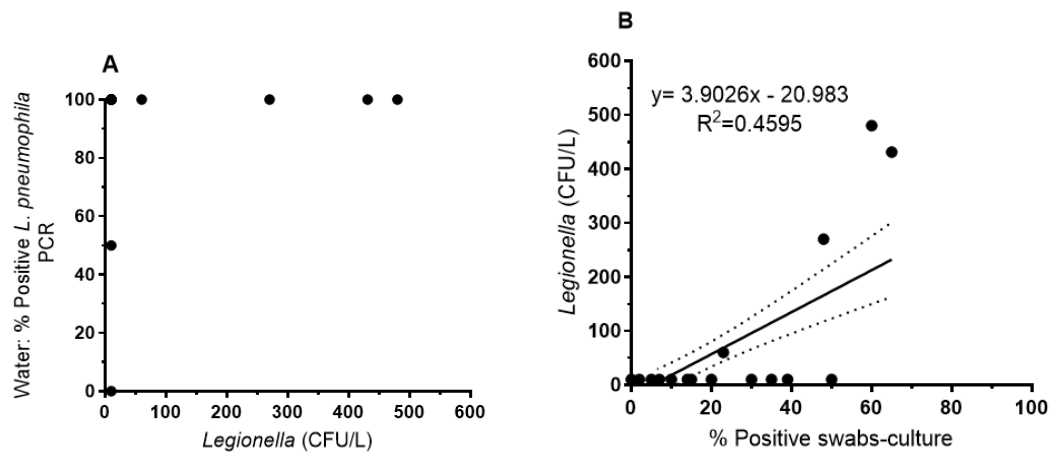


Figure S2

Legionella plate counts vs. *L. pneumophila* specific PCR-detection in cold water samples (A), and vs. culture-based positive biofilm swabs (B, ***, $p < 0.001$) (A, B: $n = 45$)

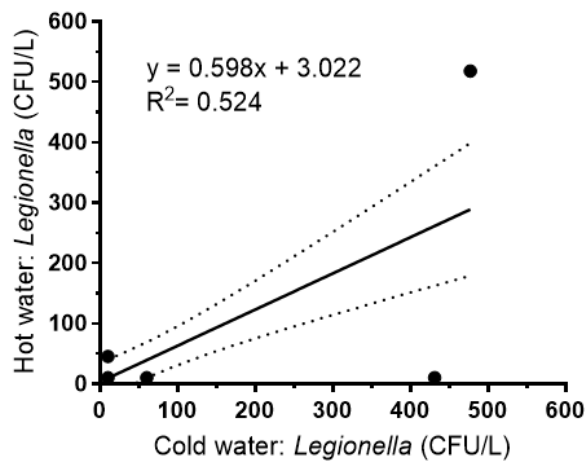


Figure S3

Correlation of *Legionella* plate counts of cold versus hot water ($n=24$) (***, $p < 0.001$).

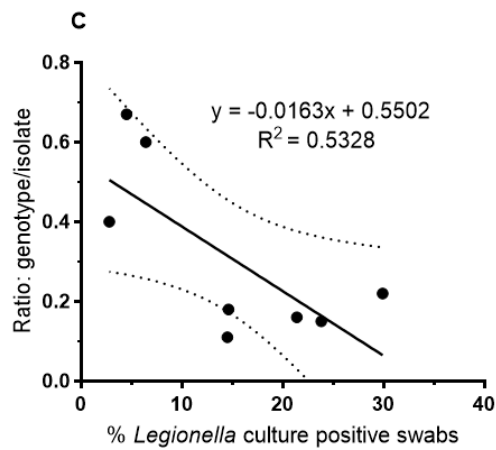


Figure S4

MLVA 8(12)-genotype diversity (number of genotypes / number of strains retrieved per sampling site) vs. the average percentage of *Legionella* positive biofilm swabs (by cultivation) per sampling site (n=45, mean values n=8) (*, $p < 0.05$).