

Evaluating *Legionella* on long-distance public transports: monitoring data and quantitative microbial risk assessment

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Abstract: *Legionella* spp. is one of the most important opportunistic pathogens in premise (domestic) plumbing, where can be aerosolized through devices such as showers, faucets, hot tubes, and toilets. Current environmental surveillance and health risk assessment of *Legionella* spp. in water distribution systems are carried out in tourist accommodation facilities for seasonal use and in healthcare settings, due to the presence of a susceptible population. Nevertheless, also long-distance public transports can be a scenario for sporadic/epidemic community-acquired Legionellosis, owing to the presence of plumbing and toilet water tanks on board of these vehicles. In this study, *L. pneumophila* was detected in 217 (54.5%) of 398 samples collected from faucets on board of these vehicles, and the monitoring data were used to estimate health risk, using a quantitative microbial risk assessment (QMRA) framework. The inhaled dose was calculated using the partitioning coefficient approach, so the airborne microbe load was derived from *L. pneumophila* concentration in water by applying a specific aerosolization ratio for inhalation exposure through faucets. The other exposure parameters (inhalation rate and exposure time) were modelled using probability distribution functions with data according to literature. An exponential dose-response model was used to estimate the health risk of infection ($r = 0.06$) by inhalation of *L. pneumophila* serogroup 1 per single event of exposure. At median *L. pneumophila* concentration of 3.6×10^3 CFU/L, infection risks ranged from 5 to 39 infected/10.000 exposed travellers/1-minute sink use. *Legionella* infection risk from faucet exposure is poorly considered on public transportations, because of the lack of routine environmental surveillance. Our QMRA results based on monitoring data showed that faucets could represent *Legionella* sources, so infection risk should be considered to protect the health of travellers.

Keywords: *Legionella pneumophila*; long-distance public transport; monitoring; Quantitative Microbial Risk Assessment (QMRA)

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