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Trends in microbiological water quality in dental units in northwestern Germany

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Background: Water used in dental units often remains in the system for a long time with little flow and thus has long contact time with biofilm-prone materials. The water may also be heated for the patients' convenience, increasing the risk of *Legionella* growth. During some procedures, water is aerosolized and may be inhaled by the patient or team. We examined water samples from dental units to determine the prevalence of pathogens in these units and to estimate the risk of infection from this source.

Material/methods: Between November 2013 and October 2016, a total of 2801 water samples from dental units and their corresponding water pipes in the Cologne metropolitan area were examined. Water samples were cultured for total plate count (TPC), and also on selective media for *P. aeruginosa* and *Legionella* spp. Potentially pathogenic organisms were subcultured and identified to species level using MALDI-TOF mass spectrometry. To classify a sample as "contaminated", the German guideline for dental units was applied with the following limits: total plate count ≥ 100 cfu/ml, *P. aeruginosa* ≥ 1 cfu/10ml, *Legionella* spp. ≥ 1 cfu/ml.

Results: In the first year, 809 water samples from 141 dental practices were examined. Of these, 711 were primary samples and 98 were controls. Among the 711 primary samples, 191 (27%) were classified as contaminated: 117 samples (62%) had an elevated plate count, 40 samples (21%) contained *P. aeruginosa* and 50 (26%) contained *Legionella* spp., of which 41 were identified as *L. anisa* and 7 as *L. pneumophila*. In the second year, 984 samples from 167 practices were examined, including 853 primary samples. Among these, 234 (27%) were classified as contaminated, 179 (76%) for an elevated TPC, 45 (19%) for *P. aeruginosa*, and 40 (17%) for *Legionella* spp. (28 *L. anisa, 12 L. pneumophila)*. In the third year, 1008 samples from 171 practices were examined. 259 samples (26%) were contaminated, with an elevated TPC in 164 samples (63%) again being the most common cause. 44 samples (17%) tested positive for *P. aeruginosa*, and 96 samples (37%) for *Legionella* spp., (86 *L. anisa* and 10 *L. pneumophila)*. Pathogens other than *P. aeruginosa* and *Legionella* spp. were only rarely isolated: during the three years of the study, *Stenotrophomonas maltophilia* was identified in five samples, and one sample yielded *Serratia* spp.

Conclusions: Although all practices in the study used some kind of water disinfection or filtration, contamination levels remained similar throughout the study period. The *P. aeruginosa* contamination rate especially is markedly higher than in normal drinking water, which may constitute an increased risk of infection for both patients and staff. Regular maintenance and microbiological monitoring of the dental units is necessary to control the water quality.