



Bakker A, Siegel JA, Mendell MJ, Peccia J. 2018. Building and environmental factors that influence bacterial and fungal loading on air conditioning cooling coils. *Indoor Air*, **28(5)**, 689-696.

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Abstract

The presence of biofilms on the cooling coils of commercial air conditioning (AC) units can significantly reduce the heat transfer efficiency of the coils and may lead to the aerosolization of microbes into occupied spaces of a building. We investigated how climate and AC operation influence the ecology of microbial communities on AC coils. Forty large-scale commercial ACs were considered with representation from warm-humid and hot-dry climates. Both bacterial and fungal ecologies, including richness and taxa, on the cooling coil surfaces were significantly impacted by outdoor climate, through differences in dew point that result in increased moisture (condensate) on coils, and by the minimum efficiency reporting value (MERV 8 vs MERV 14) of building air filters. Based on targeted qPCR and sequence analysis, low efficiency upstream filters (MERV 8) were associated with a greater abundance of pathogenic bacteria and medically relevant fungi. As the implementation of air conditioning continues to grow worldwide, better understanding of the factors impacting microbial growth and ecology on cooling coils should enable more rational approaches for biofilm control and ultimately result in reduced energy consumption and healthier buildings. used filters.

Practical Implications

1. Taxa of bacteria and fungi present on AC cooling coils vary considerably depending on the climate and the upstream filter nominal efficiency.
2. Hazardous microbes were more common on coils in systems with lower efficiency upstream filters.
3. These results imply the potential for increased microbial growth on AC coils in geographic regions with elevated dew point temperatures (eg South-East Asia, Southeast U.S).
4. The use of high efficiency upstream filters may reduce the occurrence of hazardous microbes on AC coils and possibly in the air of occupied spaces.

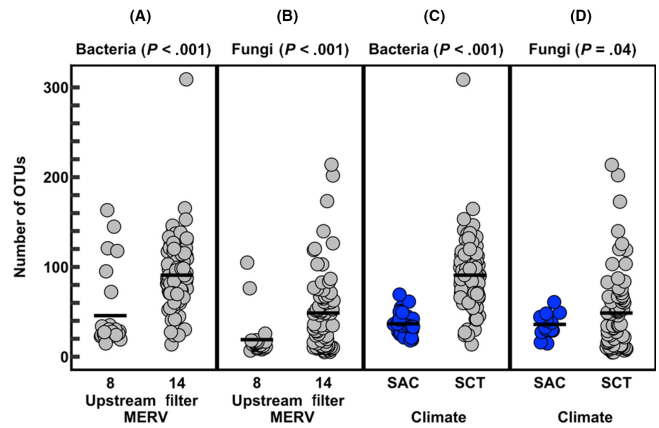


Figure 2 Comparison of bacterial and fungal richness values for coil samples taken from the following groups of AC units (A) MERV 8 vs MERV 14 upstream filters in SCT (southern Connecticut), bacteria, (B) MERV 8 vs MERV 14 upstream filters in SCT, fungi, (C) SAC (Sacramento) vs SCT (MERV 14 only), bacteria, (D) SAC vs SCT (MERV 14 only), fungi. The horizontal line represents the mean. From left to right: n = 28, 120, 14, 76, 28, 120, 27, 76

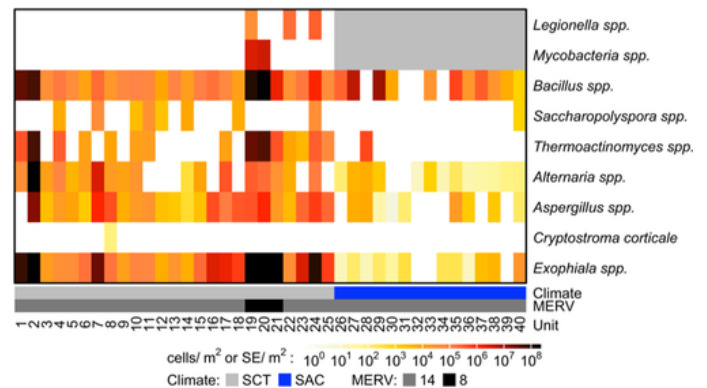


Figure 4 Heatmap of concentrations of medically relevant microbes and pathogenic genera in the AC units sampled. Gray coloring indicates that Legionella spp. and Mycobacteria spp. were not tested for in SAC.

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