

Fungal biomass detection on HVAC filters as good predictors for viable bioburden

C.Viegas^{1,2}, B. Almeida¹, A. Monteiro^{1,3,4}, G.Marchand⁵

¹H&TRC- Health & Technology Research Center, ESTeSL- Escola Superior de Tecnologia da Saúde, Instituto Politécnico de Lisboa, Portugal; ² Centro de Investigação em Saúde Pública, Universidade NOVA de Lisboa, Portugal; ³Escola Nacional de Saúde Pública, Universidade NOVA de Lisboa, Portugal; ⁴Centro de Ciências e Tecnologias Nucleares, Instituto Superior Técnico, Universidade de Lisboa, Portugal; ⁵ Institut de recherche Robert-Sauvé en santé et sécurité du travail, Montréal, Canada

Heating, ventilation, and air conditioning (HVAC) filters have been successfully used to characterize the bioburden of indoor environments. This passive sampling approach uses the HVAC filters as integrated, long-term samplers of particle-bound contaminants, such as fungi and bacteria. Furthermore, fungal biomass detection as analyses approach of HVAC filters can be a useful methodology, since molecular based-studies have already linked bioburden to health outcomes. Thus, the aim of this study was to verify if fungal biomass can be a good predictor for bacterial and fungal counts in HVAC filters. One piece of HVAC filter with 2 cm² (1.4 cm × 1.4 cm) was collected in ten Primary Health Care Centers in Portugal, washed and seeded on: malt extract agar (MEA) supplemented with chloramphenicol (0.05%) and dichloran-glycerol agar (DG18) used for fungi, and tryptic soy agar (TSA) supplemented with nystatin (0.2%) and Violet Red bile agar (VRBA) used to assess the bacterial load. Fungal biomass detection from HVAC filters was performed by dd-PCR and was amplified in a Bio-Rad T-100 thermal cycler. The fungal biomass levels were all above the limit of detection (1 copy.2 μL⁻¹) and ranged from 3.7 to 7.51E + 05 copy.cm⁻². In addition, cultivable microbial counts obtained from HVAC filters on MEA, DG18, and TSA all produced positive correlations with the fungal biomass determination. The intensity of the correlations varies from moderate to strong according to the culture media used. Mycological counts on the MEA produce the lowest correlation (rS = 0.656, p = 0.021), while those on the DG18 show the strongest (rS = 0.796, p = 0.001) although the bacterial counts on TSA also demonstrated a good correlation (rS = 0.779, p = 0.004). These results reveal that higher counts of cultivable microbiota (mold and bacteria) are related to higher fungal biomass in the HVAC filters. The results of the fungal biomass have revealed to be good predictors for both bacterial and fungal counts in HVAC filters. Of note, are the faster results obtained by this molecular approach, allowing earlier control interventions to protect patients and staff health in case of revealed contamination.

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