UNIVERSITY OF TORONTO | Civil + Mineral Engineering

Dedesko S, Siegel JA. 2015. Moisture parameters and fungal communities associated with gypsum drywall in buildings. *Microbiome*, **3**, 71. DOI: 10.1186/s40168-015-0137-y

Abstract

Uncontrolled excess moisture in buildings is a common problem that can lead to changes in fungal communities. In buildings, moisture parameters can be classified by location and include assessments of moisture in the air, at a surface, or within a material. These parameters are not equivalent in dynamic indoor environments, which makes moisture-induced fungal growth in buildings a complex occurrence. In order to determine the circumstances that lead to such growth, it is essential to have a thorough understanding of in situ moisture measurement, the influence of building factors on moisture parameters, and the levels of these moisture parameters that lead to indoor fungal growth. Currently, there are disagreements in the literature on this topic. A literature review was conducted specifically on moisture-induced fungal growth on gypsum drywall. This review revealed that there is no consistent measurement approach used to characterize moisture in laboratory and field studies, with **relative humidity** measurements being most common. Additionally, many studies identify a critical moisture value, below which fungal growth will not occur. The values defined by relative humidity encompassed the largest range, while those defined by moisture content exhibited the highest variation. Critical values defined by **equilibrium relative humidity** were most consistent, and this is likely due to equilibrium relative humidity being the most relevant moisture parameter to microbial growth, since it is a reasonable measure of moisture available at surfaces, where fungi often proliferate. Several sources concur that surface moisture, particularly liquid water, is the prominent factor influencing microbial changes and that moisture in the air and within a material are of lesser importance. However, even if **surface moisture** is assessed, a single critical moisture level to prevent fungal growth cannot be defined, due to a number of factors, including variations in fungal genera and/or species, temperature, and nutrient availability. Despite these complexities, meaningful measurements can still be made to inform fungal growth by making localised, long-term, and continuous measurements of surface moisture. Such an approach will capture variations in a material's surface moisture, which could provide insight on a number of conditions that could lead to fungal proliferation.

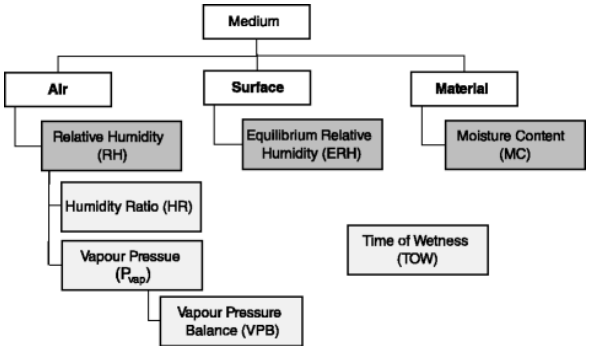

Figure 1. Classification of in-situ moisture parameters by measurement location in buildings. Measurable parameters are shown in dark grey boxes, and inferred parameters are shown in light grey boxes. Time of wetness can be calculated for all three locations and all parameters; although, it is traditionally applied to a_w.

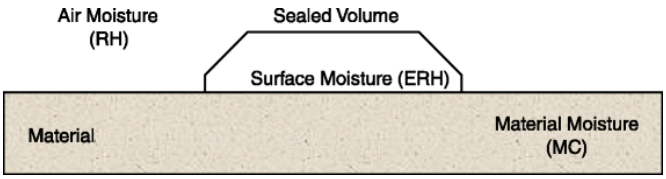

Figure 2. Visual schematic of the three locations.

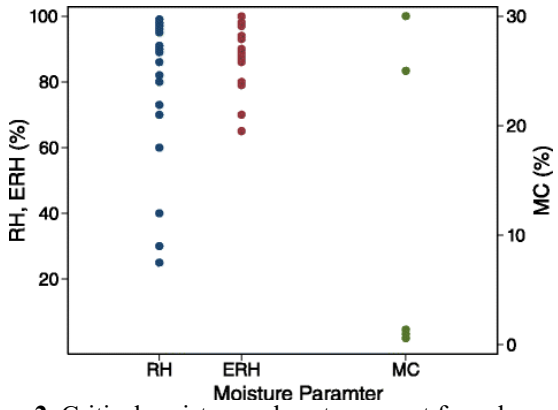

Figure 2. Critical moisture values to prevent fungal growth on gypsum drywall from the literature.

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