Mold Matters: Developing a Simpler & Cost-effective Mold Assessment Tool to Enhance Home Safety for Vulnerable Populations

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INTRODUCTION

- 72% of certified nursing home beds in the USA are currently occupied, with occupancy rates expected to increase.
- Approximately 4.6 million out of 21.3 million annual USA asthma cases are related to mold exposure and dampness in the home.
- The Department of Housing and Urban Development (HUD) helps enable the elderly to age in place by offering home health renovations and community-based services.[4] To implement these initiatives, home health and hazard assessments must be done.
  - Environmental hazards within homes poor indoor air quality, ests, and mold, contribute to respiratory problems, particularly affecting vulnerable populations.[1]
- Mold risk is not easily detected during initial assessment, which can result in homes being approved for renovations but later exposing construction workers and caregivers to harmful pathogen.

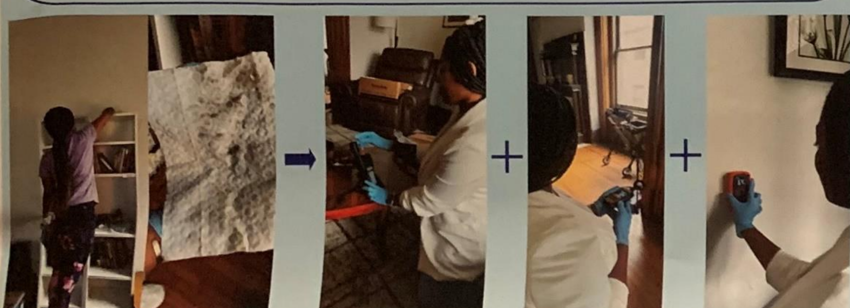
The **overall goal** of this project is to develop a quick, affordable and accurate tools to assess home mold risk.

My research experience in Phase 1 of the study:

Involved assessing how different environmental factors impact mold presence and abundance in dust in the Healthy Home Lab (Figure1).

METHODS

- To identify factors impacting mold concentration and species present within homes three 10-day trials were ran in the Healthy Home Lab (HHL). Each trial tested different levels of humidity, ventilation, and UV light exposure.
- **Overall mold risk:** Assessed by extracting DNA from dust samples collected using a dry Swiffer and used for **Environmental Relative Moldiness Index (ERMI)** testing (Photo below).
- **Environmental measurements:** Light level, wall moisture, humidity, temperature and ATP were measured to look for associations with ERMI (Photo below).



RESULTS

Trial 1: 50% humidity, high UV light, & low ventilation
Trial 2: 70% humidity, low UV light, & low ventilation

ERMI: = Sum of Log_{10} Group 1 (mold associate with water damage) minus Sum of Log_{10} Group 2 (common mold found in homes)

- Trial 1 ERMI Score: 15.2 (High Relative Moldiness Index)
- Trial 2 ERMI Score: 22.7 (Very High Relative)
- Higher humidity resulted in greater concentrations of fungal species that potentially produce toxins or are associated with severe health concerns (Figure 1)

Figure 1: Heatmap showing the concentration of each fungal species analyzed by ERMI

DISCUSSION & NEXT STEPS

- Consistent with the literature mold concentration positively associated with humidity.
- Higher humidity level appears to enrich for more opportunistic mold which may pose respiratory health concerns (Figure 1)
  - Toxin assessment is needed to determine if a true health risk is posed.

Next Steps:

- Ongoing sample collection in the HHL.
- Sampling in real homes across Pittsburgh
- Statistical analysis to determine which environmental variables predict ERMI

Public Health Implications

- The research findings will be used to develop a mold assessment module for home evaluations, benefiting vulnerable populations and promoting aging in place. This tool has the potential to increase the utilization of home health services.
- By prioritizing cost efficiency, this tool could enable lower income individuals to afford quality mold inspections, potentially preventing mold-related issues and positively impacting the iron triangle of healthcare.

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REFERENCES

1. Centers for Disease Control and Prevention. (2022, November 14). Basic Facts about Mold and Dampness. Centers for Disease Control and Prevention. Retrieved June 30, 2023, from www.cdc.gov
2. Certified Nursing Facility Occupancy Rate. KFF. (2022, August 23). Retrieved June 30, 2023, from www.kff.org
3. Housing (in)adequacy index. How do us metros rank? Porch. (2022, August 4). Retrieved June 30, 2023, from www.porch.com
4. HUD's Healthy Homes Program. HUD.gov / U.S. Department of Housing and Urban Development (HUD). (n.d.). Retrieved June 30, 2023, from www.hud.gov
5. Pennsylvania Healthy Housing Fact Sheet - nchh.org. National Center for Healthy Housing. (n.d.). Retrieved June 30, 2023, from https://nchh.org
6. The Environmental Relative Moldiness Index (ERMI). (n.d.). Retrieved June 30, 2023, from www.epa.gov
7. Chen, Allan. (510) 486-4210. (n.d.). Berkeley Lab. EPA studies confirm large public health and economic impact of Dampness and mold: They estimate that number of asthma cases attributable to exposure in home is 4.6 million, at $3.5 billion annual cost. Research News: Berkeley Lab. EPA Studies Confirm Large Public Health. Retrieved June 30, 2023, from www2.lbl.gov