Mold Management of Wetted Carpet

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Imagine this . . .

- Carpeted basement
- Away on vacation
- Water pipe burst
- What do you do?
  - Dry and clean the carpet?
  - Replace the carpet?
Background

• No known regulations
• Common practice on wet carpet
  – 24 hours rule
• Study the scientific merit of this practice
Hypotheses

- Mold cannot be significantly reduced after being wetted for 24-hour or more
- All cleaning methods are equally effective
What we want to do

• Simulate carpet in average home
  – Slightly worn
  – Contain dust

• Simulate wetted basement carpet
  – Soaked padding
  – Moist carpet
  – Contain mold spores
Our methods

- Pre-treat house dust
- Dope and embed dust onto carpet
- Wear down carpet
- Soak the padding
- Wet the carpet
- Seed with common mold spores
  - *Cladosporium* spp.
- Incubate at least 75% relative humidity
- Nylon
- Pile height $\rightarrow 0.36''$
- 1/8” gauge

(Carpet sample)

Experimental sample

Reference
Simulate carpet wear

- Hexapod tumbler
- 2000 revolution/hour
- Simulate 1 year of carpet wear
• Individual compartment for each carpet
• >75% relative humidity
• HEPA filter to minimize cross contamination
• Incubate up to 60 samples
• 1, 7, and 30 days
Schematic of incubator

- Individual air distribution system
- Redistribution plenum
- Humidified
- Filtered
CUT Out

8”

12”

6”

18”

Experimental sample

Reference

(Carpet sample)
• Dependent variable:
  – Percent mold removed

• Independent variables
  – 3 incubation times
  – 3 cleaning methods

• Sample size
  – 20 replicates per factor level
Cleaning methods

- High-flow hot water extraction
- Hot water with detergent
- Steam
• Water temperature = 45°C
• Flow rate = 3-4 gallons per minutes
• 124” waterlift
• Cleaning speed = 0.07 ft/s
• 4 wet passes, 4 dry passes
Hot water with detergent

- Woolite® consumer brand detergent
- Water temperature = 40°C
- Cleaning speed = 0.10 ft/s
- 4 wet passes, 4 dry passes
• Water temperature = 83°C
• Cleaning speed = 0.07 ft/s
• 4 passes
• Reference versus Clean carpet
  – Paired-sample t-test
• Cleaning methods and Incubation times
  – Analysis of Variance (ANOVA)
• Can mold be significantly reduced after being wetted for 24-hour or more?
  – Yes (p<0.001)

• Is one cleaning method more effective?
  – Steam method is superior to other two methods (p<0.001)
• Steam
  – Environmental friendly
  – Effective method for killing *Cladosporium* spp.
**Study Strengths**

- Large sample size
  - 20 replicates per factor level
- Experimental QA/QC
  - Plate out in triplicates
  - Automatic colonies counter
Limitations & Further studies

- Assumption
  - We did not study pad disposal

- Field trial
- Other mold species & bacteria
- Hurricane Katrina flooding situation
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