Mold in Wood Products:
Fungi

Type
- Molds
- Sapstains
- Decay

Damage
- Stain surface
- Stain Surface and interior
- Destroy wood, may stain
PENICILLIUM
TRICHDERMA
STACHYBOTRYS
Important Genera

- Stachybotrys
- Fusarium
- Penicillium
- Aspergillus
- Chaetomium
- Trichoderma
Mold ID

- Kits easy to distribute
- There is money in it, but..
- Sample collection important
- Does species matter if moisture is the problem?
Mold Species

- 250 to 300,000 species
- 45 species on Douglas-fir sapwood lumber in the first 6 weeks
Risks of Mold and Stain

- Increase wood permeability
- Reduce surface appearance
- Reduce toughness
- Health effects (spores/volatiles/contact)
Effects of Molds

- Allergens (most)
- Human pathogens (few)
- Mycotoxins (few)
Mold Risk Factors

- Fungal species
- Moisture
- Spore load
- Individual sensitivity
STACHYBOTRYS
Factors Affecting Fungal Growth

- Sapwood Content
- Temperature
- Wood Moisture Content
- Time of Year
- Treatments
PORTLAND
Oregon
DECAy
Mold Prevention

- Short log storage
- Sprinkling
- Kiln dry within 48 hrs. of sawing
- Keep wood dry
- Chemical treatments
Anti Stain/Mold Chemicals

- NP-1: 3-iodo-2-propynyl butyl carbamate (IPBC) plus didecyl dimethyl ammonium chloride (DDAC)
- Britewood XL: Propiconazole plus DDAC
- Mycostat P: Propiconazole
- Nex-Gen: Methylene bisthiocyanate plus tetrachloroisophthalonitrile
Chemicals (Cont).

- PQ-8: Copper-8-quinolinolate
- Tuff-Brite: Tetrachloroisopthalonitrile
- Sta-Brite P: IPBC
- Britewood XL: orthophenylphenenate
Performance of Antisapstain Chemicals

Days After Treatment

Degree of Discoloration (%)

- Propi
- Chloro
- Cu-8
- IPBC/DDAC
- Control
Treatment of KD Lumber

- Propiconazole
- Propi/DDAC
- DDAC/IPBC
Post KD Treatment Effectiveness

The bar chart shows the degree of discoloration (%) over time since treatment (months) for different treatment groups:

- **1 mo DF**
- **6 mo DF**
- **1 mo HF**
- **6 mo HF**

**Treatments**:
- Propi/DDAC
- DDAC/IPBC
- None

The chart compares the effectiveness of different treatments over time.
KD Treatment

- Provides short term protection against rewetting
- Protection declines with storage time
- Higher conc. may be useful
Color Removal

- 1-3 % hydrogen peroxide
- 0.3 % NaOH
- 4 % Na-silicate

(Lee, 1994)
Peroxide Effect on Brightness

![Graph showing the effect of peroxide on brightness over exposure time at different temperatures (50 C, 60 C, 70 C)].

- Whiteness Improvement (%) is plotted on the y-axis against Exposure Time (min) on the x-axis.
- Lines represent different temperature conditions: 50 C (red), 60 C (yellow), and 70 C (green).

The graph indicates that higher temperatures (70 C) result in greater whiteness improvement over time compared to lower temperatures (50 C) in the initial stages of exposure.
Peroxide Bleaching

- Costly
- Effect shallow
- Does not kill fungus in wood
Mold Removal

- Power wash
- Bleach
- Biocides
Mold/Stain Removal

- Heavily stained Douglas-fir sapwood
- Boards washed with 0-20 % bleach
- Selected boards treated with Timbor, BoraCare, or DDAC
- Incubated for 4 weeks at 32 C
- Fungal colonization determined
Ability of bleach to reduce fungal discoloration

![Graph showing the effect of bleach concentration on fungal discoloration.](image-url)
Ability of bleach to reduce fungal isolations

![Graph showing the ability of bleach to reduce fungal isolations.](image-url)
Effect of anti-fungal compounds on wood appearance
Ability of boron to prevent *Graphium*
Ability of boron to limit *Trichoderma*

![Graph showing the ability of boron to limit *Trichoderma* under different pretreatment conditions. The graph compares isolation frequency with control, Boracare, Timbor, and DDAC treatments.](chart.png)
Controlling Mold

- Bleach reduces visual effect
- Chemicals do not eliminate fungi
- Moisture control is essential
Future of Mold Problems

- Litigation moves through courts (> $2.4 Billion in 2002)
- Most litigation will fail, but....
- Homeowners will demand mold free materials
- Industry must respond to meet demand
Meeting the Demand

- Improved design to remove moisture from structures
- Development of more breathable materials
- Biocide incorporation in materials
- Moisture resistant materials