Wood Microbiology

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INTRODUCTION

Wood has been a common material used in building construction since humans started building their shelters. Because wood and its products, such as oriented strand board (OSB) and particle board, are natural products, they are naturally susceptible to fungal growth, which causes discoloration of wood products or wood decay. Mold growth and wood decay can occur even in a standing tree. Once a tree is felled, mold growth and wood decay fungi can start establishing themselves almost immediately at cut openings. If bark is removed, the exposed log can be colonized by many molds and fungi over time, including wood decay fungi. However, wood decay is generally a slow process, depending on the wood species, the quality and moisture content of wood, and other factors.

Wood decay evaluation (Code P004) is designed to determine whether wood samples from a wood-structured building have wood decay due to long-term moisture issues and fungal growth. It provides useful information on the presence of wood decay fungi, the confirmation of wood decay and the degree of wood decay. Wood decay evaluation is often overlooked by environmental professionals in their assessment of fungal growth and contamination in a wood-framed building. This analysis can also help an environmental professional to determine whether the building has a recent or long-term moisture problem. Badly decayed wood does not happen over night or over a weekend.

Wood decay evaluation & culturable wood decay fungi and fungal flora (Code P020) provides additional information on the viability of wood decay fungi and the presence of molds, including some soft rot fungi. In decayed wood, many other fungi may inhabit the wood along with wood decay fungi but may be concealed. By including culturing, other fungi in the sample can be recovered and identified. Wood decay fungi may also be recovered for identification, if necessary. The combined results provide more useful information in a forensic investigation.

This technical information document discusses various issues of using this technique during a building evaluation and investigation.

When to sample wood for wood decay evaluation

If wood members of a wood-structured building have been subjected to repeat water damage and showing signs of mold stains and discolorations, serious consideration should be given to taking bulk wood samples for wood decay evaluation. If wood decay has become visible and apparent, take samples to confirm and determine the presence of wood decay, the degree of wood decay and whether wood decay fungi are alive.

How to take wood bulk samples

Collecting wood samples for wood decay evaluation requires a couple of tools: a saw to cut out a piece of selected wood section for testing or a specially equipped drill to cut a wood core. The sampled wood pieces or wood cores are individually bagged for shipping to our lab.

What kind of results do I expect?

For P004, the results are qualitative and descriptive. Structures of wood decay fungi, if present and detected, are described and identified to the extent possible. The type of wood decay, whether white rot, brown rot or soft rot, is identified. The degree or stage of wood decay is noted.

For P020, isolation and culture results are included with the wood decay evaluation results as in P004. All recovered fungi are identified to the genus or species levels. Wood decay fungi may or may not be

identified depending on the availability of fungal structures for proper identification. Most wood decay fungi grow vegetatively in culture.

What do the results mean?

The results include detection and confirmation of wood decay in the wood samples submitted for evaluation. The degree or stage of wood decay indicates the length of time required for that stage of wood decay to develop. The later the stage of wood decay, the longer it takes to develop.

Isolation and culture results provide information on fungal flora in the samples. The results may provide clues as to the viability of wood decay fungi, which can lose viability rather quickly if the wood becomes dry or the food components in wood are exhausted. Some molds, such as *Penicillium* species, are primary colonizers of freshly cut or debarked wood. *Neurospora* species is another group of such fungi that like to grow on freshly cut green logs. *Chrysonilia sitophila* is a teleomorph of *Neurospora* that develops during a later stage of growth. *Ceratocystis, Ophiostoma*, and their anamorphs (asexual states or imperfect states, e.g. *Graphium*, *Sporothrix* or rarely *Chalara*) are commonly known as lumberyard mold and grow on wood subject to beetle infestations in forests or wood contaminated in lumber yards, where spores and inocula of the fungi have accumulated and are abundant. Secondary fungi, such as *Aureobasidium pullulans, Cladosporium, Exophiala, Phialophora,* and many other dematiaceus (dark color) fungi, are common colonizers of green lumber (which has not been properly dried) or wood products that become wet.

Fungal flora growing on wood and wood products evolve with time and moisture. The longer the wood is exposed to excessive moisture, the more diverse fungal taxa are evident. This means the more fungal species or taxa that are isolated and identified from wood samples, the longer the wood samples have been subject to excessive moisture. As previously indicated, the wood decay process is a slow process. A 2"x 4" wood stud of western spruce may take a few years to develop decay in a water-damaged house. The timing may be adjusted and calibrated by reviewing the building history, the history of known water damage, and possibly other information, such as when the initial observation of carpenter ants was made.

For those who are interested in mold on wood or wood decay fungi, please refer to the excellent book chapter, written by Dr. Susan Anagnost, below.

Anagnost, S. E. 2007. Wood in the Built Environment - conditions for mold and decay. pp. 155-178. in "Sampling and analysis of indoor microorganisms." John Wiley & Sons, Hoboken, New Jersey.