# Dysbiosis – A potential novel strategy for control of subterranean termites

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**Abstract**

Although alternative control strategies using biocontrol agents have reduced populations of many pest insects, biocontrol of termites has met with limited success. Termite living conditions - crowded colonies in moist soil- are seemingly ripe for epizootic outbreaks, yet termite colonies rarely succumb to disease. The source of their immunity comes from a multi-tiered defense system involving cellular, physiological, and behavioral mechanisms, the combination of which protect termites at the individual and colony levels. Defeating termite immunity, however, may be possible in light of recent metagenomic discoveries, highlighting the importance of the gut microbiome in disease. In several cases, dysbiosis or microbial imbalance led to the establishment of opportunistic pathogens like *Serratia marcescens,* a gram-negative bacterium found ubiquitously in soil. In this study, termites fed wood treated with a sublethal concentration of chitosan was found to exhibit dysbiosis. Moreover, the change in gut microbial diversity was associated with the establishment of *S. marcescens* along with 13 other species of bacteria that were unique to the group fed chitosan-treated wood. Based on these data, we hypothesize that chitosan or other environmentally safe antimicrobials could be used to weaken the multi-tiered immune system of termites to allow establishment of naturally occurring soil pathogens like *S. marcescens*.

*Keywords: Subterranean termites, dysbiosis, Serratia marcescens, metagenomics, gut microbiome*

# Treatments to Enhance the Resistance of Western Redcedar to Formosan Subterranean Termites

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**Abstract**

The termite resistance of western redcedar heartwood is highly variable. It was hypothesized that dip- and pressure-treatments with DDACarbonate and alkyl amine oxides would reduce variability and increase termite resistance in above ground exposures. An AWPA E26 test was conducted in Maunawili, Hawaii to test this hypothesis. After 42 months of exposure dip- and pressure-treated WRC samples termite attack was minimal, while untreated WRC was moderately degraded. These data suggest that treatment with DDACarbonate and alkyl amine oxides can upgrade the performance of western redcedar used in protected applications in areas with significant termite hazards.

# Antimicrobial Activity of Organic Wood Preservatives against Biodeterioration Fungi: Minimum Inhibitory Concentration (MIC) via Spiral Gradient Endpoint (SGE) test

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**Abstract**

Efficient, reproducible, and sensitive procedures for screening antimicrobial activities of biocides are highly desirable. The goal of this study is to use Spiral Gradient Endpoint (SGE) agar plate test to measure the minimum inhibitory concentrations (MICs) of six organic biocides against wood-degrading fungi. The SGE method enjoys time and material advantages compared with conventional doubling dilution methods in agar or broth. The results compared the efficacy of 3-Iodoprop-2-yn-1-yl butylcarbamate (IPBC), chlorothalonil (CTL), 5-chloro-2-methyl-4-thiazoline-3-ketone and 2-methyl-4-thiazoline-3-ketone (CMIT/MIT), 2-Octyl-2H-isothiazol-3-one (OIT), propiconazole (PPZ), and 4,5-dichloro-2-N-octyl-4-isothiazolin-3-one (DCOIT) against mold fungi (e.g., *Alternaria alternata*, *Aspergillus niger*, *Cladosporium cladosporioides*, *Penicillium citrinum*, and *Trichoderma viride*), sap stain fungus (i.e., *Aureobasidium pullulans* and Ophiostoma pilifera), and various wood decay fungi (including *Coniophora puteana*, *Chaetomium globosum, Gloeophyllum trabeum, Postia placenta,* and *Trametes versicolor*). The findings are in agreement with previous studies, indicating the SGE method is a viable procedure to compare the relative antimicrobial activities between organic wood preservatives in a timely manner.

# Indicating Penetration of Non-Aqueous Solvent with a Surrogate Agent: Hydrophobic Boron Containing Compound

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**Abstract**

Water-soluble boron compounds (such as boric acid, borax, and disodium octaborate tetrahydrate (DOT)) are commonly used as penetration indicators in aqueous wood treating solutions. However, aqueous wood treating solutions are not appropriate for all wood treating applications; typically, aqueous solutions tend to make wood swell and can affect the dimensional stability of the wood products. This study discovered hydrophobic boron containing compounds (borolane or borate ester, and mixtures thereof), which are soluble in solvent-based wood treating solutions and are functional with born indicator. Oil-soluble preservatives, such as pentachlorophenol (PCP), iodopropynyl butyl carbamate (IPBC), propiconazole, and tebuconazole are compatible with the new hydrophobic boron indicator. Further, this new indicator composition is chemically stable and detectable at relatively low ranges of concentration.

# Development of a 3-foot laboratory burning tunnel test for fire retardant wood and wood composites

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**Abstract**

The 24-foot Steiner Tunnel test (UL 723, ASTM 84) is the most common test used to regulate the flammability of structural wood and wood composite building materials in U.S. The Steiner tunnel test requires approximately 4 m2 of product sample, which means that preparing, shipping and testing such large specimens is burdensome and costly. As a result, the 24-foot Steiner Tunnel test is not a cost-effective research and development tool for fire retardant studies. This paper reviews several laboratory methods widely used for fire retardant product screening and quality control including the cone calorimeter test (ASTM E1354), the fire-tube test (ASTM E69) and the 2-foot tunnel test (ASTM D3806). Due to the drawbacks of these methods, a cost-effective 3-foot laboratory tunnel test was developed. Comparative results using the new test procedure are provided. The data demonstrate that the new small-scale test can be a useful precursor to running the UL 723 test.

# ISO 17025 Labs: A Brief Review of Required Testing, AWPA Guidance Appendices, and Certification

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**Abstract**

The purpose of this paper is to outline the rigorous upkeep and operations side of running a Certified and Accredited ISO 17025 Laboratory associated with Wood Products, with a focus on Strength, Durability, and Efficacy testing/screening. We will review our nine year history of testing wood preservatives and prior to Accreditation, operating in an ISO-like manner, including documentation and inter-laboratory round robin participation. Examples are given to show our quality monitoring over the years through AWPA standard tests (e.g., AWPA E1).