Forest Service Scientist Uses X-Rays To Understand Wood-Decay Mechanism

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The innovative use of sophisticated physics technology by a USDA Forest Service biologist has led to fundamental advances in understanding the molecular and chemical processes involved in fungal wood decay, thereby opening the way to the development of new, environmentally preferable methods for protecting wood. The discoveries are considered important because nearly 10 percent of the 300 million tons of trees harvested annually in the United States are used to replace wood products damaged by decay.

In recognition of this and other scientific achievements, Dr. Barbara L. Illman, research plant pathologist at the Forest Service's Forest Products Laboratory, in Madison, Wis., received the 2005 Chief's Honor Award for Distinguished Science. The award was presented in a recent Washington ceremony by Dale Bosworth, chief of the Forest Service, who cited Dr. Illman for her research in "applying solid-state physics techniques to forestry problems, invasive species mitigation research, bioremediation research, and contributions to long-term ecological research programs."

The author of more than 65 research papers, articles and technology transfer publications, she is considered an authority on the application of applying nanotechnology-scale physics equipment and facilities to biological, chemical, environmental and microbial sciences.

Dr. Illman developed techniques for employing high-intensity X-rays to examine the mechanisms of wood decay and of subsequent recycling of

woody biomass. In her research, Dr. Illman exposed samples of wood and fungi to X-rays at the National Synchrotron Light Source at Brookhaven National Laboratory. The resulting discoveries about the biochemical mechanisms of brown-rot fungi, considered the most destructive wood-decay organism, could lead to improved methods for protecting wood.

In addition, Dr. Illman's research team at the Forest Products Laboratory discovered fungal strains that are able to degrade widely used wood preservatives containing toxic metals and organic compounds such as those in chromated copper arsenate (CCA) or pentachlorophenol (penta), thereby permitting wood that has been treated with preservatives to be recycled or disposed of safely. The team has been awarded six patents for using fungi for the bioremediation and recycling of treated wood. Using X-ray analytic techniques, Dr. Illman learned that the metals remaining after remediation were in their least-toxic chemical form.

Dr. Illman's achievements also include measures to control the spread of highly destructive non-native insects, especially in shipping materials. Roughly half of all international trade goods move in wood crates or on wood pallets or spools or involve other wood material, creating a major pathway for the spread of invasive insects.

She led a research effort that developed effective heat-treatment protocols for wood packing materials to stop the spread of the Asian Longhorned beetle and other insects that have wreaked havoc among maple, ash, and other shade trees in cities around the country. Also under her leadership, scientists from FPL and the University of Tennessee developed thermal-treatment protocols for killing invasive insects on a variety of wood species. The protocols played a major role in the preparation and adoption of an international standard for quarantine treatment of wood products that is being implemented worldwide this year.

Source: Forest Products Laboratory