## B10 Botanical Evidence in a Case of Environmental Crime: The Application of Short Tandem Repeat (STR) DNA Markers and Tree Ring Analysis of *Eucalyptus Globulus* Disks

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After attending this presentation, attendees will understand the importance of using botanical evidence in casework.

This presentation will impact the forensic science community by increasing the fundamental understanding of the application of STR DNA markers and tree ring dating analysis as it applies to the discrimination of illegally cut forest timber.

Forensic botany is an emerging discipline that uses plant evidence in matters of law. Botanical evidence is usually found at crime scenes and is sometimes the only available element for criminal investigations. Currently, as supporting evidence, DNA analysis is nearly the only element that can be used as a reliable identification tool, due to the high variability of DNA across all species. One way to identify a distinctive DNA fragment for a species is to study the Polymerase Chain Reaction (PCR) products for microsatellite markers (Simple Sequence Repeats (SSRs), STRs, Simple Sequence Length Polymorphisms (SSLPs), and Variable Number of Tandem Repeats (VNTRs)). DNA regions with short repeat units (usually 2bp-6bp in length) are called STRs. In this case, the application of STR markers enabled the demonstration of the molecular traceability of *Eucalyptus globulus* seizures. On the other hand, dendrochronological techniques require the presence of annual growth rings; new growth in trees occurs in a layer of cells near the bark. A simple method for determining the periodic nature of growth in trees of unknown origin is counting its rings with computer assistance. An Image Analysis System has been specifically designed to look for a precise and efficient way to measure annual tree-ring widths from wood disks, providing an independent tool to confirm the accuracy of dating.

A robbery case in a timber forest was investigated using STR markers and dendrochronological analysis. A truck driver was accused of stealing several *Eucalyptus globulus* logs and transporting them in a truck. The truck was found by the police in a nearby forest that had been illegally logged, and wood disks were collected from the vehicle. Genetic and dendrochronological analyses of wood samples collected from the truck (evidence) were performed and results were compared to those obtained from *Eucalyptus globulus* tree disks collected at the forest (crime scene). Briefly, *Eucalyptus globulus* DNA was extracted from the wood using a commercial kit and quantified with a fluorometer; the genetic profile was obtained using EMCR 9, EMCR 10, and EMCR 11 microsatellite markers. Genetic analysis revealed different profiles for wood collected in the truck and for wood obtained at the forest. At the same time, *Eucalyptus globulus* disks were dried, sanded, and placed face down on the scanner for image acquisition, and software measured the rings in the image by making straight lines with a single mouse click from the center to the bark. A graphic of ring-widths identified by year was displayed during the analysis. Dendrochronology techniques determined a non-match of tree rings when the wood evidence was compared against the wood disks collected at the crime scene. Consequently, *Eucalyptus globulus* logs found in the truck did not come from the illegally logged forest.

This investigation demonstrates the potential for plant microsatellite markers and dendrochronology dating analysis for linking botanical evidence and plants growing at the crime scene. Following this analysis, the arrested truck driver was declared innocent.

**DNA Typing of *Eucalyptus globulus*, Dendrochronology Dating, Botany Forensic**