

Using DNA 'fingerprinting' to understand ancestry and immunity of trees

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American chestnut nuts with burrs and leaves

When Europeans came to the New World in the 16th century, they brought measles and smallpox with them. Without the immunity Europeans had cultivated over the years, the native people in America quickly fell ill. Millions died as a result. Today, trees in the New World are also dying from diseases that were introduced through global trade. However, trees are much more vulnerable than humans.

"The immune system of [trees](#) does not work in the same way as those of humans. Trees must rely, for the most part, on genetic resistance," said Jeanne Romero-Severson, director of the University of Notre Dame's [Tree Genetics Core Facility](#) (TGCF) and professor of biological

sciences. "The trees that best resist the attacks of pests and pathogens live to produce descendants that can do the same. Over millions of years, the trees, pests and pathogens usually reach a balance, where the pests and pathogens only kill the weak or damaged trees."

The sudden introduction of foreign pests and pathogens allows no time for genetic resistance to develop. For example, when chestnut blight was introduced more than 100 years ago, the American chestnut tree did not have the genetic variants to fight off the disease. This tree species is very persistent in its fight for survival, but eventually an infected tree will die.

"The Chinese chestnut tree and chestnut blight evolved together, so a balance was struck. Chinese chestnuts therefore developed [genetic resistance](#)," said Romero-Severson. "Fortunately, the American chestnut and Chinese chestnut can make healthy, fertile hybrid trees."

The American Chestnut Foundation was founded in 1983 to save the American chestnut by crossbreeding the species with Chinese chestnut trees. The foundation is spearheading the cause as its scientists breed chestnut blight-resistant hybrids. The core facility has become an important part of the effort through the development of a DNA "fingerprinting" database for all the chestnut species that people have crossbred with the American and the cultivated European chestnut trees.

"Simplistically speaking, many crossbred chestnuts are resistant to blight, but that does not mean you would plant one just anywhere," said Romero-Severson. "Our lab is creating a DNA fingerprinting database to identify the ancestry of any chestnut tree. The tree's ancestry can tell us where that tree might grow best."

The DNA fingerprint of a tree can reveal its inherited ability to live within certain environments and survive many threats including frost, insect pests and more. Additionally, the American Chestnut Foundation

uses DNA fingerprinting for cultivar identification and pedigree analysis for cultivated chestnut tree growers. Cultivar identification services support local growers in Indiana, Michigan and Ohio, allowing cultivated trees to produce nuts that people can enjoy in the Midwest.

More information: To learn more about the Tree Genetics Core Facility, click here: sites.google.com/a/nd.edu/treedna/

Provided by University of Notre Dame

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