Genome of blue stain fungus evolved to bypass tree defense in mountain pine beetle epidemic

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The genome of the fungus that helps mountain pine beetles infect and kill lodgepole pines has been decoded in a University of British Columbia study.

Also known as blue stain fungus for the stain it leaves in the wood of infected trees, *Grosmannia clavigera* is carried to the host trees by pine beetles and weakens the trees' natural defense system, allowing pine beetles to feed and reproduce in the tree bark. A successful beetle-fungus attack ultimately causes tree death.

Now, researchers from UBC and the BC Cancer Agency's Genome Sciences Centre have conducted a detailed genome analysis and identified genes in *Grosmannia clavigera* that are responsible for the fungus's ability to bypass the lodgepole pine's natural fungicide – and use it as a carbon source for fungal growth.

The study is published this week in the *Proceedings of the National Academy of Sciences*.

"We found that the fungus cannot only survive, but thrive when exposed to the normally fungicidal resin chemicals of pines," says co-author Joerg Bohlmann, a Distinguished University Scholar and professor in the Michael Smith Laboratories at UBC. "In a way, it's like these genes give the fungus the ability to turn poison into nectar."

"Our study helps to clarify how the fungus has evolved to successfully infect lodgepole pine and gives us a better understanding of the intricate chemical interaction between the tree, beetle and fungus," says Bohlmann. "This new knowledge could inform strategies to prevent future outbreaks, such as selecting trees with improved resistance to pine beetles and their associated pathogens."

The current outbreak of mountain pine beetle has destroyed more than 16 million hectares of forest in B.C. – roughly twice the size of New Brunswick or more than 32 million football fields. It has crossed the Rocky Mountains, and is now in the boreal pine forests, moving east. The devastation of large areas of pine forest is anticipated to have major consequences for global carbon balance and sequestration.

Provided by University of British Columbia