

Stirring Up Trouble? Forest Disturbance and the Spread of a Fungal Disease

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Vancouver Island, on Canada’s West Coast, is a hotspot for human infection by the environmental fungus *Cryptococcus gattii* sensu lato (*C. gattii*), with one of the highest incidence rates worldwide.¹ *C. gattii*, which can colonize certain tree species,² can cause cryptococcosis—a severe, sometimes fatal respiratory and neurological illness that primarily affects individuals with healthy immune systems.^{3,4} Previous studies have suggested that environmental factors such as temperature, humidity, and vegetation contribute to the presence of *C. gattii* in certain regions.^{2,5} The contribution of disturbing forest areas, however, has remained unclear.

A study recently published in *Environmental Health Perspectives (EHP)*⁶ examined the relationship between forest disturbance from tree harvesting and the risk of *C. gattii* infection in people on Vancouver Island. The findings suggest that tree harvesting may indeed influence the incidence of this fungal disease. First author Emily Acheson, who was completing her PhD at the University of British Columbia at the time of the research, was intrigued by earlier findings that linked individual tree cutting with increased aerosolization of *C. gattii*

spores.⁷ She wanted to investigate this relationship on a broader scale.

Acheson and her colleagues collected data on *C. gattii* infection cases on Vancouver Island from 1998 to 2014 from the British Columbia Centre for Disease Control. To assess tree harvesting, they incorporated satellite imagery and land-use records from the same period. The team mapped 2.5-km buffer zones around human settlement areas, up to 20 km out, in eastern Vancouver Island. Then they summed the area of annual tree harvests occurring within each buffer zone. The team found a positive correlation between tree harvesting and *C. gattii* incidence rates, corroborating the earlier research.

Karen Bartlett, a professor emeritus in the University of British Columbia’s Occupational and Environmental Health Division, notes the study’s contribution to understanding the connection between land use and infectious diseases. Bartlett served as an advisor for Acheson’s dissertation, upon which the paper is based. She says her own earlier research^{7,8} on *C. gattii* revealed complex ecological factors involved in the spread of cryptococcosis, for



Soil disturbances, including forestry activities like this logging operation on Vancouver Island, may release fungal spores into the environment, potentially affecting people and animals in the region. Image: © iStock.com/Sheila OBrian.

example, the activities of companion animals such as horses, cats, and dogs. These findings point to the importance of cross-disciplinary collaboration in disease prevention and mitigation, as well as other proactive efforts, says Bartlett. She suggests training public health workers to anticipate and address emerging infectious disease risks, as well as training scientists and medical practitioners to better understand environmental influences on the dynamics of cryptococcosis.

Sarah Kidd, head of SA Pathology's National Mycology Reference Centre in Adelaide, Australia, explains that tree harvesting and other forest disturbances may lead to aerosolization of wood particles, soil, and microorganisms—including *C. gattii*. In turn, aerosolization of microbes can promote their spread to new areas and initiate infections when inhaled by humans and other animals. Kidd, who as a postdoctoral researcher studied *C. gattii* emergence on Vancouver Island,⁹ cites historical evidence among forestry workers¹⁰ and others^{11–13} showing that soil disturbances can cause fungal infections. “*C. gattii* has also been shown to be present in air samples, soil, fresh water, and sea water, and on shoes and car tires, where it has potential for further spread,” she says.

Notably, Kidd's work⁹ found that native tree species such as Douglas fir and alder were susceptible to *C. gattii* colonization. In addition to plentiful hosts, climate change and the prevalence of a strain tolerant of temperate climates, called VGIIa,⁹ may both contribute to the high incidence of *C. gattii* infections on Vancouver Island.^{14,15} Kidd highlights the need for risk assessment and mitigation strategies in forestry practices to protect workers and communities. Forestry workers, for example, could wear respirators during certain activities. Bartlett cautions, however, that unlike other outbreaks, on Vancouver Island those affected were older individuals (but not classically immunocompromised), rather than forest workers.¹⁶ “Mitigation depends on observing the facts of an outbreak and the environmental factors that may lead to an increased population risk in a changing climate,” she says.

To better understand the mechanisms underlying the relationship between forest disturbance and *C. gattii* infection risk, Acheson suggests that future research should investigate the potential combined effects of environmental factors, such as temperature, and tree harvesting on the risk of *C. gattii* infections. In addition, she calls for long-term monitoring of both tree harvesting and *C. gattii* infection rates to assess the persistence and magnitude of this association over time. Acheson hopes to expand the team's work into studies of other fungal pathogens, such as *Blastomyces*, a fungus found largely in the Midwestern, South Central, and Southeastern United States.¹⁷ She notes that fieldwork to supplement remote sensing and geographic information systems work will allow for a more comprehensive understanding of the ecology of these fungi and of possible control measures to reduce the burden of cryptococcosis.

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