RECENT RESEARCH ACTIVITIES

Extracellular glycolipids and glucans secreted by a selective lignin-degrading fungus, *Ceriporiopsis subvermispora*

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A white-rot fungus, *Ceriporiopsis subvermispora*, known to be a selective lignin-degrading fungus, decomposes lignin and hemicelluloses in wood prior to the decomposition of cellulose. Because of its potential applicability and usefulness of selective lignin degradation in the industry, understanding the mechanism of selective ligninolysis has been studied. However, fundamental knowledge, especially the role of secondary metabolites and extracellular glucans in wood decay, is still insufficient to unveil this unique wood degradation mechanism. Secondary metabolites secreted by wood rot fungi play varied roles such as transport of wood biomass components, redox reactions of metal ions for wood degradation, and defense and symbiotic signals in the microbial community. In particular, the roles of extracellular secondary metabolites in selective white-rot fungus are key for selective ligninolsis at a site far from the hyphae and extracellular enzymes. Extracellular glucans, mucilaginous surroundings of hypha called "sheath", are produced by wood-rot fungi and play multiple roles in the lignolysis. Here, we focus on extracellular glycolipids and glucans and report secretion and chemical structure of them (Figure 1).

Cerebrosides are a kind of sphingolipids and composed of hexose and a ceramide (*N*-acylsphingosine) moiety. These compounds are known as strong amphipathic substances and potential signal molecules in the microbial community. First, we isolated cerebroside from *C. subvermispora*. *C. subvermispora* was incubated for 2-4 weeks in three different types of culture media: wood, basal liquid, and stable-isotope labeled with ^{13}C- and ^{15}N- medium. Next, we determined the chemical structure of cerebrosides. The structure was analyzed by LC-ESI-MS, GC-EI-MS, and NMR experiments in combination with stable-isotope labeled information. As results, we report three glucocerebrosides, isolated from a white-rot fungus, *Ceriporiopsis subvermispora*. The structural differences originate from the sphingoid moiety having (8*E*)- or (8*Z*)-double bonds and methyl branches at the olefinic C-9 carbon atom. We found an accumulation of cerebrosides in the sheath and a different expressed pattern of cerebroside in a wood-degrading medium and a liquid medium.[1]

We analyzed the structure of the sheath of *C. subvermispora* by transmission electron microscope, NMR followed by stable-isotope labeling and methylation analysis. We conclude that the sheath polysaccharide is composed of comb-like β-1,3 glucan branching glucopyranosyl residues at *O*-6 positions.[2] Further studies are needed to understand biological activities and the metabolism of cerebrosides and the sheath.

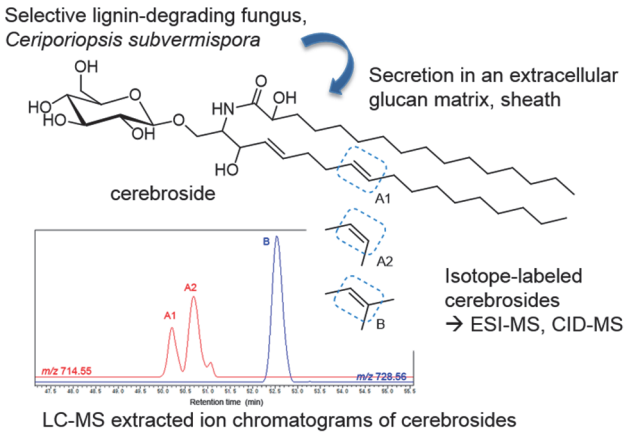

Figure 1. Extracellular metabolites, cerebrosides secrete in the sheath of *C. subvermispora.* (Outline)

Acknowledgements

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References

[1] Nishimura, H., D. Yamaguchi, and T. Watanabe, "Cerebrosides, extracellular glycolipids secreted by the selective lignin-degrading fungus *Ceriporiopsis subvermispora*", *Chem. Phys. Lipids*, 203, 1-11, 2017.

[2] Suzuki, D., H. Nishimura, K. Yoshioka, R. Kaida, T. Hayashi, K. Takabe, and T. Watanabe, "Structural characterization of highly branched glucan sheath from *Ceriporiopsis subvermispora*", *Int. J Biol. Macromol.* 95, 1210-1215, 2017.