25 May 2018

**Optimized lignin analytics to improve biomass conversion efforts**

Rebuilt and fully optimized technique results in a robust method for lignin structural analysis

**The Science**

As plant breeding programs embrace the idea of the biorefinery, lignin is emerging as a potential feedstock for commodity chemicals. To improve our understanding of lignin’s chemical structure and find potential bioproducts in lignin, GLBRC researchers developed a powerful analytical method to identify new and low-abundance compounds within the complex lignin biopolymer.

**The Impact**

GLBRC researchers developed a method that would more fully and accurately describe the chemical makeup of the lignin biopolymer. This improved method of structural analysis will guide future biomass conversion efforts and help advance lignin’s potential as a renewable source of aromatics.

**Summary**

As interest in biomass utilization has grown so too has interest in manipulating lignin biosynthesis, suggesting that more robust lignin analytical methods are needed. As the derivatization followed by reductive cleavage (DFRC) method is particularly effective for structurally characterizing natively acylated lignins, we used an array of synthetic β-ether γ-acylated model compounds to determine theoretical yields for all monolignol conjugates currently known to exist in lignin, and we synthesized a new set of deuterated analogs as internal standards for quantification via GC-MS/MS. Yields of the saturated ester conjugates ranged from 40% to 90%, and NMR analysis revealed the presence of residual unsaturated conjugates in yields of 20% to 35%. In contrast to traditional selected-ion-monitoring, we demonstrated the superior sensitivity and accuracy of multiple-reaction-monitoring detection methods, and further highlighted the inadequacy of traditional standards relative to isotopically labeled analogs.

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**Funding**This research was partially funded by the DOE Great Lakes Bioenergy Research Center (DOE BER Office of Science DE-FC02-07ER64494 and DE-SC0018409), and by Stanford’s Global Climate and Energy Program (GCEP).

**Publications**

Regner, M. *et al.* “Reductive cleavage method for quantitation of monolignols and low-abundance monolignol conjugates.” *ChemSusChem* **11(10)**, 1600-1605 (2018) [DOI: 10.1002/cssc.201800617].

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