

Towards specific description of autohydrolyzed lignin's chemical structures

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Biomass-to-Biochemicals and Biomaterials (BtB²)

Industrial Consortium Biorefinery Process

Pre-competitive unit operations

Technically feasible (biorefinery co-location)

Middle-intensity
autohydrolysis

1.

Mechanical
refining

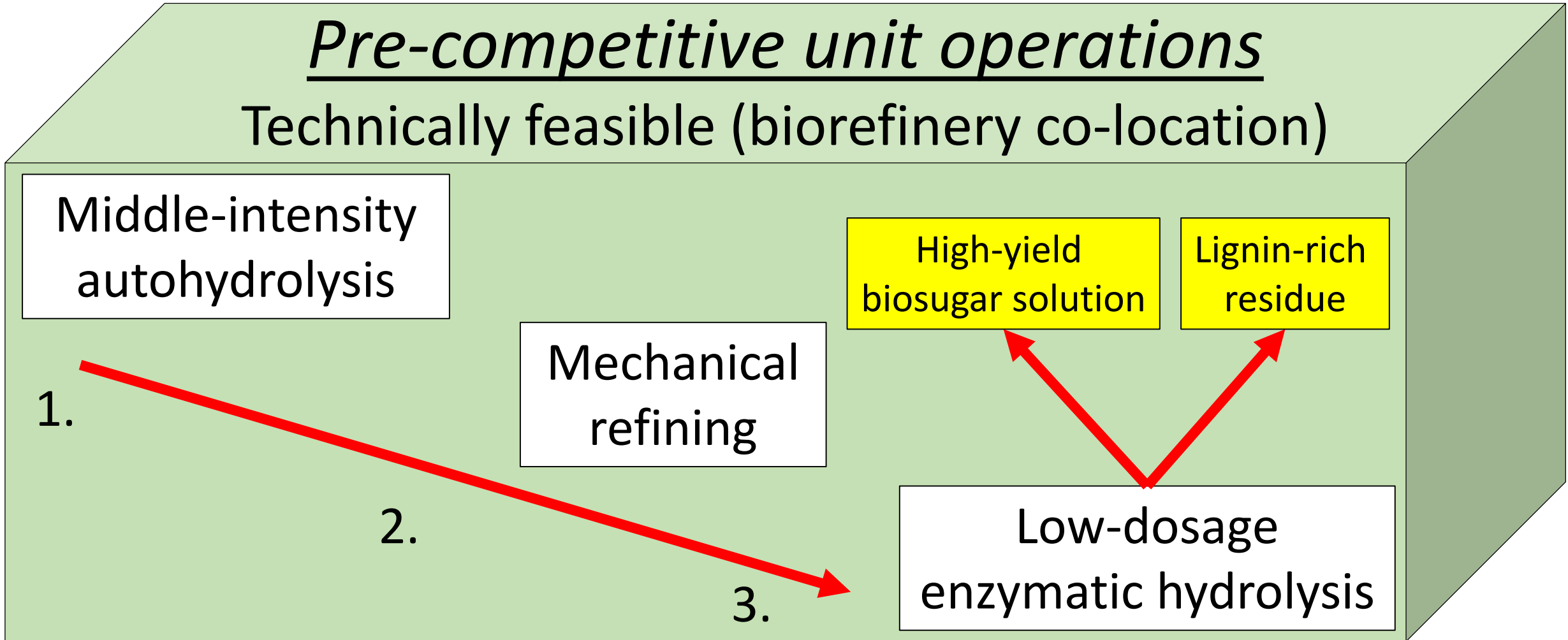
2.

High-yield
biosugar solution

Lignin-rich
residue

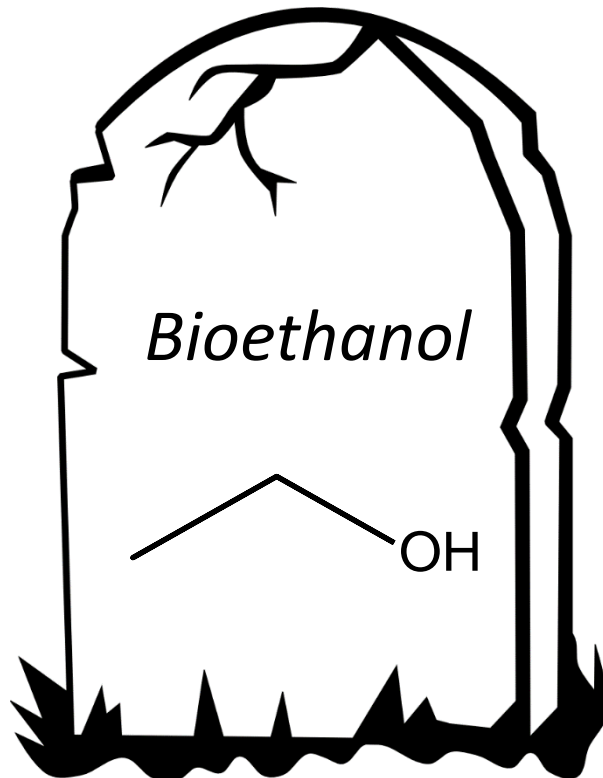
Low-dosage
enzymatic hydrolysis

3.



ECONOMICALLY FEASIBLE?

SUGARS



LIGNIN'S POTENTIAL VALORIZATION APPLICATIONS

- Wood adhesives
- Foams
- High-value chemicals
- Carbon fibers
- Fuel additives
- Paper sizing agents
- Battery additives
- Greases
- Dispersants
- Agricultural aids
- Concrete & cement
- Dust control agents
- Asphalt
- Antioxidants

Red = Active projects @ NCSU

RESEARCH CONTRIBUTION



NOVEL
AND
PROFITABLE
LIGNIN
APPLICATIONS



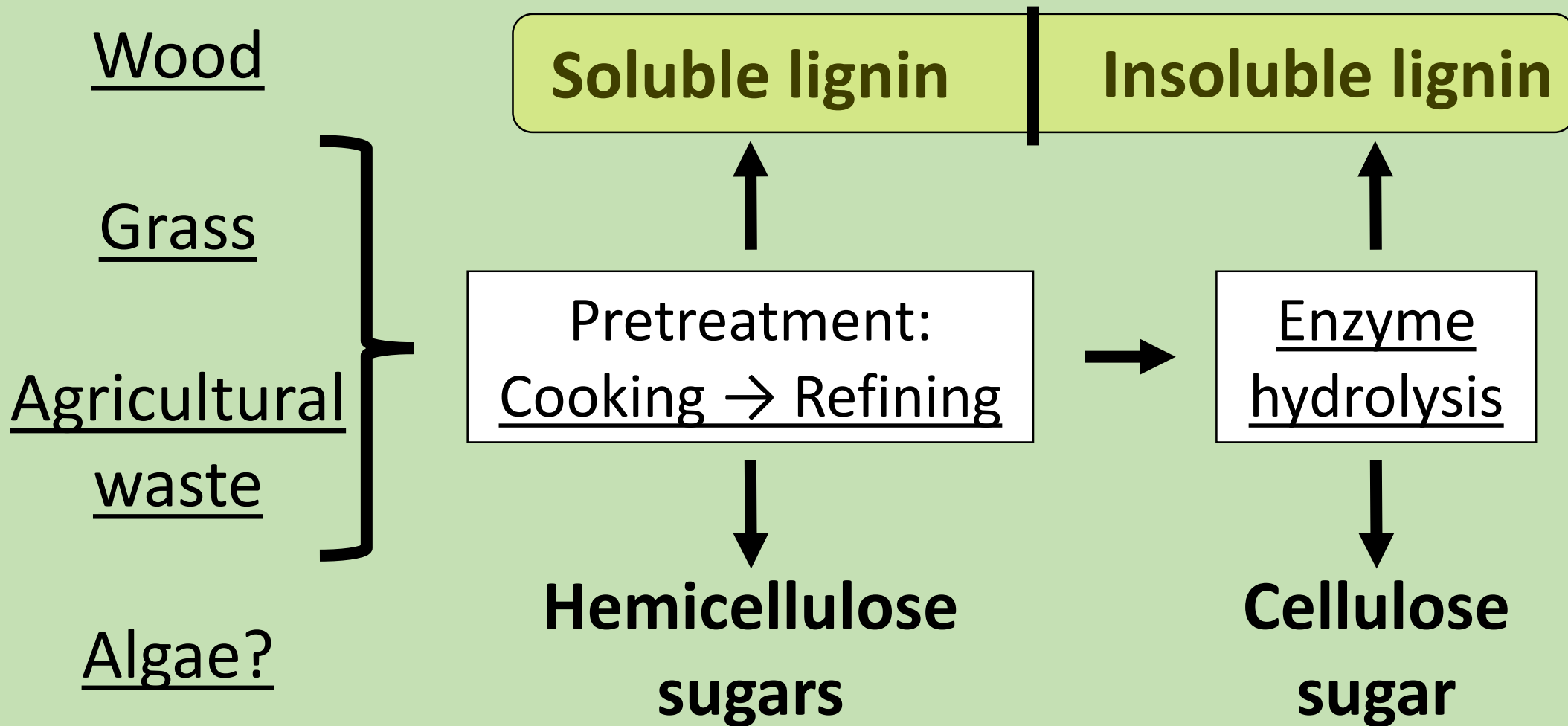
WHAT DOES THE LIGNIN “*LOOK LIKE*”?

Characterization targets

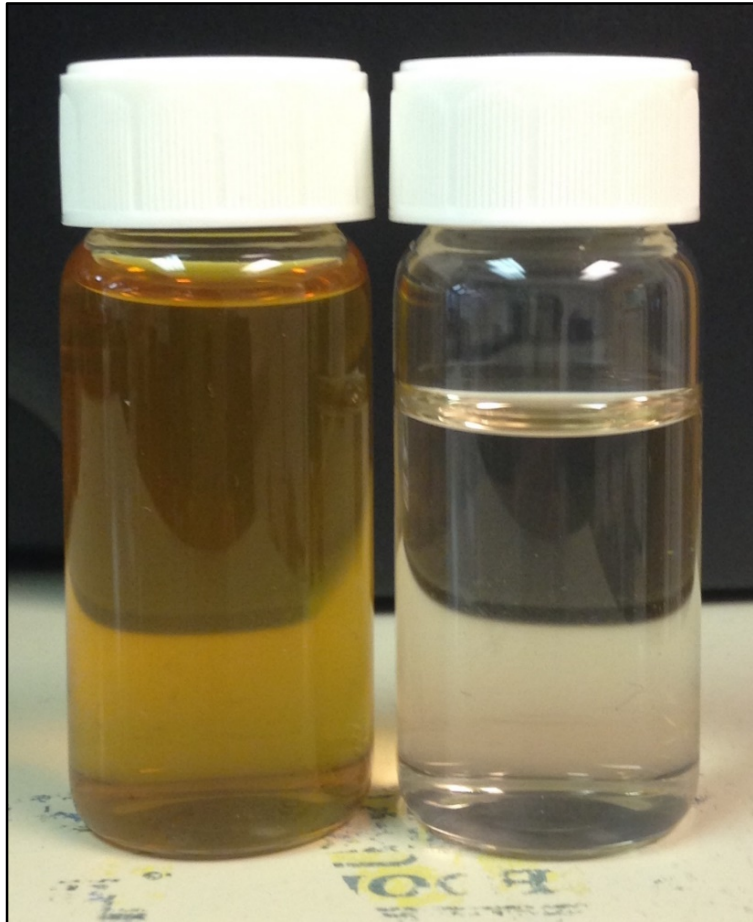
1. Lignin isolate “extractability”
2. Approximate molecular weights
3. Hydroxyl quantification and distribution
4. Inter-lignin structural quantification and distribution

Forest Biomaterials

Industrial Biorefinery Process



WATER-SOLUBLE LIGNIN

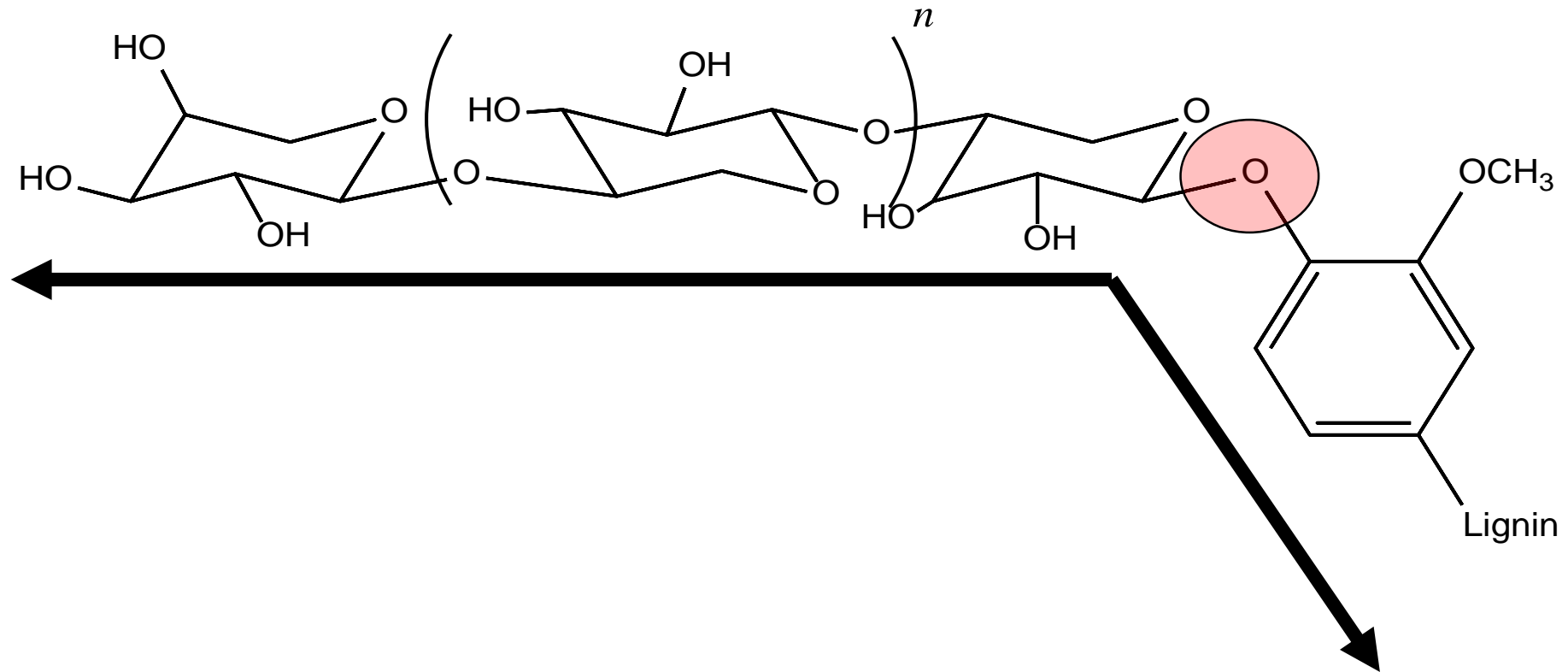


Novel process:
*Solvent-free
removal of soluble
lignin to preserve
hemicellulosic-
sugar solution*

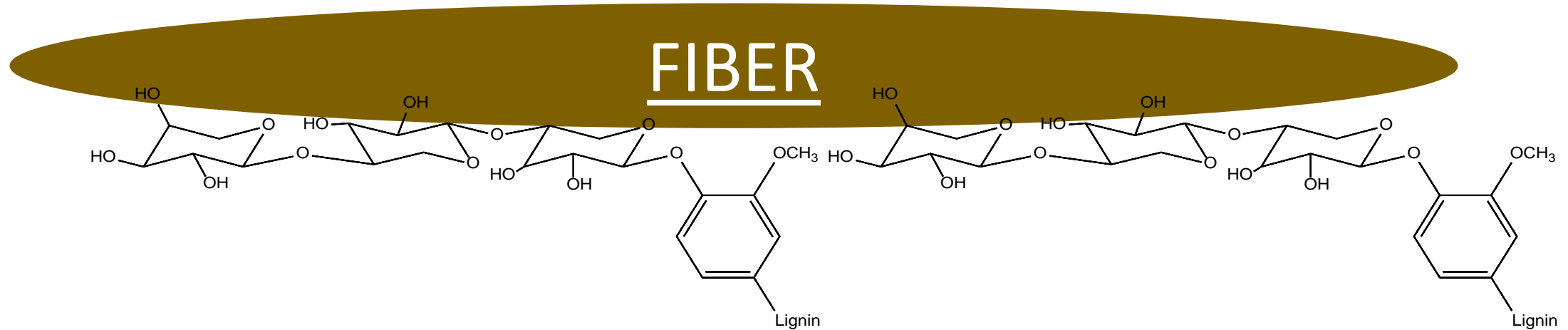
Left: Red maple autohydrolyzate

Right: After soluble lignin removal

AMBERLITE® XAD LIGNIN: THE NEW FRONTIER



FUNDAMENTAL APPLICATION FOR BIOREFINERY SOLUBLE LIGNINS



Opportunity:

Deliver lignin properties directly
to the surface of a fiber

Properties imparted

- Color (UV-absorbance)
- Hydrophobicity
- Antimicrobial

*See you at my
poster!*

Funding Acknowledgements:

USDA NIFA National Needs Fellowship

NCSU BtB² Industrial Consortium

NSF Grant 1604019



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