

Visualization of significant alteration of *Populus* biomass by *C. bescii*

Background

- *Caldicellulosiruptor bescii* is an anaerobic, thermophilic bacterium capable of growing on raw biomass and breaking down cellulose and hemicellulose into simple sugars.
- Morphological or chemical changes to the lignocellulosic biomass resulting from incubation with *C. bescii* has not been studied, especially at experimental time lengths beyond 24 h.

Approach

- *Populus* cross-sections were incubated with *C. bescii* for 0, 72, and 288 h and imaged with SEM and ToF-SIMS.

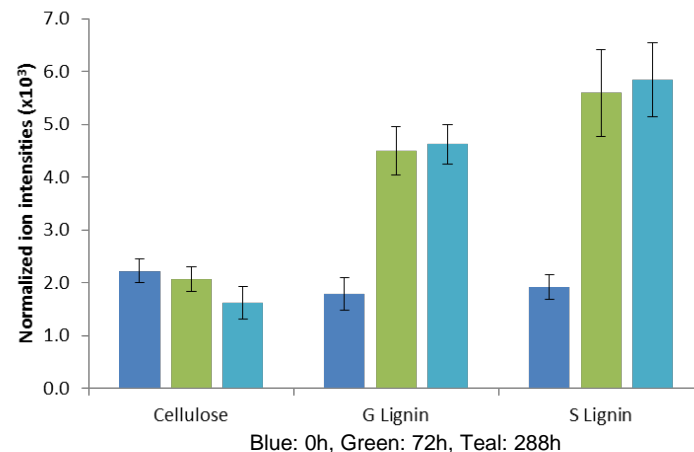
Outcome

- After 72 h incubation with *C. bescii*, syringyl and guaiacyl lignin increased by 190% and 150%.
- Polysaccharide peak fraction dropped 25% after 72 h and 27% by 288 h following incubation with *C. bescii*.
- *C. bescii* cell growth on *Populus* was biphasic and the micro-organism was shown to create crevices in the cell wall.

Significance

- *C. bescii* is targeting surface cellulose and hemicellulose, but the increase of surface lignin could be inhibiting further sugar access.
- The biphasic cell growth is attributed to the degradation of easily accessible sugars follows by the utilization of more insoluble polysaccharides.

Populus cross-sections incubated with *C. bescii*



SEM image of *C. bescii* (blue circles) attached to cellulose walls at 48 h

