ABPDU

Advanced Biofuels *(and Bio-products)* Process Demonstration Unit

with:

FATER S.p.A.

BIO World Congress on Industrial Biotechnology

July 22, 2015

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The FATER – ABPDU partnership

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Berkeley Lab's ABPDU has been developing and validating an integrated waste-to-energy process under a DOE work-for-others (WFO) agreement with FATER, an Italian JV between Procter & Gamble and the Angelini Industrial Group.

Key outcomes indicate that post-consumer absorbent hygiene products (AHP) can be readily and economically converted -- without using harsh or expensive pretreatment routes -- to fermentable sugar intermediates as well as biofuel and bio-based chemical products.

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FATER Corporate Summary

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Founded in 1958 by Angelini
Since 1992, a joint-venture of Procter & Gamble and Angelini

- Italian market leader for Hygiene products:

Pampers LINES LINIDOR TAMPAX DIGNITY

- CEEMEA market key player for hard surface cleaning:

ACE comet

- 1,110 employees
- 1,000 related employees
- Turnover: € 1,150 million
- 4,563,900,882 product units sold per year
- 3.5 mil € per year in consumer research
- 4 facilities:
  - Pescara (Italy)
  - Campochiaro (Italy)
  - Porto (Portugal)
  - Mohammidia (Morocco)

Key FATER products and EU recycling issues

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"In 2010, total waste production in the EU amounted to 2.5 billion tons. From this total only a limited (albeit increasing) share (36%) was recycled, with the rest was landfilled or burned, of which some 600 million tons could be recycled or reused."

Pampers

LINIDOR

DIGNITY

The 7th Environment Action Programme sets the following priority objectives for waste policy in the EU:

- To reduce the amount of waste generated;
- To maximize recycling and re-use;
- To limit incineration to non-recyclable materials;
- To phase out landfilling to non-recyclable and non-recoverable waste;
- To ensure full implementation of the waste policy targets in all Member States.

A significant volume and product development opportunity…

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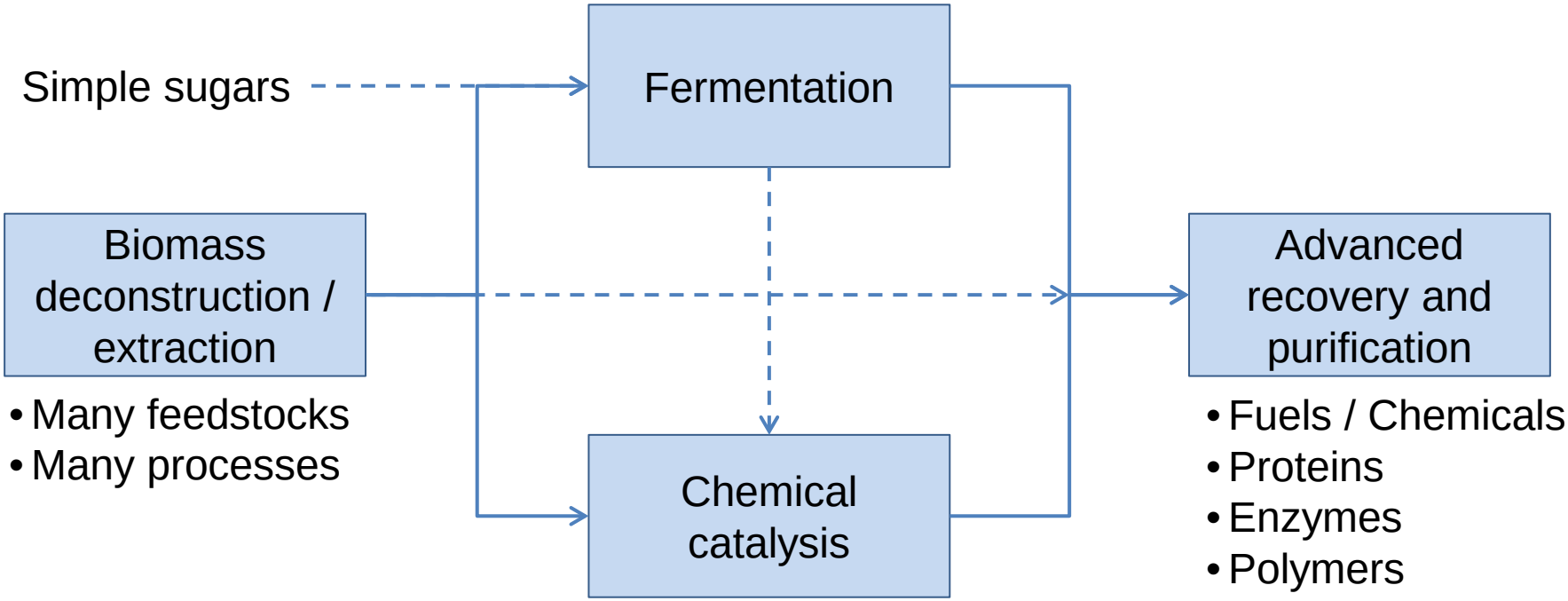
ABPDU's Mission

Partner with researchers from industry, the National Labs, and academia to optimize and scale technologies for bio-based chemicals / materials / fuels commercialization.

- Established by American Recovery and Reinvestment Act funds in 2009 – roughly $17 million invested in the 15,000 square foot bench-to-pilot demonstration Lab
- Managed by US DOE's Bioenergy Technologies Office / EERE

ABPDU technical capabilities

- Process demonstration, integration and techno-economic analysis across varied bio-process configurations, feedstocks and products



- Can focus on individual unit operations or several processes in succession

Facility at a glance – from lab-to-pilot scale

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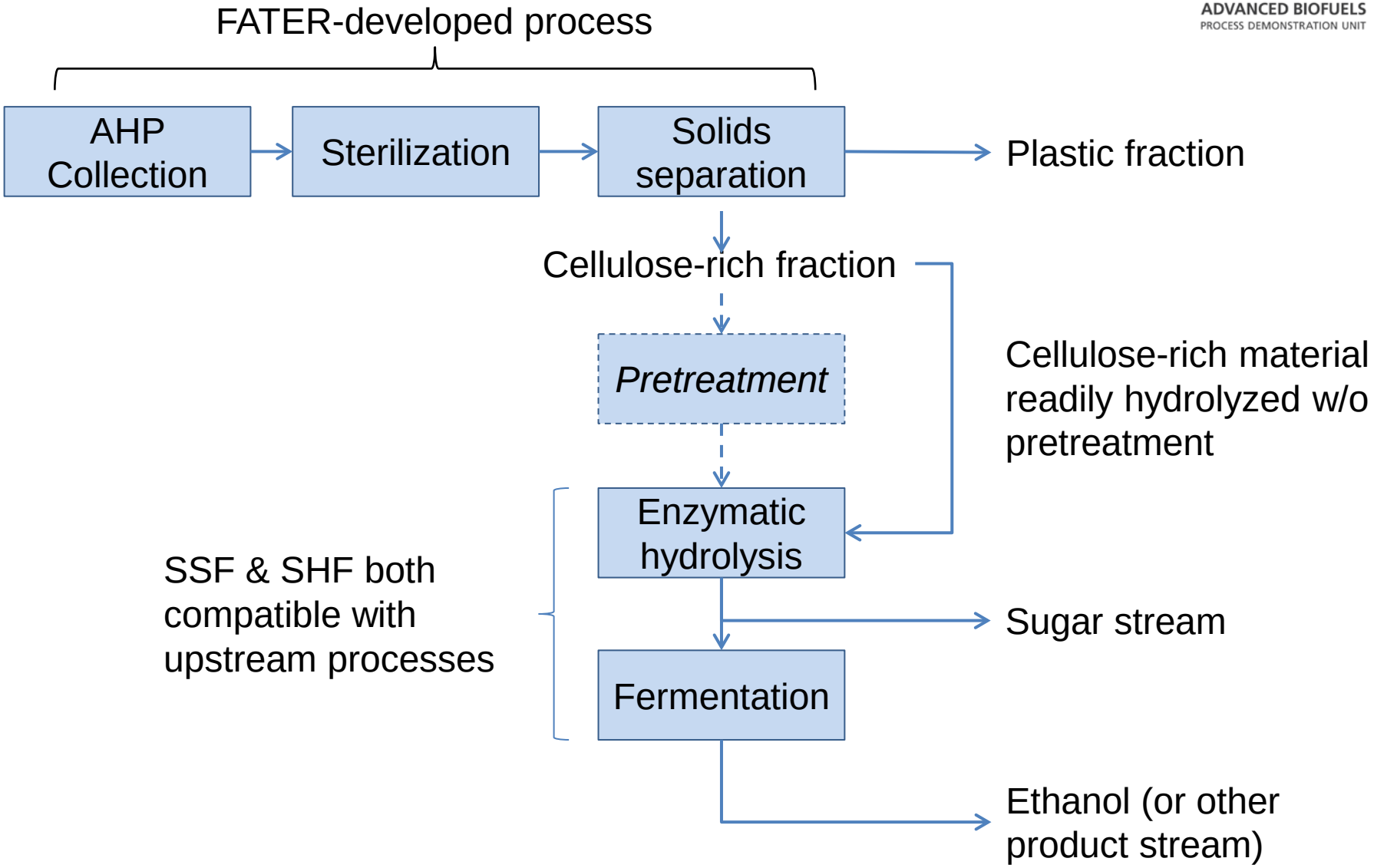
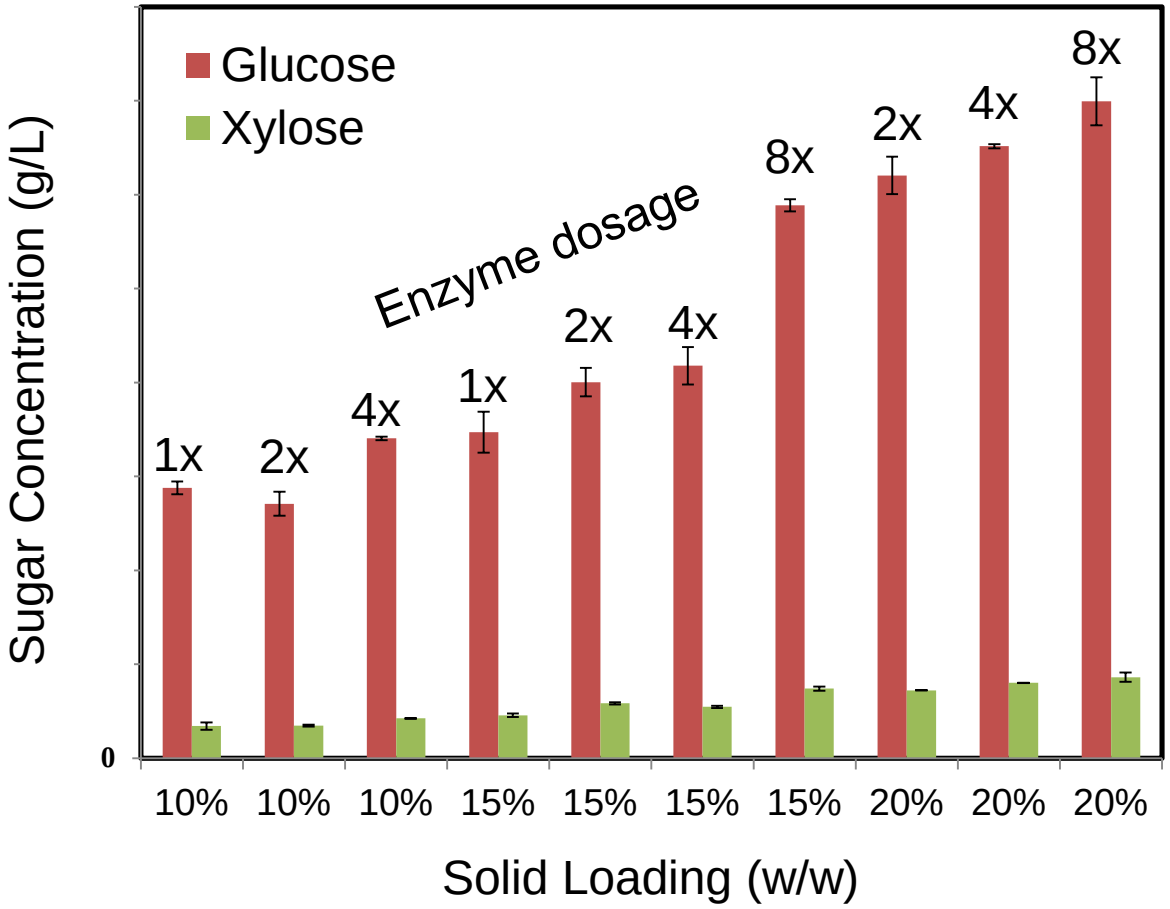
Process development and TEA framework



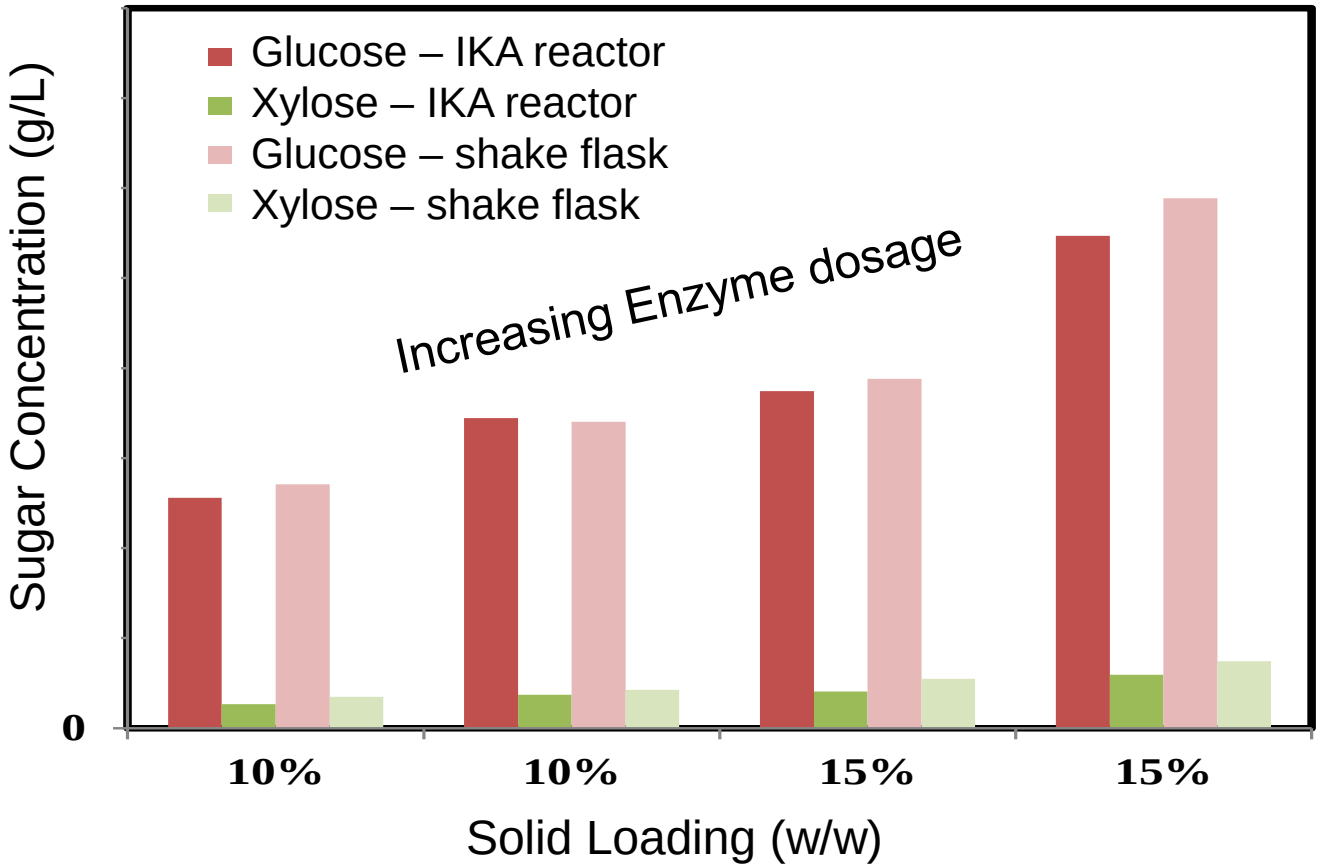
Lab-scale hydrolysis process optimization



Bench-scale enzymatic saccharification

Efficient mixing key to reproducible, scalable hydrolysis of mock and actual AHP materials

Optimized hydrolysis performance at bench scale



Bench-scale fermentation validation

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Mock & post-consumer AHP material performance

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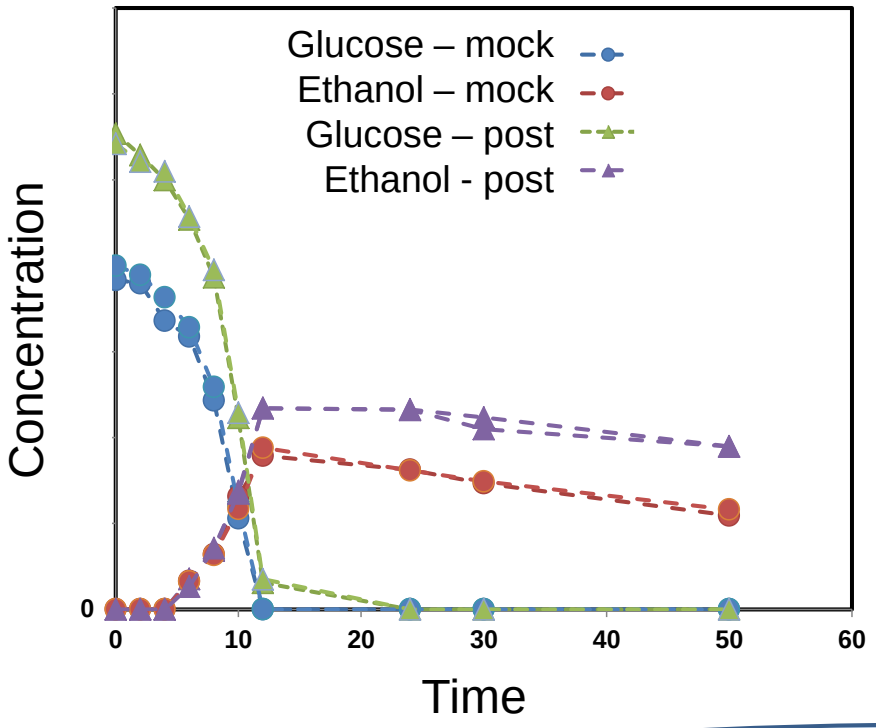
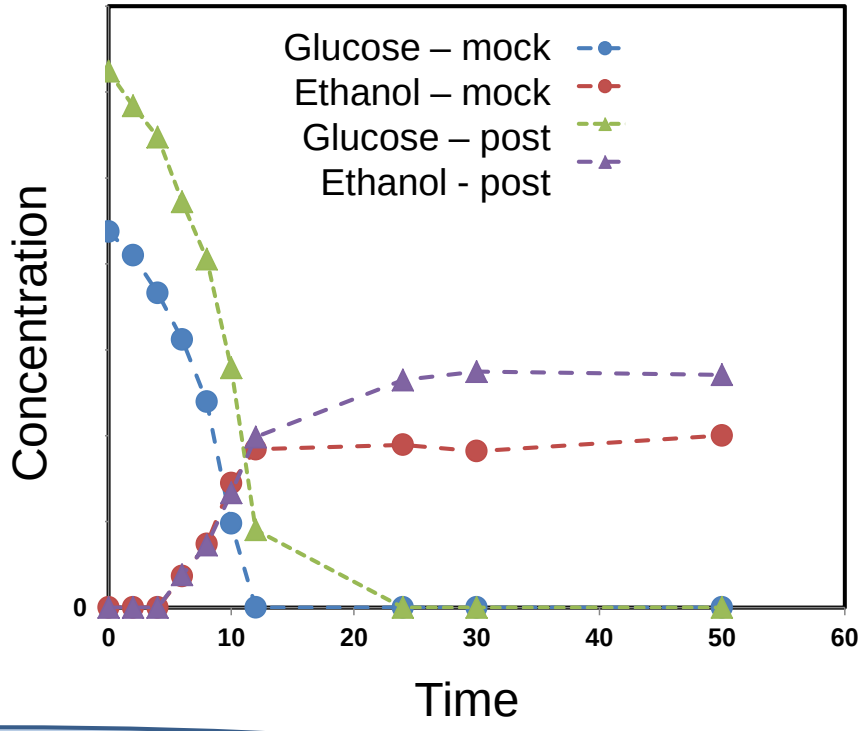
Shake-flask fermentation



Bench-scale bioreactor fermentation



AHP-derived sugars readily fermented with no apparent toxicity in either SHF or SSF production modes.

Potential commercialization routes

- Pretreated sugar intermediate
  - Distributed, relatively small scale production of enzyme-compatible cellulose-rich material (sugar intermediate) for integration with cellulosic ethanol or chemical producers
- Sugar product
  - Production of sugar monomers and packaging / distribution to users in traditional first-gen starch- and sugar-based fermentation manufacturers

Thank You

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