MACROALGAE BIOREFINERY DEVELOPMENT WITH MICROBIAL COMMUNITY ADAPTATION

Lieve Laurens*[1], Robert Nelson[2], and Eric Allen[3]

[1]National Renewable Energy Laboratory, Golden, CO – États-Unis
[2]National Renewable Energy Laboratory, Golden, CO – États-Unis
[3]Scripps Institution of Oceanography, La Jolla, CA – États-Unis

Résumé

Seaweeds or macroalgae are attractive candidates for carbon capture, while also supplying a sustainable photosynthetic bioenergy feedstock, thanks to their cultivation promise in offshore marine farms. Seaweed cultivation requires minimal external nutrient requirements and allows for year-round production of biomass. Despite this potential, there remain significant challenges associated with realizing the large-scale, sustainable marine agronomics, as well as in the development of an efficient biomass deconstruction and conversion platform to fuels and products. Recent biotechnology progress in the identification of enzymatic deconstruction pathways tailored to complex polymers in seaweeds opens opportunities for more complete utilization of seaweed biomass components. Effective, scalable and economically viable conversion processes tailored to seaweed are discussed and gaps are identified for yield and efficiency improvements. We demonstrate here for the first time an *in vivo* to *in vitro* transition of fish gut microbiome, through batch experiments to determine metabolic activity from gut inocula and macroalgae homogenates or reference media. We report the metabolic activity at 10 ml vessel scale, with 2-4 mL inoculum, derived from wild Kyphosid gut samples for gas production, composition, short chain fatty acid metabolism, other metabolites, demonstrated effective carbon conversion to known and unknown product. Batch monitoring of metagenomic time-series sequencing of the microbial communities showed the respective microbiome transition over multiple passages of the inoculum.(*1*, *2*) The microbiome and evolution of batch fermentation reactors indicated a consistent adaptation of the microbiome to the seaweed feedstocks.

Mots-Clés: microbiome, polysaccharides, economics, metabolic activity

*Intervenant