

Growth of *E. coli* strains on tagatose and its association with Inflammatory bowel disease

Contact: Xin Fang xif033@ucsd.edu

Background

The gut microbiome of inflammatory bowel disease (IBD) is shown to be dysbiotic with lower bacteria diversity. In particular, the abundance of *E. coli* is elevated in IBD patients, and literature has shown that *E. coli* strains from phylogroup B2 and D are enriched in patients. A previous study suggest that B2 strains have additional enzymes (tagatose biphosphate aldolase) that may give them advantage in utilizing mucus glycan or food additives (tagatose) to outcompete other other microbes and thrive in the intestine. In this project, we want to evaluate if the usage of sweetener tagatose is associated with the overgrowth of B2 *E. coli* strains and growing IBD patients population.

Specific aims

There are 3 specific aims for this project:

- Since no known tagatose transporter has been annotated for *E. coli* genomes, first we need to verify if *E. coli* could import tagatose and directly utilize it as a nutrient source.
- If growth is possible on tagatose, identify differences in growth pattern across *E. coli* strains from different phylogroups - do we observe differences in growth rate between strains that is consistent with our prediction?
- Grow multiple strains on tagatose together - how does the growth pattern change when grown in a community? Do B2 strains outcompete other strains?

Procedures

1. Identify *E. coli* strains from different phylogroups to work with in the lab
2. Order tagatose if it is not already available in the lab.
3. Grow all strain separately on M9 minimal media and use tagatose instead of glucose as the carbon source
 - a. If no growth is observed on tagatose, we could potentially try growing them on the ALE machine
4. Compare the growth pattern on tagatose across strains from different phylogroups
5. Grow multiple *E. coli* strains on tagatose together, and observe their growth patterns in the *E. coli* community.

Future perspective

If we do observe certain strains with growth advantage on tagatose as we predicted, we can consider introducing these strains to mouse model and feed them with diet with tagatose, and further test the association with IBD progression.