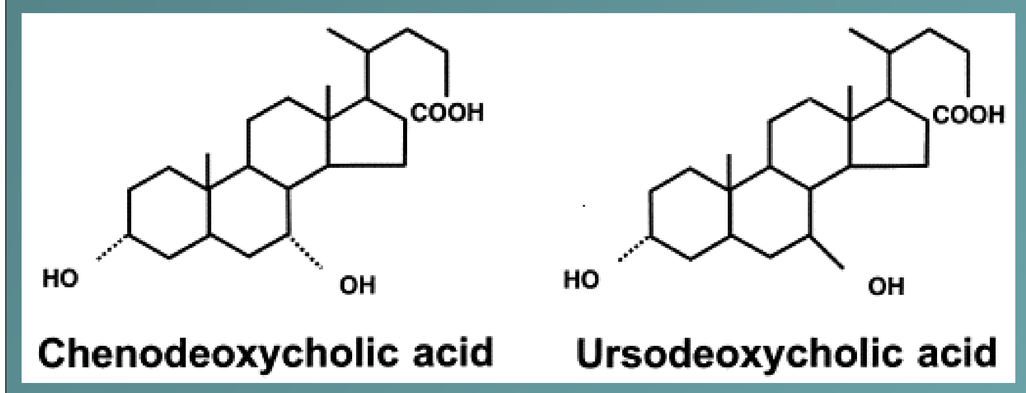
Cheno vs Urso Deoxycholic Acid

Daniel Oxman
College Park Scholars – Science & Global Change Program
Chemical and Biomolecular Engineering
doxman@umd.edu
College Park Scholars Academic Showcase, April 30, 2021

Introduction

For my project, I worked with the Complex Fluids Lab here at UMD to test the different properties of two enantiomeric bile salts. These molecules play a huge role in ensuring the proper function of our livers. The two molecules I worked with, Chenodeoxycholic acid and Ursodeoxycholic acid are the exact same, except the orientation of one functional group, which gives rise to very different properties.



These are the molecular structures of both Cheno and Urso. Notice how similar they are? The only difference is the one OH group in the bottom right.

Here's a picture of me with an osmometer, a machine that measures the number of particles per kilogram of solvent. The two bile acids are almost the exact same, but Urso has a much lower osmolarity, meaning it self-assembles into smaller structures!

Site Information:

Name of Site: UMD Complex Fluids Lab

Your supervisor: Faraz Burni

The site mission: To investigate properties of gels, self-assembling polymers, and other complex fluids

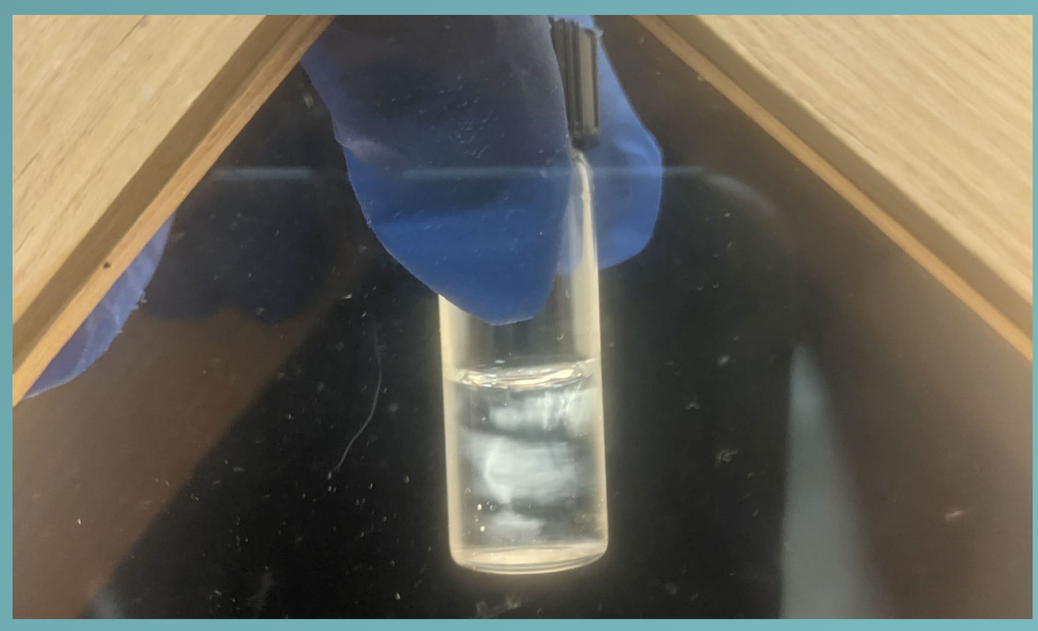
The particular goals of the site you were at: Investigate the chemical differences between bile salts

Activities:

One of my main jobs was to make solutions of the bile salts and use them to measure osmolarity data, and also to see what they did over time. I also designed experimental set-ups to find new qualitative ways to test for differences between the molecules.

Impact:

These bile salts are used in the treatment of cholestasis, a condition in which bile in the liver stops flowing. Our hypothesis was that Urso acts as a more effective supplement because it can form more particles per mole of solute, meaning it can increase the osmotic pressure in the bile ducts more easily and serves as a better treatment for cholestasis. Through these experiments, we sought to answer that question.



One cool property of Urso is that when left out, it self–assembles into a viscous gel, and when exposed to polarized light seems to glow due to a phenomenon known as birefringence. It has to do with the non-uniform structure of the gel, how cool is that?!

Here I am with an experiment I designed. If the solution inside the tube has solute in it, we should see water flow through the semipermeable membrane and raise the water level. This took me FOREVER to finally set up!

Check out my testimonial video here!

Acknowledgments:

A huge thanks to Dr. Srinivasa R. Raghavan, Faraz Burni, Dr. Holtz, Dr. Merck, and everyone else that has helped me in my SGC journey. Climate change is freaking real!