

## NANO-BME Seminar

**Time: 4:00PM Thursday, Mar 3**

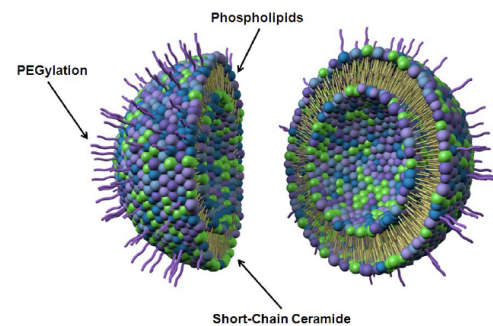
**Location: EP253 and <https://sdsmt.zoom.us/j/94046899625>**

### Spingolipid-Based Nanotherapeutics for the Treatment of Cancer

Brian Barth, Ph.D.

Chemistry, Biology and Health Sciences  
South Dakota Mines

**Abstract:** Spingolipids are a major classification of lipid that have gained interest for their roles in cell death and proliferation. Ceramide is a prominent spingolipid linked to cell death and which lies at a central crossroads of spingolipid metabolism. The processes governing its generation and metabolism, especially to pro-survival metabolites, are often dysfunctional in cancer. Notably, novel classes of therapeutics seek to augment cellular ceramide levels and can be broadly defined within a category of spingolipid-based therapeutics. The effectiveness, or lack thereof, for spingolipid-based therapeutics is closely tied to spingolipid metabolism. One such therapeutic that we have helped to develop is the ceramide nanoliposome, which delivers the C6-ceramide analog that can be readily incorporated within the ceramide metabolic network. The ceramide nanoliposome has recently completed a phase I clinical trial for solid tumor malignancies, with an additional phase I clinical trial for acute myeloid leukemia to commence soon (ClinicalTrials.gov identifiers: NCT02834611 and NCT04716452). In addition, we have helped to develop calcium phosphosilicate nanoparticles (CPSNPs) as a nanodelivery system that can deliver chemotherapeutics, imaging agents, and spingolipids to malignant cells. Interestingly, CPSNPs designed for cancer imaging and photodynamic therapy also regulate unique pathways of spingolipid metabolism as part of their mechanism of action. More specifically, we uncovered an immunoregulatory role for dihydrosphingosine-1-phosphate that was responsible for the anticancer effects of indocyanine green-loaded CPSNPs. Overall, this presentation will discuss the development of both the ceramide nanoliposome and CPSNPs, with a specific emphasis on the underlying spingolipid biology that mediates therapeutic efficacy and resistance. Better understanding of this biology has continued to enhance the development of next generation strategies with these nanotechnologies.



**Figure:** Nanoliposome incorporating short-chain ceramide <sup>(1)</sup>.

**About the speaker:** Dr. Barth obtained his Ph.D. in biochemistry and molecular biology from the University of Alaska Fairbanks and postdoctoral training at the Penn State Hershey Cancer Institute in pharmacology, hematology and oncology. Dr. Barth was a recipient of the National Cancer Institute's prestigious K22 Career Transition Award and has since maintained continuous funding focused on spingolipid biology and leukemia.



<sup>(1)</sup>Barth *et al.* "Ceramide-Based Therapeutics for the Treatment of Cancer," *Anti-Cancer Agents in Medicinal Chemistry*, 2011, 11: 911-919.