

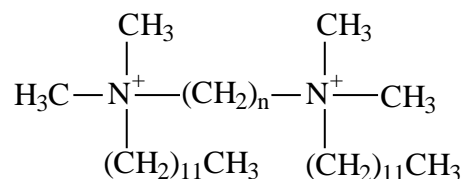
College of Liberal Arts and Sciences
Fall 2021 Chemistry Seminar Series
Friday, October 29th

Dr. Richard D. Sheardy, Professor
Department of Chemistry and Biochemistry
Texas Woman's University
Denton, TX 76204

Novel Interactions of DNA Oligomers with Gemini Surfactants

Abstract:

We have carried out studies focusing on sequence and environmental effects on the formation and stability of the quadruplex forming oligomers (XXXGGG)₄ and complimentary i-motif forming (CCCXXX)₄, where X is A and or T, using spectroscopic and calorimetric approaches. Under defined conditions, these sequences form folded structures with a high negative charge densities. In a separate study, we have been investigating the physical properties of a series of Gemini surfactants (shown below, where n = 2, 3 or 4) using conductivity, refractivity, light scattering and calorimetric approaches. At concentrations above the *cmc* (around 1.0 mM), these surfactants form micelles of high positive charge density. Thus, we were interested in the potential interactions between these DNAs and these surfactants. For the initial study, solutions of a fixed concentration of (TTAGGG)₄ in standard PBS buffer and concentrations of the 12-4-12 surfactant ranging from 0 to 3 mM were prepared. In those solutions where the [12-4-12] was greater than the *cmc*, a precipitate formed which contained all of the DNA. At concentrations of 12-4-12 below the *cmc*, precipitates formed but some DNA was still left in solution. To date, we have found that the precipitation of the DNA by the surfactant is dependent on the concentration of the surfactant as well as the concentration of the DNA and the charge or charge density of the DNA. We will give a progress report of these studies.



Bio:

Richard D. Sheardy was born in Lake Orion, MI and received his BS in Chemistry Education at Michigan State University. After earning his PhD in organic chemistry at University of Florida, he had a Post Doctoral Fellowship in biophysics at University of Rochester. Sheardy began his academic career at the Hazleton Campus of Penn State University and then went to Seton Hall University where he initiated his research on DNA conformation and stability. At Seton Hall, Sheardy mentored sixteen PhD students. In 2006, Sheardy moved to Texas Woman's University where he is currently Cornaro Professor and Chair of the Department of Chemistry and Biochemistry.

He teaches freshman and biophysical chemistry and continues his research focusing on the structure, stability and ligand binding properties of unusual DNA conformations to learn more about the molecular basis of cancer. He has mentored many MS and undergraduate students here at TWU as well. Sheardy is Conference Chair for the North American Calorimetry Conference and is a SENCER Leadership Fellow. He has organized many symposia at regional and national conferences on nucleic acid biophysics and science education reform. Under Dr. Sheardy's leadership, the department of Chemistry and Biochemistry was recognized by the American Association of Colleges & Universities (AAC&U) as a model department for incorporating civic engagement and social responsibilities into the degree programs for our chemistry and biochemistry majors. Dr. Sheardy was also a member of the TWU team that was awarded the William E. Bennett Award for extraordinary and exemplary contributions to citizen science.

Sheardy is married to Joanne and they have two children, Allison and Alex and, currently, 2 cats.