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Postdoctoral positions in the Barondeau lab at Texas A&M University are available for individuals with a strong interest in biophysical and/or bioinorganic chemistry. Our labs are located in the Interdisciplinary Life Sciences building (<http://vpr.tamu.edu/resources/iilsb>), where we have access to state-of-the-art facilities for structural biology, mass spectrometry, spectroscopy, and enzymology.

The project is funded by NIH (renewed in 2017) and focuses on structure-function properties of the human Fe-S cluster assembly complex. Fe-S clusters are ancient protein cofactors that are required for some of the most important reactions in biology. Conserved biosynthetic pathways build and distribute these clusters to the hundreds, if not thousands, of proteins that require Fe-S clusters for their function. In humans, an Fe-S assembly complex located in the mitochondrial matrix is responsible for synthesizing Fe-S clusters. Defects in the biogenesis of iron-sulfur clusters are directly associated with myopathy, neurodegenerative ataxia and ataxia-susceptibility, and contribute to genomic instability, the development of cancer, and aging. The structural core of this assembly complex consists of cysteine desulfurase (NFS1), eukaryotic-specific LYR protein (ISD11), and acyl carrier protein (ACP) subunits and is referred to as the SDA complex. We recently reported crystal and electron microscopy structures along with functional properties of the mitochondrial cysteine desulfurase (NFS1-ISD11-ACP) complex (<https://www.ncbi.nlm.nih.gov/pubmed/28634302>). This manuscript describes lock-and-key interactions between the acyl-chain of ACP and ISD11 along with a novel cysteine desulfurase architecture.

Highlights of this study:

- http://www.science.tamu.edu/news/story.php?story_ID=1812#.WUIPlmjuUI
- <https://www-ssl.slac.stanford.edu/content/science/highlight/2017-09-30/structure-human-cysteine-desulfurase-complex>

Objectives of the project

1. Apply biophysical methods (X-ray crystallography, SAXS, EM, and mass spectrometry based methods) to determine the interactions between the three accessory proteins and the core SDA complex that constitute the fully functional Fe-S cluster assembly complex.
2. Elucidate the determinants that drive quaternary structure and activity differences between NFS1 and its prokaryotic homolog IscS.
3. Explore how the composition of the acyl-chain associated with ACP and post-translational modifications influence the structure of the assembly complex and its ability to synthesize Fe-S clusters.
4. Determine molecular details of the frataxin activation mechanism for Fe-S cluster biosynthesis as a step towards a treatment for Friedreich's ataxia.
5. Investigate the roles of individual proteins in Fe-S cluster assembly and distribution networks using a chemical biology approach coupled to global fit kinetic analysis. This strategy takes advantage of an intein-based strategy to incorporate fluorophore labels that can be used to report cluster content (<http://pubs.acs.org/doi/10.1021/ja510998s>).

To apply for a Postdoctoral position (initial application deadline July 1st, 2018), see link below:
https://tamus.wd1.myworkdayjobs.com/en-US/TAMU_External/job/College-Station-TAMU/Postdoctoral-Research-Associate-1_R-000735

Please also feel free to contact me at barondeau@tamu.edu for more information.