The work I did this summer fell under two categories: 1) the synthesis of an N-substituted acetamido 2-pyridyl porphyrin with the metalloporphyrin subgroup and 2) the synthesis of acinetoferrin, a siderophore to be used for future cell uptake studies in the siderophore subgroup.

1. Synthesis of an N-acetamido-2-pyridyl porphyrin (Figure 1).

Peroxynitrite generation, detected \textit{in vivo} by its reaction with tyrosine to produce nitrotyrosine, has been demonstrated to have a pathogenic role in the progression of diseases such as diabetes mellitus.\(^1\) The Groves metalloporphyrin subgroup has designed and synthesized potential peroxynitrite decomposition catalysts by attaching hydrophilic alkyl groups to the pyridine nitrogens of 2-pyridyl porphyrins. For instance, N-acetamido-2-pyridyl porphyrins of the general type, $\text{N-CH}_2\text{-C(O)}\text{-NHR}$, were made by alkylating 2-pyridyl porphyrin with different acetamido groups, each having its own unique alkyl group. Metallating the porphyrin center with iron may then provide a biological metal center that can react with and decompose peroxynitrite. This summer, I repeated the synthesis of a porphyrin that was previously made in the lab but neither well characterized nor explored for its decomposition activity. The porphyrin synthesized is a 2-pyridyl porphyrin tetra-alkylated with acetamido groups:

\[ \text{Figure 1. A N-acetamido-pyridyl porphyrin} \]

Most of the time working with this porphyrin was spent purifying reaction intermediates by column chromatography and extraction. The final reaction succeeded in tetra-alkylating the porphyrin, as evidenced by the LC-MS data. Other members of the metalloporphyrin subgroup

will re-run this reaction and see if the same rotational isomers with the same HPLC retention times are formed.

2. Synthesis of Acinetoferrin (Figure 2).

Acinetoferrin is the principal siderophore secreted by acinetobactin. Of particular interest are its two lipophilic side-chains, which are reminiscent of the phospholipid motif.\(^2\) Previously, the Groves siderophore subgroup developed their own synthetic method for acinetoferrin, tested it with phospholipid vesicles, and determined the three-dimensional structure of both the metallated and non-metallated species. It is of future interest to the group to determine the condition within a human macrophage under which acinetoferrin binds iron for transport back to acinetobacter. The initial four steps of this multi-step synthesis, starting with citric acid and finishing with the synthesis of 2-tert-Butyl-1,3-di-N-hydroxysuccinimidyl citrate (Figure 3), was completed.

![Figure 2. Acinetoferrin](image1)

![Figure 3. 2-tert-Butyl-1,3-di-N-hydroxysuccinimidyl citrate](image2)

The biggest challenge in this synthesis was the isolation of intermediates by selective recrystallization. Other members of the siderophore subgroup will complete the last eight steps of this synthesis.

Before this experience, I was aware of the importance of research and science in all of our lives but I often felt myself floundering in this area of study due to my lack of real-life experience. Textbook study had become a battle to keep myself from routinely memorizing and then forgetting after exams. I had an obscure view of research. These issues were very much on my mind throughout the summer. I had wanted to work in a Chemistry laboratory to see if I could contribute to a scientific research effort and to reconcile a schism between where I saw science has brought us today and how the scientific process actually unfolds.

This summer, I learned how to determine and visualize the structure of molecules. The tools that I used to do this were NMR Spectroscopy, UV Spectroscopy, and HPLC. In addition, I submitted samples to the Mass Spectroscopy and the Molecular Biology LC-MS labs and received data from these two facilities. From these experiences, I got just a taste of how sophisticated chemistry has become and how careful I should be with recording and interpreting data if I want what I am doing to be useful for me or for someone else in the future.

However, on top of all the practical techniques and lab skills I learned, I also confronted what I had issues with before: the actual process of scientific discovery. Science is much more of a communal process than I had once imagined. Somewhere in my mind lurked the tangling misconception that scientific discovery and a sort of intellectual seclusion went hand-in-hand. In reality, scientists very much need interaction within the community in order to keep updated, motivated, and to help each other understand. Good communication skills and the continual willingness to learn are just as essential to success here as they are in any other field. I

appreciated attending the CEBIC Conference held at Princeton this summer and especially valued going to the Groves group meetings every Friday, when students would discuss their research with each other.

Working on organic synthesis this summer has re-ingrained in me that one of the most important values in life is to keep a pure heart towards one’s work. To be focused on the big picture certainly helps one to avoid an experimental contamination on any given day. Having been allowed some of the responsibilities of a real chemist along with mentors for supervision and guidance to turn to has helped me enormously by building my view of the scientific process. Since I am planning to have a career related to the healthcare field, I will surely find practical use for this experience in the future but also I hope that I will be able to pass on the respect for scientific advancement and chemistry this opportunity has given me to others.

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