Shane Abbley

Experiment 1: Additional Questions

Explain the connection between uric acid and gout, also discuss the antioxidant properties of uric acid:

Uric acid is a metabolic byproduct from the degradation of purines. Although a waste product, uric acid protects erythrocytes from lipid peroxidation[1]. As concentrations of uric acid in the blood increase, crystals build up in joints. This is known as gout and causes pain, inflammation, and decreased mobility.

How could you determine the concentration of uric acid in blood?:

A simple enzymatic assay of the blood plasma with uricase is often used to determine uric acid concentration. First, collect blood samples, centrifuge, and separate blood plasma. Then using a spectrophotometer determine the change in absorbance at 293 nm after adding the enzyme. The change in absorbance can then be correlated with the initial concentration of uric acid in the blood plasma.

Describe an experiment that could determine the molar absorptivity of urate dianion:

The experiment solution would need to have a pH significantly greater than 9.5, the pKa of the dianion is 9.5, perhaps 11.5 would work. With this the dianion urate would be in greater abundance. The solution would need to be performed in the absence of oxygen because the dianion reacts with oxygen. This could be done in a nitrogen or argon gas environment. A vacuum could also be pulled to reduce reactive gas species further, if this approach is taken a time constraint would need to be considered as some volatile molecules will be pulled out of the solution.

---

[1] Ames, B N, et al. “Uric Acid Provides an Antioxidant Defense in Humans against Oxidant- and Radical-Caused Aging and Cancer: a Hypothesis.” *Proceedings of the National Academy of Sciences of the United States of America*, U.S. National Library of Medicine, Nov. 1981, www.ncbi.nlm.nih.gov/pmc/articles/PMC349151/.