

The fluorometric determination of riboflavin in energy drinks focuses on the B-vitamin riboflavin with energy drinks consumed. The use of riboflavin within the body is to reduce the amount of stress on metabolic pathways. It's useful towards athletes and active individuals, so riboflavin is mostly seen within numerous energy drinks like Monster and Rockstar. I found the concentration of riboflavin within monster and rockstar by the making of a standardized curve. The method used for this experiment is making sodium citrate/citric acid buffer at a pH of 3.5. This solution is made by adding 58.82 g of sodium citrate and 38.42 g of citric acid to 1 L of deionized water, then adding concentrated sodium hydroxide to change the pH to 3.5. The 1 mM riboflavin solution was then made by adding .2 mg of riboflavin to a basic solution then adding the stock sodium citrate/citric acid buffer to 50 mL. The 1 mM riboflavin stock solution is then used to create dilutions ranging from 0 to 60 micromolar. The digital multimeter and blue LED at 405 nm is used to detect the voltage of each dilution to obtain the standard curve.

The emission intensities of the riboflavin concentration standard graph can be seen in figure one. The known concentration of Monster energy drink was 19 μM and was calculated to be 14 μM , and the known concentration of rockstar energy drink was 7.3 μM and was calculated to be 4.4 μM by the use of the standard curve. The calculated riboflavin concentration with the energy drinks was less than the known. The at-home instrumentation was different from the in-lab given the circumstances of using a 3D printed spectrophotometer. The experiment's setup is seen in figure 2 as the circuit board consists of the wirings towards the blue LED, 9V alkaline battery, and detector. The digital multimeter is set at 2 DCV to read the volts of emission intensity within each riboflavin dilution. The blue LED is set up on the right of the 90-degree angle, and the detector is on the left. The riboflavin concentration's cuvette is then placed at the angle with a cover over the top of it.

The range of the riboflavin concentrations from 0 to 55.56 μM was optimal, but reducing the range to 0 to 30 μM would have been more precise given the lower riboflavin concentrations within the energy drinks. The energy drinks riboflavin concentration was lower for human consumption, but the calculated results were also lower than the known values. The monster was calculated at 14 μM and was known at 19 μM , and rockstar was calculated at 4.4 μM and was known at 7.3 μM . Overall, the cost of the equipment used is low and extremely accurate, given the range of concentration being broader than wanted. Future directions for the experiment should be at a lower and narrower range of riboflavin dilutions made from the 1 mM riboflavin stock solution. To verify the unknown concentration and further validate the standardized curve, the use of standard additions to make the matrix consistent and a commercial instrument are needed. I want to acknowledge the faculty of the college of arts and sciences at Maryville University for the instrumentation and funding research. The list of references is listed to help complete the fluorometric determination of riboflavin in the energy drinks experiment.