Cortisol in Pika Hair

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Abstract

Cortisol (figure 1) has been extracted from various organisms' hair and used to model stress levels, but has yet to be done with Pika. This work aims to efficiently extract Cortisol from Pika Hair and model the concentration over time. Human hair was used initially instead of Pika due to abundancy. Human hair was cleaned with water and isopropyl alcohol several times before being dried and powdered. Methanol was added to each small hair containing vial and sat for 48 hours, extracting the Cortisol. The hair was removed and the vials were dried, and water was added to re-suspend the extracted protein. Samples were run through High Performance Liquid Chromatography (HPLC) using various methods to achieve peak separation. Cortisol has λ_{max} at 248 nm on the basis of figure 2, and HPLC data were analyzed at this wavelength. Cortisol was extracted successfully using human hair with a retention time of ~24 seconds. Cortisol extraction from rabbit hair was not as successful.

Introduction

Cortisol is an excellent indication of stress levels in various organisms.[1] Quantifying the levels of cortisol in Pika hair allows researchers to illustrate how stress levels in Pika respond from certain stimuli. HPLC can be used to optimize an extraction method.

Results and Discussion

Figure 4 illustrates the peak separation for human hair achieved as well as the overlap between extracted cortisol and pure cortisol for an HPLC run at λ=248 nm. The retention time was ~24 seconds. Rabbit hair was used using the same extraction method and produced the results in figure 5. The maximum absorptions were quantitatively analyzed for rabbit hair and shown to have a standard deviation of 20.166 with an average of 46.109. More precise measurements in terms of mass and surface area need to be taken with cortisol extraction as well as possibly altering the HPLC method for different organisms.

Conclusions

The extraction method appeared to work more efficiently for human hair as compared to rabbit hair. Moving forward, the rabbit hair method should be optimized. Finally, Pika hair should be used to make sure the method is completely optimized using the best available tools. This extraction and analysis has been consistent with literature extraction procedures for different organisms' cortisol from hair.
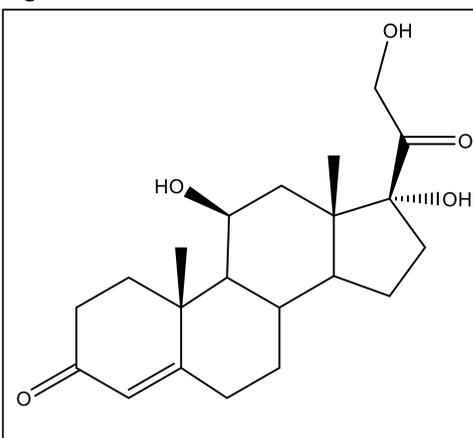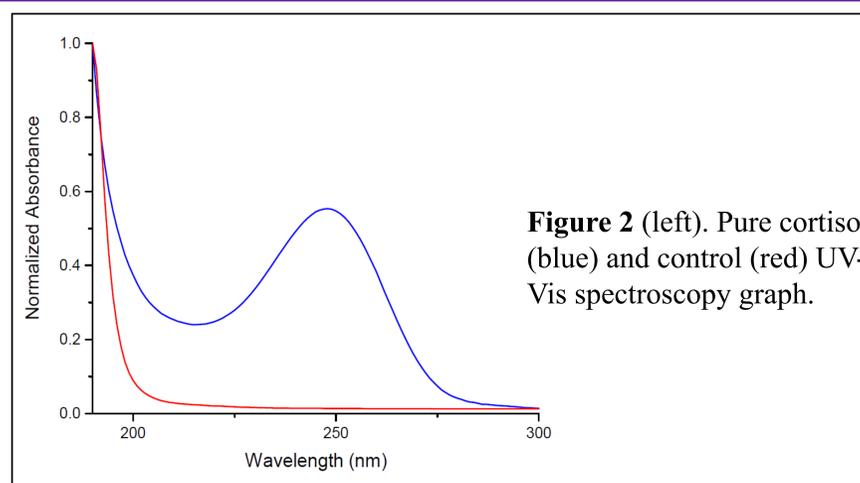

Figure 1 (left). Structure of cortisol.[2]

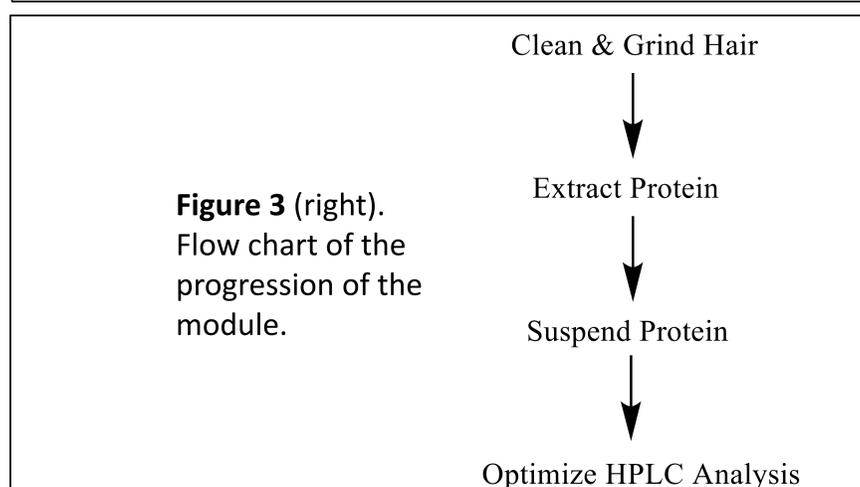**Figure 2** (left). Pure cortisol (blue) and control (red) UV-Vis spectroscopy graph.

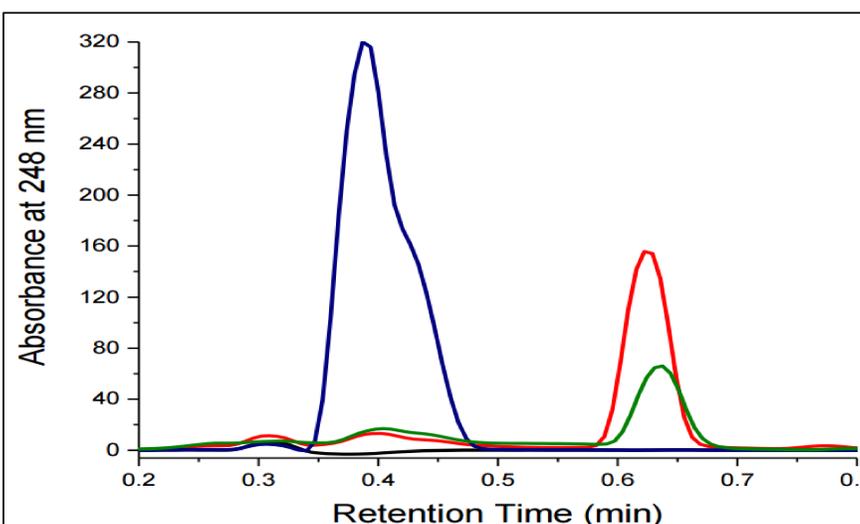**Figure 3** (right). Flow chart of the progression of the module.

Clean & Grind Hair

↓

Extract Protein

↓

Suspend Protein

↓

Optimize HPLC Analysis

Figure 4 (above). Representative HPLC-UV-Vis chromatograms gathered at 248 nm (λ_{max} for cortisol). A 90% cortisol (blue) sample, cortisol extracted from hair sample 1 (green), cortisol extracted from hair sample 2 (red), and a blank solved (black) chromatograms are shown.
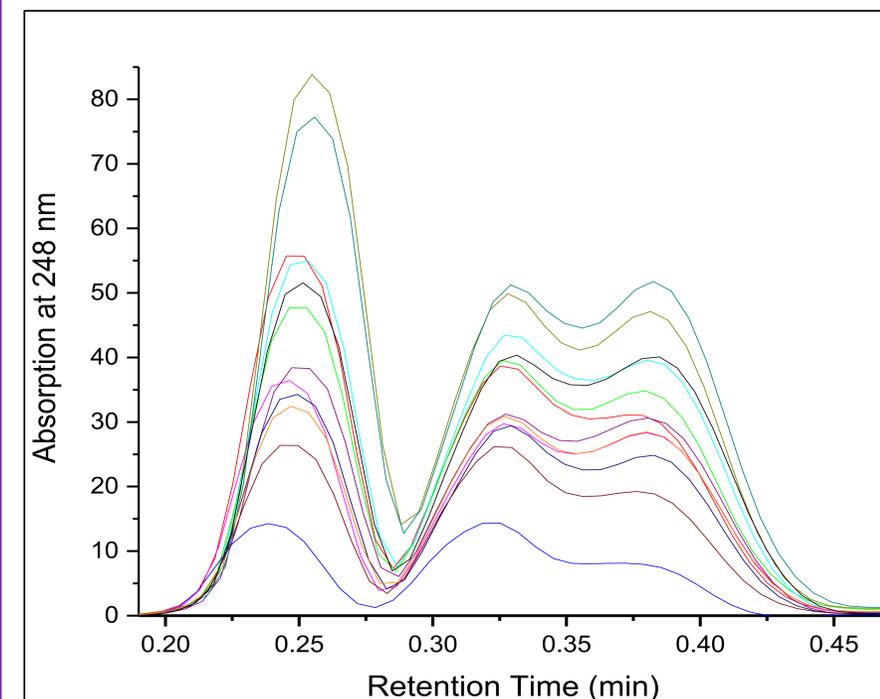

Figure 5 (above) shows the cortisol extracted from 12 different rabbit hair samples. Each colored line corresponds to individual sample absorption at 248 nm. Each run took 10 minutes to complete, however all useful data fit into the time interval shown in the figure. The absorption peaks look fairly similar in shape corresponding to similar retention time.

Acknowledgements

References

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2. Randall, M. *Dartmouth Undergrad. J. Sci.* **2011**.