The Investigation into Spectral Differences in Aged Semen Stains to Determine a Biological Time Clock

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Bodily fluids are one of the more common types of evidence found at crime scenes, and they contain valuable DNA information[1]. However, in some cases, DNA is not as useful unless the time in which it was deposited can be determined. Human semen has an abundance of proteins that can degrade over time and when exposed to the environment, the degradation of these proteins could be used to establish a biological clock to determine the age since deposition of a semen stain. This information could be used in crime scene reconstruction, corroboration, and supply time intervals for investigators.

While there are numerous methods to positively identify and detect bodily fluids, many of these techniques can be destructive or require a great amount of sample[1]. Instrumentation that can positively identify semen non-destructively and in miniscule amounts allows DNA analysis to be done after identification, or determining age since deposition in this case. Attenuated total reflectance fourier-transform infrared (ATR FTIR) spectroscopy is one of the few instruments that is non-destructive and requires miniscule amounts for analysis. It has been previously proven that ATR FTIR can in fact be used in the identification of bodily fluids, including semen[2].

In this study, various samples were deposited and left to age, ranging from 1 day to 30 days. The IR spectra were then collected and chemical shifts references in a human semen sample that are attributed to proteins were observed. These shifts were then used to calculate the ratios of all chemical shifts observed to each other. The relationship between the age of the sample and the ratios were shown graphically to determine a relationship. There was an observed decrease between days 1 and 2, which can be attributed to the protein degradation. After 2 days, there were slight changes in the ratios but the significance of these changes would have to be determined with further research. Samples were also left to age in various conditions such as in sunlight and in complete darkness and were analyzed the same way as the aged samples. This study showed that sunlight promotes protein degradation resulting in a lesser percent transmittance value than human semen that was to degrade in complete darkness. The protein degradation exhibited in both the aged and environmental studies show promise that a biological time clock may be determined with further research.

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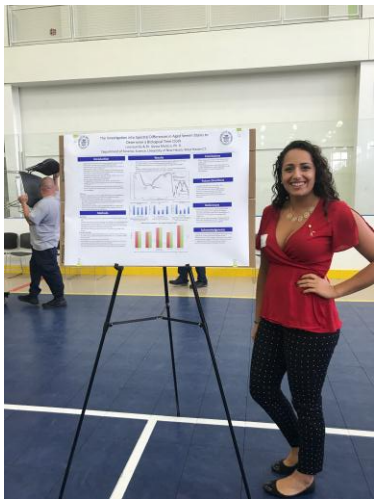

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My name is Lina Guindy and I'm from Syracuse, New York. I am currently a senior at the University of New Haven. On top of my academics and research, I am the president of Phi Sigma Sigma, vice president of Gamma Sigma Alpha National honor society, and I am a building supervisor at the Beckerman Recreation Center. After my time at the University I hope to go to graduate school for a more specialized forensic science degree.

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