Centennial Honors College
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ABSTRACT

Major: Forensic Chemistry Poster

Faculty Mentor(s): John Determan

Mette Soendergaard

Fluorescent Biosensing of Methamphetamines using Manic Acid, Polyethyleneimine Derived Carbon Dots Incorporated with DNA Aptamer

Kaylee Stinson

Mackenzie White

Drug trafficking is one of the most increasingly profitable illegal businesses around the world as the market value of drugs continues to rise by hundreds of billions of dollars each year. Methamphetamine (MA) is just one of the widely used illicit substances that are becoming a major problem. Abusing MA allows someone to become susceptible to an overdose, potentially resulting in a coma or even death. To combat this drug crisis, carbon dots (CDs) are starting to be used as drug sensors. CDs are environmentally friendly and cost effective, making them a valuable component to utilize within drug sensing schemes. CDs have properties that demonstrate unique biosensing capabilities due to the fluorophoric nature of the material. When CDs are combined with a negatively charged DNA aptamer, the fluorescence produced by the CDs is utilized for the specific detection of MA. The CDs are derived from malic acid and polyethyleneimine (PEI), positively charging the CDs from an excess of nitrogen. When the CD is bound to the DNA aptamer, its fluorescence is quenched. When MA is introduced to the aptamer-capped CD, it fluoresces once again. The fluorescence from the MA indicates that the aptamer released itself from the CDs to bind to the MA, indicating a positive result. The fluorescence of the CD correlates linearly with the concentration of MA via Beer's Law. This same concept can be applied to any drug (i.e. cocaine) that has an equivalent DNA aptamer in an effort to counter the drug crisis as a whole.