

**Centennial Honors College  
Thomas E. Helm Undergraduate Research Day 2024**

**ABSTRACT**

Major: Forensic Chemistry

Poster

Faculty Mentor(s): John Determan

---

**The Use of Silica Nanoparticles as Biosensors for Illicit Drug Detection**

**Mary Pearson**

**Ashley Webb**

**Payton Wiggins**

---

The use and addition of illicit drugs is an international crisis. Illicit drugs can do irreparable harm to the neurological and cardiovascular systems of the user. After only a few short hours, illicit drugs can become undetectable due to being metabolized quickly by the body. This creates a necessity for an effective and reliable onsite drug test to be able to be utilized by police officers and first responders. Other current techniques used for drug testing are gas chromatography-mass spectrometry, enzyme-linked immunosorbent assay, Raman instruments, and high-performance liquid chromatography. These techniques are known to be time consuming, complex, and are not easily portable. In previous research studies, gold nanoparticles that were capped with an aptamer were used to detect the presence of illicit drugs. This was conducted through the use of colorimetry. In our current study, silica nanoparticles are used because they are inexpensive, readily accessible, and abundant. The silica nanoparticle will be filled with a biological fluorescent dye, specifically Fluorescein Isothiocyanate Isomer I. The silica nanoparticles will then be capped with DNA aptamers. The biologically specific DNA aptamers will only be able to interact with the target drug and not the legal analogs of the target drug. The fluorescence of the capped nanoparticles will quench when interacted with the target drug. The composition of the particle will be verified with infrared spectroscopy and TEM imaging.