

# Fentanyl Analog Independent Detection (FAID)

Portable fentanyl detection technology offers unmatched sensitivity and enhanced safety for first responders, military, and law enforcement personnel

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**Patent pending**

**Technology Readiness Level (TRL) 5**

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## Business Problem

Fentanyl, a synthetic opioid, is the leading cause of death among Americans aged 18 to 45. Its chemical structure can be easily altered, resulting in more than 4,000 modified formulations known as analogs, some which are 1,000 times more potent than morphine. The rapid emergence of novel analogs, which can be lethal in trace amounts, poses a significant challenge for existing detection methods that primarily identify known compounds. Current technologies fail to address the evolving landscape of synthetic opioids, increasing the risk of undetected, highly potent analogs entering the market and exacerbating the public health crisis linked to opioid overdoses.

## Customer Need

Frontline personnel, including first responders, law enforcement, and military personnel, require a reliable, portable solution to detect both known and unknown fentanyl analogs in real-time.

Currently, there is a critical gap in detection capabilities because existing technologies are limited to detecting a small subset of known compounds. There is a need for technology that accurately identifies fentanyl analogs, especially in high-risk environments where exposure is possible. Quickly and accurately identifying these substances is crucial for ensuring the safety of personnel and the public and for guiding appropriate medical responses in overdose situations.

## Sandia Approach

Researchers at Sandia National Laboratories have developed the Fentanyl Analog Independent Detection (FAID) system. FAID is a novel detection sensor that identifies the backbone structure common to all fentanyl analogs. This approach allows it to detect both known and unknown compounds without prior synthesis or characterization. FAID can identify a wide range of analogs by analyzing common structural features critical to the interaction of these compounds with opioid receptors in the human body. The portable chemical sensor operates effectively in the presence of common cutting agents and delivers results in under ten minutes.



## Competitive Advantage

FAID is the only technology capable of detecting unknown fentanyl analogs at trace concentrations. In contrast to traditional methods that rely on extensive libraries of known compounds, FAID minimizes the risk of false negatives, which is vital as illegal drug manufacturers continuously create new analogs to evade detection. Additionally, drug detection dogs can be adversely affected by fentanyl, and test strips have limited scope. FAID offers comprehensive detection without the risk of environmental interferences. The compact, lightweight FAID sensor is comparable to a carry-on suitcase, making it easy to transport and deploy in various settings, delivering results in under ten minutes for quick decision-making in critical situations.

FAID's unique capabilities position it for significant market demand as the opioid crisis evolves. While fentanyl is a deadly threat the technology is also being evaluated for use in the detection of other drugs of abuse and other toxins of interest to potential end users with promising initial results. The technology is poised for licensing agreements with government agencies, law enforcement, and private sector partners. Its novel detection method, portability, and proven effectiveness make it an attractive solution for multiple applications.

## Technical Benefits

- **High Sensitivity:** FAID detects fentanyl analogs at concentrations below one microgram, ensuring safety for first responders.
- **Comprehensive Detection:** It identifies a wide range of analogs, including those not yet synthesized, enhancing public safety.

- **Rapid Results:** The innovation delivers results in approximately ten minutes, enabling timely interventions.
- **Portability:** FAID weighs less than ten pounds, is sized like a carry-on suitcase, and is designed for easy transport.
- **Improved Decision-Making:** It allows for timely administration of countermeasures like Narcan, potentially saving lives.

## Industries & Applications

- First Responders
- Law Enforcement
- Military warfighters
- Public Health Organizations

## Awards and Recognition

- R&D 100 Award Winner (2025)



## Next Steps

Sandia is seeking partners to develop and commercialize this technology. For more information, please contact Sandia National Laboratories' Licensing and Technology Transfer office.

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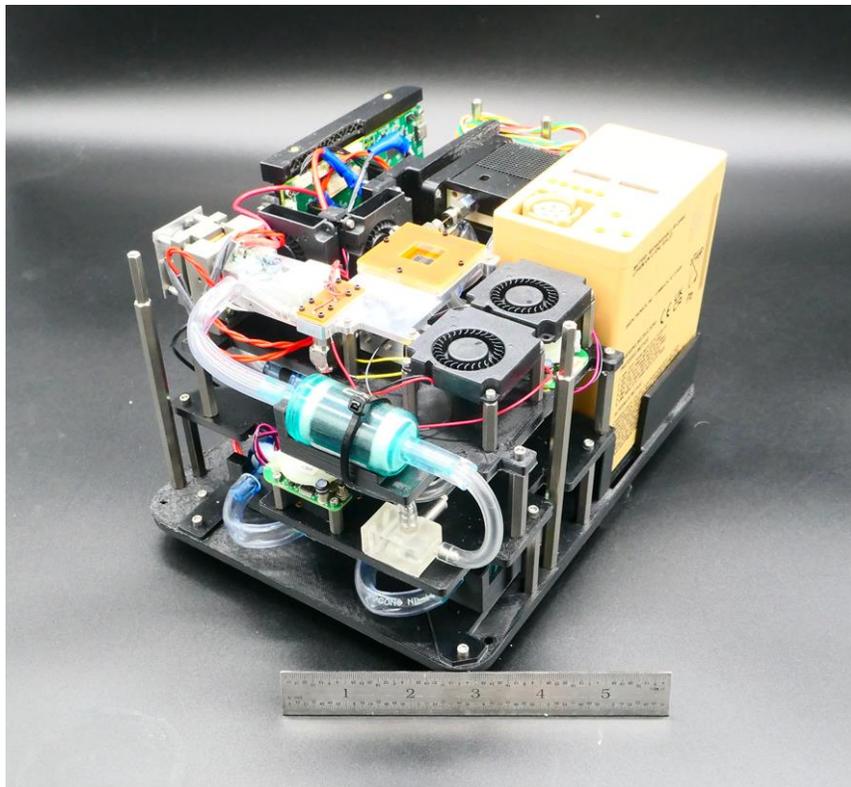


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## Technical Figures



*FAID is a portable, chemical sensor that can accurately detect trace amounts of fentanyl and unknown synthetic opioids – known as analogs – in real-time. The Gen 4 prototype shown above is 60 percent smaller and half the weight of previous versions of the device. It runs off battery power or electrical wall/vehicle outlets.*

