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Detecting and Managing Drug Contraband

An overview of technologies for managing entry of drug contraband and detecting their use in correctional facilities[1]

This technology brief is part of a series of documents that focuses on contraband in corrections. The first brief provides an overview of contraband, including types and associated technologies and products used to detect contraband on people, in vehicles, and in the environment. This brief focuses specifically on strategies to detect and manage drug contraband. The goal of this series is to offer foundational insights from use cases, highlight challenges of contraband detection, compare illustrative products, and discuss the future of contraband detection and management.

Key Takeaways

- Drug use is prolific in the United States' correctional system and increases violent incidences with staff and between inmates, decreases the health and well-being of the incarcerated and staff, and undermines the process of rehabilitation.
- Strategies focused on drug detection at the points of entry have the greatest potential to mitigate drug contraband by requiring all staff, inmates, visitors, delivered consumables, mail, and personal items to be searched before entry.
- A multilayered approach using X-ray scanners, chemical detection devices, digitized mail programs, and facility-based drug treatment programs can significantly reduce drugs within correctional facilities.
- Technology cannot fully replace corrections staff, but variations in drug composition and the routes through which they are smuggled into correctional facilities demonstrate the challenges that can be addressed by technology.

Drug use is inextricably tied to crime and incarceration.[2] According to a study by the U.S. Department of Justice between 2007 and 2009, 63% of inmates met the criteria for drug dependence or abuse at the time of arrest.[3] Inmates with dependence problems at the time of incarceration or who have had previous addiction habits are particularly vulnerable to continued use or relapse. The fact that 58% of inmates continue to meet the criteria for drug dependence during incarceration underscores the problem of drug availability and continued abuse within correctional facilities.[3] Drugs are commonly smuggled into prisons and jails by inmates, staff, and visitors through methods that are difficult to detect. Furthermore, physical searching of individuals entering a correctional facility is time consuming, and clever concealment efforts make it difficult to identify incoming drugs with any one technology or strategy. This brief focuses on drug contraband, the challenges of ever-changing drug analogs, available detection technologies, and illustrative products.[4]

Contraband Detection Solutions for Correctional Facilities

This document explores drug contraband detection technologies. Additional documents in this series address specific contraband topics.

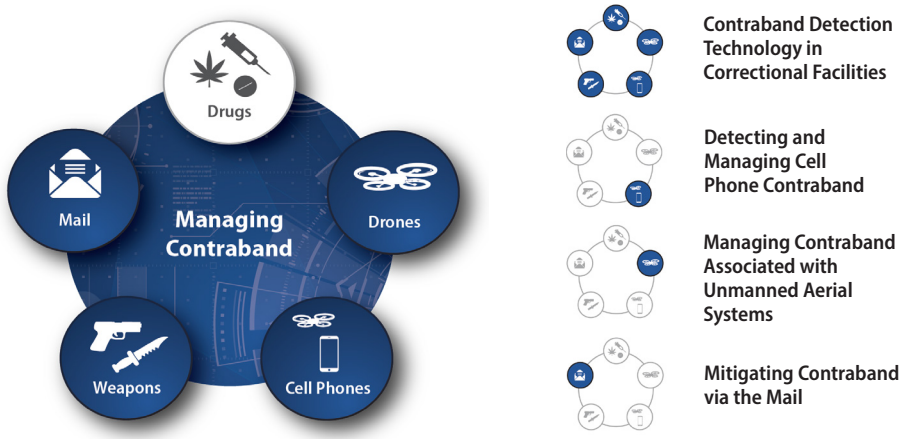

Figure 1: The successful management of drug contraband requires a multi-layered approach using scanning technology, physical searches, and chemical detectors.

1. There are over 7,100 federal, state, local, and tribal prisons or jails in the United States. To enhance the readability of this brief, the terms *prison*, *jail*, and *correctional facility* are used interchangeably.
2. Disney, L., Hayward, A., & LaVallee, R. (2010). *Illicit drug use and criminal behavior: A literature review*. Washington, DC: Office of National Drug Control Policy.
3. Bureau of Justice Statistics. (2017, June). *National Inmate Surveys, 2007 and 2008–09*. Washington, DC: U.S. Department of Justice; and Substance Abuse and Mental Health Services Administration. (2015, November). *National Survey on Drug Use and Health, 2007–2009*. Washington, DC: U.S. Department of Health and Human Services.
4. Products referenced within this document are used for illustrative purposes and do not represent NIJ's or CJTEC's recommendation, endorsement, or validation of product claims.

Drugs are a problem for correctional facilities.

Drug contraband is a constant threat within the U.S. correctional system because higher potency drugs and newly synthesized analogs, as summarized in **Figure 2**, are becoming increasingly difficult to detect. In addition to marijuana, cocaine, heroin, and methamphetamines, synthetic cannabinoids, cathinones, and opioid analogs are becoming more pervasive. These synthetic or designer drugs are collectively known as novel (new) psychoactive substances (NPS). The term *NPS* is a legal definition, and there is no universally agreed-upon way to categorize them, but generally they are grouped into three of four categories as stimulants, depressants, hallucinogens, and cannabinoids. While NPS are associated with prisoner harm, their prevalence in prisoner populations is largely undetermined.[5] In 2020, a British report based on a voluntary questionnaire of the 186 responding prison staff indicated that 67% asserted that NPS had a deep impact on their work as they commonly witnessed prisoners exhibiting drug effects (e.g., outbursts of anger, slurred speech, hallucinations, psychosis, significant mental deterioration). Similarly, 91% have witnessed aggression at least once, with 53% experiencing direct harm.[6] As substances emerge that are significantly more potent than traditional drugs, detection methods must evolve and adapt. Even with sophisticated detection technologies, smaller quantities of drugs are less conspicuous to correctional staff and can be challenging to detect using physical searches and body imaging technology.

The availability of synthetic drugs has fueled the rise of contraband smuggling into facilities and use among prisoners. Additionally, synthetic cannabinoids and cathinones are becoming a primary concern in the prison drug trade because of their unpredictable and dangerous effects. Opioid analogs, synthetic cannabinoids, and synthetic cathinones can be liquified and sprayed onto inconspicuous items, such as dried plant material, and paper products, such as mail, or disguised as common products (e.g., candy, toiletries) and, therefore, can be trafficked surreptitiously.[7] These drugs are responsible for contributing to overdoses and deaths in the prison system. In California alone, overdoses in the prison population increased by 113% between 2016 and 2019, with the majority of overdoses attributed to synthetic drugs, such as fentanyl.[8] In addition, adverse health symptoms experienced by both inmates and prison staff are a problem because they may be inadvertently exposed to high-potency drug contraband.

Drugs undermine rehabilitation efforts and destabilize the prison system because contraband is commonly used as currency and often sustains gang activity. Additionally, prison staff and family members can be coerced to participate in drug smuggling efforts by the incentive of financial gain or the threat of gang retaliation on the outside.[9] A major concern with staff involvement in smuggling is their ability to circumvent the detection practices, thus enabling the trafficking of drugs into the prison facility with impunity.[10]

"Contraband posed serious challenges for us, such as inmate drug overdoses, inmates manipulating the jail environment and inmates harming other inmates and officers, just to name a few of the issues."[11]

—Sheriff Dale Lancaster, Somerset County Sheriff's Office, Maine

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6. Corazza, O., Coloccini, S., Marrinan, S., Vigar, M., Watkins, C., Zene, C., . . . Bersani, G. (2020). Novel psychoactive substances in custodial settings: A mixed method investigation on the experiences of people in prison and professionals working with them. *Frontiers in Psychiatry, 11(460)*. https://doi.org/10.3389/fpsyt.2020.00460
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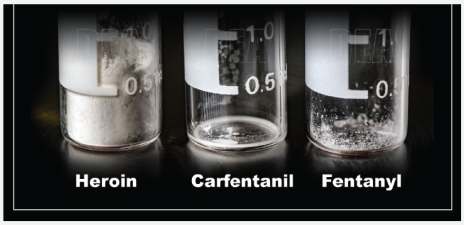
Drugs	Description	Potency	Appearance
Synthetic Opioids **Fentanyl, Carfentanil**	Manmade chemicals that act on the opioid receptors in the brain that induce pain relief. Synthetic opioids are highly addictive and are typically smuggled as powder, pills, or liquified into various forms. The drugs can produce euphoria, sedation, respiratory depression, unconsciousness, and possibly death.[12]	100 to 1,000 times more potent than morphine[13]	Synthetic opioid analogs are much more potent than heroin. The picture illustrates a lethal dose of carfentanil and fentanyl relative to heroin. 
Synthetic Cannabinoids **K2, Spice, APINACA**	Manmade chemicals that act on the same brain receptors as tetrahydrocannabinol (THC), which induces the psychoactive effects of cannabis. However, the effects of synthetic cannabinoids significantly differ from cannabis and can cause confusion, loss of motor coordination, agitation, hallucinations, seizures, and possibly death. The chemicals are typically produced in liquid form and sprayed onto material such as plant matter or paper.[14, 15]	100 times more potent than THC[16]	Synthetic cannabinoids can be sprayed onto pieces of paper to enable inconspicuous distribution. 
Synthetic Cathinones **Bath Salts, MDMA, Molly**	Manmade highly potent chemicals designed to mimic a naturally occurring stimulant found in the khat plant. These substances have effects similar to common illicit stimulant drugs such as amphetamine, cocaine, and MDMA. The drug is typically found in crystal or powdered form and disguised as bath salts, cleaning agents, or plant food. Intoxication via synthetic cathinones can lead to hallucinations, paranoia, panic attacks, violent behavior, and possibly death.[17]	10 times more potent than cocaine[17]	Synthetic cathinones commonly come in crystal form, which is often disguised as bath salts. 

Figure 2: Synthetic drugs are difficult to detect because their high potency enables them to be smuggled in very small quantities.

12. National Institute on Drug Abuse. (2019). *What is fentanyl?* Retrieved from https://www.drugabuse.gov/publications/drugfacts/fentanyl
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17. National Institute on Drug Abuse. (2020). *What are synthetic cathinones?* Retrieved from https://www.drugabuse.gov/publications/drugfacts/synthetic-cathinones-bath-salts

Strategies to Manage Drugs in Correctional Facilities

Points of entry are one of the most common routes for drug smuggling into facilities; inmates, visitors, and correctional staff bring drugs through the front door. This predominant route of drugs entering correctional facilities is exacerbated by contact visits, insufficient searching of staff members, and ultimately the limited resources available to aid in interdiction efforts, such as technology and personnel to monitor the grounds and perform physical searches.[18] Incoming mail for inmates is also a problematic source of drug introduction, because liquified synthetic drugs can be sprayed on to paper and easily disguised as a benign piece of correspondence, book, or magazine. Furthermore, inmates who have drug dependencies do not get adequate treatment while incarcerated; only 20% of inmates with drug abuse problems enroll into an official prison-based treatment program.[19] In light of these challenges facing correctional facilities, the following strategies can be used independently or as a comprehensive approach to drug interdiction efforts:

- Physical search and canine drug detection
- Restriction of visitation and regulation of staff
- Prison-based drug monitoring and treatment programs
- Mail inspection and digitized mail programs
- Point-of-entry search of persons using technologies and processes

Physical Search and Canine Drug Detection

Physical searches and drug-detecting canines are traditional drug contraband interdiction methods. Physical searching of persons and locations within facilities is effective when contraband is readily discernible to correctional officers. The typical targets of drug-detecting canines are based on training objectives and primarily include cocaine, heroin, marijuana, and methamphetamine.[20] These methods have their limitations and require screening staff and highly trained dogs and handlers. Furthermore, these methods have been challenged with evolving smuggling trends that take advantage of newly synthesized analogs, concealed drugs, and the willingness of traffickers to swallow or insert contraband into their body cavities. These evasive schemes have made it difficult for canines to be adequately trained to detect the ever-expanding list of synthetic analogs and have limited the capability of correctional staff to readily identify contraband by physical search.[20]

Restriction of Visitation and Regulation of Staff

Visitation has a positive effect on the well-being of inmates and can reduce recidivism.[21] However, because of the threat of drug smuggling by visitors, some facilities facing drug problems have adopted a no-visitor policy or transitioned to video calls.[22] According to the Federal Bureau of Prisons (BOP), visitors are a primary contributor to drug introduction within prisons because there is a lack of physical barriers during visitation and an absence of sufficient monitoring efforts by staff. In addition, the BOP further states that the prison system fails to prevent staff from introducing drugs by not enforcing consistent employee searches and not adequately restricting the personal property that staff bring into facilities.[19] For example, in 2016, 46 prison guards in the state of Georgia were indicted for drug trafficking at nine different correctional facilities.[23] In 2020, six correctional officers were charged with drug smuggling at the Rikers Island prison complex, and three correctional officers were indicted on drug trafficking at a private detention facility in Queens, New York.[24, 25]

18. Federal Bureau of Prisons. (2003, January). *The Federal Bureau of Prisons' drug interdiction activities*. Report Number I-2003-002. Retrieved from https://oig.justice.gov/reports/BOP/e0302/final.pdf
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Prison-Based Drug Monitoring and Treatment Programs

Of the 7,100 correctional institutions in the United States, only a small fraction offers on-site medication-assisted treatment (MAT) programs. MAT programs use a combination of methadone, buprenorphine (i.e., Suboxone), and naltrexone to assist with withdrawal and cravings associated with opioid addiction. Additionally, naltrexone can be used to treat alcohol abuse by decreasing the desire to be intoxicated. Rhode Island Department of Corrections pioneered the use of the MAT program in 2016, and within its first year of implementation, post-incarceration overdose deaths decreased by 61%.[26] The combination of a MAT program, counseling, monitoring, and group therapy has been demonstrated to not only reduce the abuse of drugs within correctional facilities, but also to reduce the rate of recidivism.[27]

Image courtesy of Abbott.

Figure 3: Abbott's SoToxa Oral Fluid Mobile Test System is a handheld drug testing analyzer that detects recent intake of common drugs within 5 minutes. Law enforcement agencies worldwide have adopted SoToxa into their oral fluid roadside screening program; this technology application could be used as a model for prisoner drug monitoring programs.

Although MAT programs have been demonstrated to be successful, some challenges need to be addressed before implementation. The efficacy of prison-based treatment programs relies on inmate participation, adequately trained treatment providers, and the ability to overcome the stigma of drug dependency by treating it as a mental illness.[28] Furthermore, current regulations in the Federal BOP restrict the use of opioid derivatives in correctional facilities, presently prohibiting comprehensive MAT programs. The threat that drugs intended for treatment can be hoarded and trafficked within the prison introduces additional challenges to drug mitigation efforts.[28]

Drug use in prisons can be monitored by random or scheduled drug screening. The use of drug screening in itself is not a preventive method but enables correctional authorities to audit the effectiveness of drug interdiction efforts and ultimately manage the application of treatment to inmates with drug dependencies. Urinalysis is the most common type of drug screening and is typically outsourced for laboratory analysis, which can take 5 to 10 days for results. The adoption of on-site drug screening methods using portable handheld technology may assist in real-time monitoring of inmate drug use. Portable saliva testing devices are currently being employed by law enforcement agencies to enable officers to detect drug use at roadside sobriety checks. These devices, one of which is captured in **Figure 3**, have the potential to be effectively transitioned into the prison system, bolstering treatment programs and facilitating health and wellness mechanisms by providing real-time indication of drug use.

"The United States has less than five percent of the world's population and we consume two-thirds of the world's illegal drugs and incarcerate almost a quarter of the world's prisoners, more than eight of ten of whom have some substance involvement."[29]

—Joseph Califano Jr., President of the Columbia University–based National Center on Addiction and Substance Abuse

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Mail Inspection and Digitized Mail Programs

The concealment of synthetic drugs in paper products has resulted in an influx of drug contraband entering prisons via the mail system. Synthetic cannabinoids, cathinones, methamphetamines, and opioid analogs can be liquified and sprayed onto paper, incorporated into ink and crayon wax, and disguised as a benign piece of correspondence. Additionally, buprenorphine is commonly hidden under stamps or within pages of books and magazines. When received, the drug-soaked material can be subdivided into many doses and distributed for consumption.

The trafficking of drugs via mail has become so problematic that many prisons have restricted mail to preapproved postcards or have discontinued the delivery of mail entirely. However, being able to receive correspondence from family members and friends promotes inmate well-being and reduces the rate of recidivism.[30] Because of this benefit, correctional facilities implementing mail restrictions have been challenged by the American Civil Liberties Union, which states that a ban on incoming mail violates the inmates' First and Fourteenth Amendment rights.[31]

In an effort to retain physical mail delivery, multiple correctional facilities have implemented routine mail inspection using technology to detect embedded drug contraband. In one example, the Dauphin County prison in Pennsylvania adopted the VeroVision Mail Screener system (shown in **Figure 4**) to inspect the mail of over 1,000 inmates. The system uses hyperspectral imaging that penetrates the mail substrate and detects drugs using a library of target chemicals. The imaging device has been demonstrated to be effective at detecting a substantial number of drugs and adulterants, such as cocaine, methamphetamines, opioids, and phenylcyclohexyl piperidine (PCP). The system has the capability to expand its chemical library through software updates and can perform a scan in less than 10 seconds. However, processing one piece of mail per 10 seconds may not be effective in large institutions, where this process would translate to a significant burden of time to effectively scan the typical mail received on any given day.

In correctional facilities where incoming mail has been determined to be a significant source of drug contraband, the decision may be made to restrict incoming mail altogether and adopt a digitized mail program. This operation consists of

Image courtesy of ChemImage.

Figure 4: VeroVision Mail Screener, offered by ChemImage, uses imaging spectrometers and sensor technology to detect drug contraband found in mail.

redirecting incoming mail to a processing location, where it is scanned (digitized) and provided to inmates either in electronic format on a tablet/computer or reprinted on copy paper and physically delivered. The original paper copies are then retained for the inmates upon release or held for a period of time before disposal. This process has been adopted by multiple agencies and is currently being vetted by the BOP, primarily in response to escalating synthetic drug smuggling. In one example, the Polk County South Jail in Frostproof, Florida, uncovered a synthetic cannabinoid trafficking operation intending to use the inmate mail system to traffic drug-laced papers.[32] The Polk County Sheriff's Office established a digitized mail program using Securus Technologies, which established a letter-scanning process for physical mail and electronic messaging system that enables correspondence to inmates via an email application.[33]

Adopting a digitized mail program effectively inhibits the flow of drugs through the mail system. However, the program introduces challenges, such as concerns about privacy rights and the security of legal correspondence, and it does not eliminate staff exposure to potentially hazardous chemicals embedded in the mail. In addition, the installation of a digitized mail program requires the introduction of new policies, hiring or retraining of staff, and cost burdens associated with acquiring electronic devices for inmates to communicate electronically.

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Point-of-Entry Search Using Technologies and Processes

In response to an evolving drug problem and resourceful concealment efforts, correctional facilities require innovative technology that effectively screens incoming inmates, visitors, staff, and their personal belongings. The efficacy of detection technology relies on the ability to distinguish concealed foreign material or identify the presence of discreet drugs with confidence. Furthermore, employing a screening process at the point of entry requires the methodology to be expedient enough to handle large volumes of people and packages entering the facility. Technologies used for high-throughput inspection at the point of entry can be broken down into two primary subcategories:

1. **Scanning devices** are designed to provide high-throughput screening at the point of entry. The systems use several scanning technologies for body imaging, including transmission X-ray, backscatter X-ray, millimeter wave, and metal detectors.[34] These systems can identify objects hidden on a person; however, transmission X-ray devices can detect materials hidden within body cavities and concealed in packages; therefore, they are the most widely adopted and robust imaging technology used by correctional facilities.
2. **Chemical analysis devices** provide identification or indication of the presence of drugs by recognizing their unique chemical structures. These systems use ion mobility spectrometry (IMS), Raman spectroscopy, and infrared (IR) spectroscopy to differentiate and identify drugs at a trace level. Chemical analysis devices can be used as the primary screening tool or supplement body scanning systems. Devices that use Raman or IR spectroscopy provide the added benefit of identifying a substance using a vast library of chemistries to identify narcotics, chemicals, cutting agents, and precursors.

In an ideal scenario, every person, package, and consumable entering the prison would be subject to screening protocols before entering a facility. However, every prison and jail are different and present a unique set of challenges. To implement a comprehensive screening process, facilities should consider a multifaceted approach that combines traditional searches, detection canines, scanning technology, and chemical analysis devices to provide the best solution to preventing drugs from entering a prison. **Figure 5** demonstrates the use of multiple drug interdiction strategies to assist correctional staff in managing access while reducing the flow of drugs through the points of entry.

34. Koslover, R., Hung, V., Babin, S., & Mills, A. (2017, April). *A market survey on contraband detection technologies*. Washington, DC: Department of Justice, Office of Justice Programs, National Institute of Justice; National Criminal Justice Technology Research, Test & Evaluation Center. Retrieved from https://www.ojp.gov/pdffiles1/nij/grants/250685.pdf

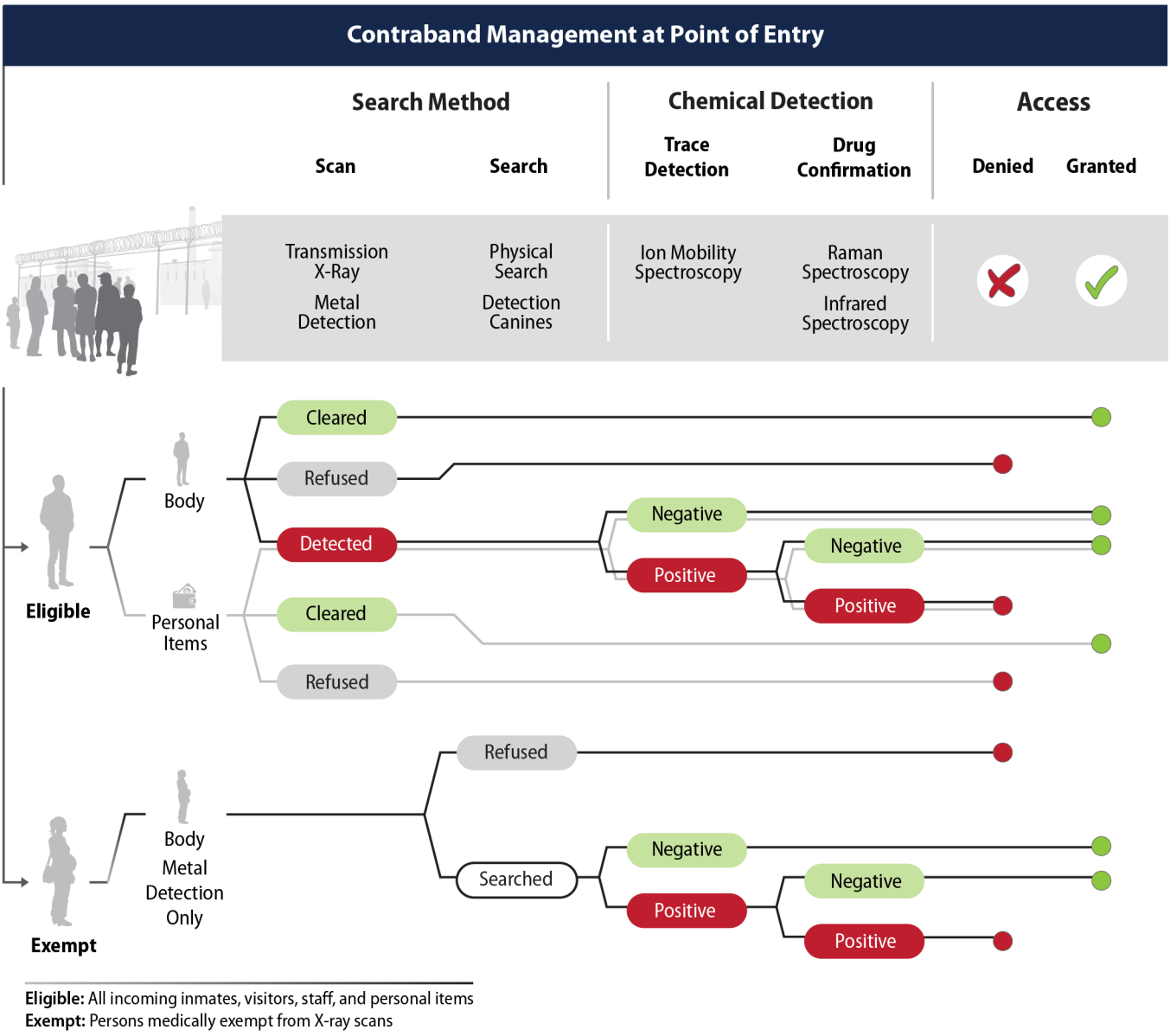

Figure 5: The multilayer approach of using scanning technology, physical searches, and chemical detectors provides a comprehensive method to identify drug contraband on people and items.

Technologies to Detect Drugs at a Point of Entry

Scanning

X-ray technology, notably body scanning devices, has been widely adopted by facilities for point-of-entry screening and has demonstrated success at restricting illicit material from entering prisons and government buildings. The first full-body transmission X-ray scanners were introduced into correctional facilities in the early 2000s to reduce the burden of physical searches, which are time consuming, viewed as invasive, and challenged by contraband hidden within body cavities. The implementation of transmission X-ray devices has grown significantly over the past two decades with several manufacturers targeting the corrections market and establishing thousands of units in prisons across the United States. The predominant manufacturers of X-ray devices employed by correctional facilities are RadPRO, ADANI, Smiths Detection, and OD Security. The systems developed by these companies generate a thorough scan in less than 20 seconds and yield a digital image capable of identifying foreign material hidden within body cavities and within packages. One of the biggest considerations when adopting scanning technology is the expense: each device costs between $150,000 and $250,000, and large institutions may require multiple units to effectively screen at each entry point. Additionally, the operational knowledge needed by the correctional staff is significant and, therefore, necessitates considerable training requirements and hands-on experience to correctly interpret the image output.

Image courtesy of OD Security.

Figure 6: OD Security's Soter RS is an X-ray full-body scanner that can reveal any type of contraband hidden either outside of or even inside the human body.

The ability to detect illicit material cleverly hidden by incoming inmates, visitors, and staff using body-scanning devices is highly regarded by correctional authorities. According to the Correctional Service of Canada, 330 drug overdoses occurred between 2012 and 2017 in Canadian prisons.[35] To combat contraband entering these facilities, the Ontario, Canada, prison system purchased 16 OD Security Soter RS instruments (seen in **Figure 6**) and within 6 months of adoption, the province performed 136,600 individual scans in which 4,690 drug identifications were made.[36] In another instance, the Wayne County jail in Richmond, Indiana, adopted the Smiths Detection B-SCAN device after routinely discovering drugs and other contraband during cell searches. In the first 2.5 months of employing the instrument, the Wayne County jail performed 992 individual scans and found more than 20 items of contraband.[37] The instruments also serve as a significant deterrent for drug smuggling attempts because inmates, visitors, and prison staff are informed and leery of the technology before they are scanned.

Although body scanning devices can be an effective tool, there are challenges in certain scenarios. The use of the X-ray technology is seen as controversial because the devices emit radiation, which can be harmful if an individual is scanned too frequently over a certain period of time, is pregnant, or is undergoing radiation treatment. Radiation exposure becomes particularly problematic for routine scanning of correctional staff and work release prisoners. In addition, some state laws, such as those in Ohio, do not allow correctional staff to be scanned.[38] The concern about radiation exposure allows cleared correctional staff, inmates who have hit their limit of scans, and visitors with viable medical exemptions to enter the facility without being screened and thus provides an opportunity for drug entry. Furthermore, the systems are designed to detect foreign material on a person and cannot distinguish ordinary personal items from materials that may be laced with synthetic drugs. If routine screening is to be implemented on all persons entering a jail, correctional facilities may require an additional modality of detection to confirm drugs are not being smuggled inconspicuously. The use of chemical analysis technologies in combination with body scanning helps address this challenge.

35. McKendy, L., Biro, S., & Keown, L. (2018). Overdose incidents in federal custody, 2012/2013 - 2016/2017. Retrieved from https://www.csc-scc.gc.ca/research/sr-18-02-en.shtml#n1
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Chemical Analysis

Chemical analysis devices can be used as a routine screening tool or to augment body scanning. As stand-alone solutions, chemical detectors can provide correctional staff with a methodology to determine the presence of drug contraband when used on personal items, clothing, and body surfaces. Successful use of chemical analysis technology requires that the devices be easy to use, be sensitive, and quickly produce a reliable result while retaining the integrity of the tested material. Additionally, the systems employed by prisons should minimize the exposure of staff members to harmful compounds that may potentially be inhaled or absorbed through the skin, such as fentanyl and carfentanil. Spectroscopy is the dominant technology used in chemical detectors, where a beam of electromagnetic radiation penetrates a sample, and the system detects how the sample responds to the stimulating energy. These systems effectively compare the resulting spectra to a library of known responses to identify the chemistry of the substance. As depicted in **Figure 7**, the most common systems use Ion Mobility Spectroscopy (IMS), Raman Spectroscopy (Raman), and IR spectroscopy.

Technology	Costs	Advantages	Disadvantages
Ion Mobility Spectroscopy	$25,000 - $50,000	• Detects trace residue on nearly any substrate, such as hands, clothing, paper, and personal items • Offers simple operation designed for use by nontechnical personnel • Analyzes a sample in less than 10 seconds • Does not destroy the sample	• Limited chemical selectivity, operational conditions such as temperature, and passive exposure to targets can generate increased rates of false alarms • Does not detect marijuana
Raman Spectroscopy	$12,500 - $50,000	• Detects hundreds of drug compounds • Analyzes a sample in less than 1 minute • Offers user-friendly operation that can analyze samples through transparent packaging or on the substrate surface • Minimizes exposure to staff through noncontact-based operation • Does not destroy the sample • Offers simple operation designed for use by nontechnical personnel	• Highly pigmented drugs like black tar heroin and marijuana prove challenging for the technology to analyze • Background interference from mixtures can mask the identification of the target drug • Passive exposure to targets can generate increased false alarms
Infrared Spectroscopy	$25,000 - $60,000	• Identifies thousands of drug compounds • Analyzes a sample in less than 1 minute • Requires a very small amount of sample for analysis • Does not destroy the sample • Offers simple operation designed for use by nontechnical personnel	• Loading a raw sample onto a platform for analysis increases the chance of staff exposure • Vegetative drugs, such as marijuana and synthetic marijuana, can be challenging to identify • Passive exposure to targets can generate increased false alarms

Figure 7: Chemical analysis devices provide a quick and robust method of indicating or identifying drug compounds in a correctional facility.

Ion Mobility Spectroscopy

One of the most prevalent chemical detection technologies employed in correctional facilities is IMS because of its ease of use and high sensitivity.[39] IMS can detect and identify a large range of drug compounds, including synthetic cannabinoids, synthetic cathinones, fentanyl, carfentanil, cocaine, and methamphetamines; however, the systems are not reliable in detecting THC in the form of cannabis.[40, 41, 42] Currently, the Pennsylvania Department of Corrections uses the Rapiscan Itemiser 3E IMS device (a new version of the device can be seen in **Figure 8**) in each of the state's 25 prison facilities in response to a series of drug overdoses related to synthetic cannabinoids. This system can detect more than 30 types of cannabinoids and is used to screen all incoming inmates, visitors, and prison staff.[43] Although successfully employed by many correctional facilities across the United States, IMS technology use in jails has been contested by visitors and staff who claim that IMS systems routinely generate false positives because they are hypersensitive. In response to these accusations and the numerous lawsuits filed against correctional facilities, the state of California decided to discontinue the use of IMS devices after an initial 3-year pilot.[44]

Image courtesy of Rapiscan Systems.

Figure 8: Rapiscan Systems' Itemiser 4DN is an IMS device that can detect narcotics in 8 seconds.

Image use by agreement with Thermo Fisher Scientific.

Figure 9: Thermo Fisher Scientific's TruNarc, a handheld Raman device, enables users to scan nearly 500 suspected controlled substances in a single, definitive test.

Raman Spectroscopy

Raman spectroscopy has the unique capability of identifying drugs via laser without making contact with the substance, which reduces potential exposure to staff. Raman devices use a library of target chemicals and have been demonstrated to be effective at detecting a substantial number of drugs and adulterants, such as cocaine, methamphetamines, opioids, ecstasy, synthetic cannabinoids, and synthetic cathinones; however, drugs that are highly pigmented like black tar heroin and marijuana prove challenging for the technology to detect.[45] Raman spectroscopy devices enable prison staff to confidently determine the drug type in less than 1 minute, are handheld, can run off battery power, and maintain sample integrity. Although not widely adopted by correctional facilities, handheld Raman spectrometers have been used successfully in the field by law enforcement officers, prompting recent acquisitions by prisons, such as the Lenawee County jail in Michigan and the Boulder County jail in Colorado. These correctional facilities purchased the Thermo Fisher Scientific TruNarc device (seen in **Figure 9**), which can detect more than 450 controlled substances in a single test, including synthetic cannabinoids, fentanyl, and synthetic cathinones, providing a clear readout of the substance detected. In a study performed by Marshall University, the Raman system was demonstrated to be highly accurate when analyzing single-component reference samples (97.6%); however, the system's accuracy diminished when tested on actual case samples (76.9%).[45]

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Infrared Spectroscopy

IR spectroscopy has been used for drug detection in laboratories for several decades; however, recently the technology has advanced to be employed in the field by nontechnical users. Of the aforementioned systems, IR spectroscopy has the broadest drug identification capabilities and generates the highest discriminating capability.[46] The systems can detect thousands of drug compounds, including synthetic cannabinoids, synthetic cathinones, fentanyl, cocaine, methamphetamines, and their cutting agents. However, samples such as dried cannabis or synthetic cannabinoids sprayed on to plant material are not easily characterized by the technology.[47] Much like Raman spectroscopy devices, IR spectroscopy has not been widely adopted by U.S. correctional facilities for drug interdiction efforts. However, the capability to accurately identify a vast number of drug compounds is promising to mitigate the ever-evolving synthetic drug market. The Smiths Detection Target-ID system (seen in **Figure 10**) is one of the first IR spectroscopy devices developed specifically for drug identification in the field. The system uses a library of 2,500 drugs, cutting compounds, and precursors, providing a clear readout of the substance detected in less than 1 minute.[48] In addition to illicit stimulants and opioid drugs, the device is also capable of detecting synthetic cannabinoids and synthetic cathinones sprayed onto paper.

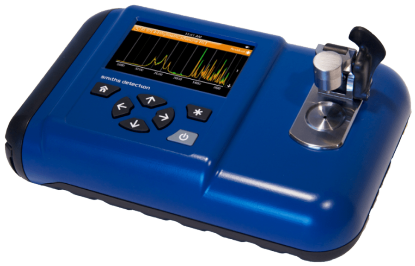

Image courtesy of Smiths Detection.

Figure 10: Smiths Detection's Target-ID leverages Fourier Transform Infrared spectroscopy technology to identify up to 2,500 substances using a preloaded library.

Limitations of Drug Interdiction Methods and the Future

The ability to detect and manage drug contraband in correctional facilities has its challenges, and each interdiction strategy has benefits and limitations. Although ideal in theory, a comprehensive approach may not be feasible for all correctional facilities, and the costs associated with implementing such a rigorous program can be burdensome. Moreover, after a specific strategy is employed, the efforts to smuggle drugs are often adapted to circumnavigate a particular strategy's effectiveness. Technologies and programs such as body scanning, chemical analysis devices, prison-based treatment programs, and digitized mail programs are not a panacea; however, they provide correctional staff with a robust method that enhances their ability to identify and reduce drug contraband that may otherwise go undetected by traditional techniques, such as physical searching and environmental monitoring. Moreover, the cost associated with these strategies can be significant, and implementation of new technologies and programs necessitates substantial training requirements to ensure that the methods are effective.

Historically, drug analysis has been performed in the laboratory, which is costly, time consuming, and requires highly trained scientific personnel. Because of the complicated laboratory process and the number of drug samples submitted to forensic toxicology laboratories, some states have observed a backlog of nearly 4 months.[49] However, significant advancements have been made to adapt laboratory instrumentation for field-forward use. These advancements have provided correctional staff with an auxiliary capability for identifying drugs in correctional settings in near real-time. Ideally, the goal for corrections is a detection technology with appropriate stand-off capabilities that ensures staff safety and confidently detects drug compounds. Promising technologies such as hyperspectral imaging, which combines spectroscopy and digital imaging technology, can provide effective stand-off capabilities to identify unique chemical compounds, thus providing an innovative method to detect hidden drugs in an ever-evolving and challenging environment.

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Three Key Considerations for Leaders in the Corrections Community

1. Eradicating drugs from the prison system requires a comprehensive and multimodal approach.

A layered defense would include an X-ray scanner in the warehouse to search all packages and an IMS device at the front lobby checkpoint to detect the presence of opioids and synthetic drugs on visitors, staff, and incoming inmates to prevent drugs' entry. All inmates, visitors, and staff must go through the front entrance checkpoint, which includes metal detection and X-ray scanning for persons and property.

2. Technology is not a panacea for drug interdiction in correctional facilities but has the potential to provide an additional way to combat the evolving drug market.

The best security technology available can only augment dedicated correctional staff doing their jobs. It can never automate or supplant the correctional officer being vigilant in observation and search duties of inmates and institution environments, nor supervisory staff making regular rounds to ensure staff are executing those duties and confirming security equipment is operational and calibrated. Leaders of correctional agencies must deploy drug detection and interdiction technologies that fit their specific operational use case; they must take action. For some, that action may be screening all incoming postal mail to eliminate synthetic drug compounds; for others it may be using investigative staff deploying handheld drug analyzers on incoming periodicals and packages. Additionally, routine urinalysis of the inmate population, including testing that detects synthetic drug compounds, may provide the necessary surveillance to indicate whether interdiction efforts are effective.

3. Engaging the community is critical because awareness of interdiction strategies may act as a prophylactic measure and deter attempted drug smuggling and recidivism.

Robust technologies that effectively target drug contraband will discourage people from attempting to enter a facility with drugs. Furthermore, communities do not want the incarcerated population continuing to use drugs or drug-addicted inmates released back on the street. Engaging with the community to provide knowledge of the escalating drug issues observed within prison walls and the reasoning behind newly implemented drug interdiction efforts can build trust between the public and the corrections system. The most important education effort correctional leaders must take is modeling and implementing a zero-tolerance organizational posture toward drug introduction and use by inmates and staff. This posture includes deployment of appropriate drug detection and interdiction technologies; searches of inmates and staff; and situational awareness of every visitor, contractor, staff member, and inmate who enters their correctional facility.

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