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Drug Detection Strategies: International Practices within Correctional Settings

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Drug Detection Strategies: International Practices within Correctional Settings

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Executive Summary

Key words: *drug detection, interdiction, mandatory drug testing, drug detection dogs, ion scanner, x-ray technologies detection*

The current report was completed in response to the recommendations of both a focus group study on drug interdiction in Correctional Service Canada (CSC) institutions (Johnson and Allen, 2006) and the Independent Review Panel on federal corrections (2007) to examine and report on effective drug detection methods used in other correctional jurisdictions and provides insight into the efficacy of these methods. The intention is to assist in determining which interdiction technologies currently in use should be maintained and whether tools utilized in other jurisdictions could be considered for future use.

The report begins with an overall description of the most widely-used drug detection techniques and practices in selected jurisdictions, including their current use in CSC, and reports on their strengths and limitations. The second section of the report examines studies that have evaluated the effect that these practices have had on the drug situation in institutions in the jurisdictions examined.

The four main interdiction strategies reviewed are the use of canine detecting units, trace detection technology, bulk detection technology, and mandatory drug testing. All four strategies are currently employed by CSC. The canine units, bulk technology, and mandatory drug testing are all also used in the UK, US and Australia. Internationally, the use of trace detection technology was documented only in the United States, with the exception of one Australian institution.

Although numerous major correctional jurisdictions use detector dogs (e.g., US, UK, Australia, Canada), there is no conclusive research evidence to demonstrate that canine detecting units have a significant impact on reducing the availability of drugs in correctional facilities.

Trace detection technology has the capacity to identify many of the drugs of concern but research has demonstrated that trace detection is more sensitive to certain drugs (e.g., cocaine) than others (e.g., marijuana or drugs in pill form) and can generate high "false positive" rates. Research suggests that trace detection may reduce the availability of drugs in prison.

Urine is the biological specimen most commonly used to test for drug metabolites in a correctional setting. Overall, results on the effectiveness of urinalysis as a deterrent are mixed. Issues of concern include the ease of altering urine specimens and the variability in metabolite half-lives of different substances which makes drugs with a longer half-life (e.g., marijuana) easier to detect in urine than those that metabolize quickly (e.g., cocaine or opiates) and the potential that this may result in drug-using inmates switching to more serious drugs with a shorter half-life in an effort to avoid detection. However, unequivocal evidence to support this contention is not currently available.

Overall, it is clear that all of the drug detection tools examined are capable of detecting drugs. However, each method comes with certain benefits and drawbacks, sometimes in a

complementary fashion. What remains unclear is which tool or combination of tools yield the most accurate (low false positive and false negative), cost-effective results. Therefore, the ability to detect drugs and the impact of the use of these tools on inmate drug use, drug seizures, and drug smuggling (by inmates, staff and visitors) is currently unknown. Many of the evaluations examined were not easily comparable due to the inconsistent collection and presentation of data. Furthermore, the difficulty of acquiring accurate baseline data renders it difficult to determine the overall effect of any single interdiction method on the amount of illicit drugs entering the facilities.

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Introduction

Drug interdiction has been identified as a high priority for the Correctional Service Canada (CSC) in several key recent reports. In 1999, a Task Force on Security made several key recommendations regarding drug interdiction strategies with the aim of ensuring the safety and security of federal institutions (Correctional Service Canada, 1999). In support of CSC's Drug Strategy, the task force recommended that: searching and search plans be standardized and the importance of searching be communicated effectively; CSC install ion mobility spectrometry devices (i.e., ion scanners) at every principal entrance; CSC employ drug detection dogs at every institution; and CSC pilot the creation of "drug free" units or institutions. Several of these recommendations were formally adopted by senior management in early 2000 and, subsequently, each institution was equipped with an ion scanner, provided with access to a drug detection dog, and implemented a "drug free" unit or range. These activities were intended to enhance the institution's ability to detect drugs and increase drug seizures, as well as deter offenders from attempting to smuggle drugs into the institution and from using drugs once inside.

According to the results of an audit of drug interdiction activities (Correctional Service Canada, 2006), information regarding drug interdiction was being reported by the majority of institutions. However, it was not being collected or presented in a consistent manner. Specifically, each institution and region had created its own unique method of recording the results of each activity, which reduced the ability of the Service to analyze their effectiveness.

More recently, in 2007, the Government of Canada appointed an Independent Review Panel to examine CSC's operational priorities, strategies, and business plans as part of the Government's commitment to tackling crime. The resulting "Report of the CSC Review Panel: A Roadmap to Strengthening Public Safety" (Correctional Service of Canada Review Panel, 2007) noted the Panel's opinion that "the presence of illicit drugs in federal penitentiaries is not only unacceptable but results in a dangerous environment for staff and offenders" (Correctional Service of Canada Review Panel, 2007, p. vii). This "dangerous environment" includes assaults against offenders and staff, the transmission of infectious diseases, and a decreased ability to provide a safe and secure environment where offenders

can focus on rehabilitation (Correctional Service of Canada Review Panel, 2007). The Panel then made several recommendations to strengthen CSC's interdiction initiatives through measures such as:

- Enhanced perimeter control;
- Increased use of technology;
- More drug detector dogs;
- Better search of vehicles and individuals entering the penitentiary;
- Intelligence gathering and sharing.

With regard to the use of technology to aid in the detection of drugs, the Panel also suggested that the CSC look to other jurisdictions to find effective new approaches (Correctional Service of Canada Review Panel, 2007).

In order to implement the recommendations of the Independent Review Panel, CSC established a Transformation Team (Rodrigue, 2008) and has been taking a number of concrete steps to reinforce and improve its security measures. One of the first courses of action was to increase the number of drug dog detector teams, from 46 to 126, and to enhance the use of these teams both at principal entrances and throughout the institutions. In addition, searching capability within institutions has been enhanced, including accommodation areas, yards/perimeter, and common areas. Other practices that have also been implemented, or will be implemented in the near future, with the aim of eliminating drugs from CSC's institutions include:

- Hiring an additional 165 Security Intelligence Officers (SIOs), analysts and administrative officers.
- Subjecting every person entering a federal correctional facility (visitor, contractor, volunteer, or staff member) to the same searching routines.
- Establishing a national visitor database that will allow CSC to determine if a member of the public is visiting multiple institutions or many offenders.
- Requiring inmate visitors to schedule their visits in advance.
- Increasing the use of yard towers to reduce the incidence of drugs being thrown over penitentiary walls, while investigating the possibility of using advanced technology in the long term.

- Re-examining yard routines to ensure that yards are searched for drugs before offenders are permitted out for yard time.
- Improving the use of emerging technologies such as motion detectors

(Rodrigue, 2008. p. 12).

All of these recommendations were derived after extensive consultations with unions, managers and front-line staff.

Furthermore, the Report on Plans and Priorities for 2009-2010 continues the emphasis on drug interdiction and states that "CSC will focus on ways to eliminate the entry, trafficking and demand for drugs in its institutions." (Correctional Service Canada, 2009, p. 17).

These drug interdiction recommendations and practices are important when reflecting on the mission of CSC in promoting public safety. The proliferation of a drug trade within prison walls is a danger to those who work there as well as those who reside there, not to mention that it impedes the rehabilitation process of many addicted offenders (Gravett, 2000). Substance abuse is often a key factor related to offending and allowing drugs to penetrate correctional walls only exacerbates the addiction amongst offenders (Gravett, 2000). Thus, in addition to treatment efforts aimed at reducing substance abuse, preventing drugs from entering facilities will help encourage the successful rehabilitation of offenders and their safe re-entry into society at the end of their term.

Purpose of Report

The current report aims to respond to both the recommendations of a 2006 focus group study on drug interdiction conducted by the Addictions Research Centre as well as the Independent Review Panel on federal corrections (Correctional Service of Canada Review Panel, 2007). The focus group study was aimed at gaining opinions and insight from staff working directly and indirectly in the area of drug interdiction on key areas such as:

- perceived strengths and weaknesses of current drug interdiction strategies;
- drug interdiction topics requiring further research;
- the needs of staff not currently being met to best operate under current drug interdiction practices and policy.

One of the information gaps identified by staff who participated in the focus group was a review of drug interdiction policies and practices in other jurisdictions including a review of "best practices". As previously-noted, the Independent Review Panel also suggested that the technologies being used by other jurisdictions in the detection of drugs be examined. Furthermore, although the recommendations of the Task Force on Security (Correctional Service Canada, 1999) have been successfully implemented, a deeper, empirically-based understanding of the efficacy of drug interdiction practices may assist in identifying ways to improve their use. With new drug detection technologies frequently being introduced, it can be a challenge to determine which methods are best suited to CSC's mandate. In addition, considering the cost of some drug detection strategies, it is important to investigate whether these technologies and methods yield measurable results in terms of reducing the amount of drugs that enter facilities. In an attempt to meet these goals, a thorough review of the research literature was employed. Search engines such as MEDLINE, Psychology and Behavioral Sciences collection and SocINDEX were utilized. Furthermore, a search using the National Criminal Justice Reference Service (NCJRS) was completed as well as a general Google Search. In addition, prison system websites were examined in the countries considered in this report. Other sources of information included reference lists from reports and personal communications with key contacts.

This report examines evaluations and national drug strategy policies and practices from a variety of countries (Britain, Australia, and the United States of America) who share common goals with CSC in terms of drug interdiction in prisons. The report is organized into two major sections: first, a detailed description of the practices highlighted by the Task Force on Security and the Independent Review Panel - canine detecting units, trace and bulk technologies, and mandatory drug testing (MDT) - will be provided. The use of these tools in various jurisdictions, including CSC, will also be discussed. The second section of this report will describe various evaluations and pilot projects that have been conducted on the utilization of these interdiction methods and discuss the extent of empirical support for the impact of these different practices and technologies in reducing the presence of drugs in correctional environments. In addition, challenges that have been identified in the implementation of these different practices will be described.

Canine Detecting Units

In the late 19th century, the use of police canine units in the United States gained popularity due to their unique ability to follow scents (Scientific Working Group on Dog Orthogonal detector Guidelines [SWGDOG], 2006). In the beginning, canines were almost exclusively used to track human scents; however, authorities soon realized their potential to identify illicit drugs and chemicals present in various explosive devices (SWGDOG, 2006). The following section will examine the practices of canine teams internationally in detecting drugs within correctional facilities.

Classes of Canines

Internationally, two types of canine detector dogs are utilized in correctional environments. "Passive" drug dogs (PDDs) are kept on a leash under the control of a trained handler and are used primarily to search inmates and visitors (Gravett, 2000; US Department of Justice, 2000). They have the appropriate temperament so as to not react aggressively towards those they patrol. "Active" drug dogs (ADDs) are not used to search people, but are instead allowed off leash to search buildings, hallways, and outside perimeters for the same types of drugs as PDDs (Gravett, 2000). ADDs are also under the control of handlers and must have the appropriate temperament to not react to adverse working conditions, such as night shift work, disruptive inmates, and overall high noise levels (Gravett, 2000).

Currently, the Canada Border Service Agency (CBSA) has 69 canine detecting teams in use throughout Canada, and will occasionally lend out their teams out to other agencies, including CSC (Canada Border Service Agency, 2006). The CBSA currently employs only one ADD team; the rest of its teams are PDD. Teams are situated at the major ports and border crossings in Canada.

In Ireland, PDDs are available for all correctional institutions (Irish Prison Services, 2006). In Northern Ireland, the deployment of PDDs is used to screen visitors before entering visiting areas (Northern Ireland Prison Service, 2006). Visitors identified by a dog as possibly holding drugs are offered closed visits or are refused entry (Northern Ireland Prison Service, 2006).

Australia relies almost equally on canines and mandatory drug testing in terms of their overall drug interdiction strategy. Nation-wide, Australia has a ratio of drug dogs per inmate ranging from 1:148 to 1:350, and uses both Passive and Active drug dogs within their institutions (Black, Dolan, & Wodak, 2004).

Skills

The mobility of dogs and their unique ability to detect a wide variety of substances directly to the source are factors related to the long history of use of canine detection units worldwide (Gravett, 2000; US Department of Justice, 2000). A canine can search a large vehicle in five minutes, a small vehicle in one minute, and over 2,300 kilograms of mail in approximately thirty minutes (US Department of Justice, 2000). A canine's sense of smell is equivalent to some of the most modern trace detection technologies and they can be trained to detect any type of drug, be it illicit or prescription (Gravett, 2000). In addition to drugs, canines have been used for explosive identification and mobile phone detection (Blakey, 2008).

Although canines as a group are known to have the capability to detect any drug, an average of nine substances appears to be the maximum number any one drug dog can accurately detect without having its detection abilities compromised (US Department of Justice, 2000). While an ion scanner can detect tiny amount of substance (e.g., a nanogram of cocaine on a piece of paper currency) the shortcoming is that often such small traces of drugs do not lead to a large enough source to amount to a dosage (US Department of Justice, 2000). Canines, however, are trained to recognize not only the drug, but the impurities that accompany the drug. This necessitates that a large enough amount of the drug must be present for the canine to detect it, but that the sample is not too small to evade its senses (US Department of Justice, 2000). Thus, it is unlikely that a molecule of a drug isolated from a larger source, such as those present on paper currency, would be detected by a canine.

Training and Pedigrees

In the United States, there are a number of agencies that train drug-detecting canines. The breed favoured for drug detecting is the Labrador Retriever, followed by the German Shepherd, the Golden Retriever, and German Short Hair Pointer (US Department of Justice, 2000). Originally, dogs from animal shelters were recruited for detector dog programs. However, it was determined that only 1 out of 1,000 dogs from shelters possessed the skills needed to become a drug-detecting canine and, consequently, several jurisdictions now use specially-bred dogs (US Department of Justice, 2000). For example, the Australian Customs Service developed a Labrador Retriever breeding program to create a pool of canines with the desired qualities needed for detection (US Department of Justice, 2000).

In Canada, canines used by the Canada Border Service Agency (CBSA) are trained by the Detector Dog Learning Service (CBSA, 2006). The choice of canine for the CBSA includes the Labrador Retriever, with respect to narcotic detection, and the Beagle, for food and plant detection (CBSA 2006). The Detector Dog Learning Service offers ongoing advice to handlers and is also responsible for the annual technical evaluation of the canine units (CBSA, 2006).

Currently, in England's National Offender Management Service (NOMS) there are approximately 750 drug dogs in service that are split between patrol dogs (Alsatian type), active dogs, and passive dogs (either Labradors or Springer Spaniels) (Blakey, 2008). Dog trainers must complete programs that lead to accredited certificates of qualification. Specialist drug detecting dogs attend an annual re-training seminar of 40 hours to further their development and refresh their drug detecting techniques (Gravett, 2000). Dogs that fail this reassessment process are taken out of service for three months and, if no improvement is seen during this timeframe, removed from service altogether (Gravett, 2000).

Use of Canine Detecting Units in CSC

In 2001, a Detector Dog Program was established by the Correctional Service Canada as part of a strategy to curb the flow of drugs into federal institutions. Prior to this time, detector dogs were used through localized initiatives and programs. The CSC now has a fully coordinated and standardized national program, ensuring that all CSC institutions across Canada (with the exception of Healing Lodges) have access to the detector dog service.

All of CSC's dog and handler teams are trained and certified at the Canada Border Services Agency in Rigaud, Quebec. As part of CSC's commitment to maintaining and improving the skills of the detector dog teams, they are required to re-certify on a yearly basis.

Drug detector dogs in CSC are used in searches of persons, cells, vehicles, and other areas of the institution. Furthermore, all inmate articles and effects may undergo searching prior to being issued to the inmate. All mail and parcels received at institutions are searched by manual or mechanical means (Correctional Service Canada, 2001). This may include the use of detector dogs, X-ray machines, or ion scanners.

Benefits and Limitations

The use of canines in correctional facilities is beneficial in that they are less likely to detect minute traces of a substance as compared to trace detecting devices such as ion scanners (US Department of Justice, 2000). One of the limitations, however, is the short duration in which canines may work (approximately 1 hour) before needing a break (US Department of Justice, 2000). As well, a drug detecting canine is unable to inform its handler which drugs it has discovered, only that detection has been made (US Department of Justice, 2000).

According to the UK's Her Majesty's Prison Service (HMPS) Good Practice Guide, the use of canines is favourable inside the penitentiary walls rather than outside where wind and adverse weather can affect the strength of a scent (Her Majesty's Prison Service (HMPS), 2003). In addition, a report from the University of Durham examining drug smuggling in correctional facilities highlighted that the majority of complaints made towards the use of canines came from those who were searched outside the prison in view of the public (Morgan, Hornsby, and Hobbs, 2005). Visitors felt on display, humiliated, and stigmatized as drug-dealers when the canines identified them as possibly holding drugs. The report noted that this issue could easily be resolved by moving such searches into a private area inside the institution (Morgan et al., 2005).

When training the canine, it is essential to ensure that the person or object concealing the drug is varied so the dog learns to recognize the drug and not the scent of the person or object (HMPS, 2003). Her Majesty's Prison Service (2003) also suggests that employing the

dogs in an unpredictable pattern prevents others from smuggling contraband between shifts. In the United States, use of canines around people is rarely employed due to a common fear of dogs, as well as, in the instance of ADD, the possibility that the canine may bite (US Department of Justice, 2000).

Trace Detection

Trace detection refers to the practice of identifying microscopic particles of different substances. Above absolute zero, all particles, regardless of how small they may be, give off a vapour. The amount of vapour is related to the amount of the substance found within the sample particle (US Department of Justice, 2000). When relating this to trace detection, a person in contact with a large quantity of a prohibited substance (i.e. drugs), is very likely to have "particulate" or particles of that substance on their person. By collecting a sample via vacuum or swiping from clothing, skin, hair, or personal items, the trace detector can identify whether or not a person or object has been in contact with the substance of interest (US Department of Justice, 2000). A vacuum model resembles a small handheld 'dust buster' which sucks up particles into a filter and then processes them. Similarly, the swiping technique directly sweeps the particles onto a filter, which are subsequently processed for vapour residues. Powdery substances seem to give off the greatest particulate, thus cocaine and heroin are the most common drugs identified through this method (US Department of Justice, 2000). However, subsequent search methods must be utilized in addition to trace detection as the age of the drug, size, and packaging will all affect the quantity and quality of vapour it gives off (US Department of Justice, 2000).

Three forms of trace technology are the Ion Mobility Spectrometry, Mass Spectrometry, and Mistral Spray. The details of each are described below.

Ion Mobility Spectrometry (IMS)

An Ion Mobility Spectrometer (IMS), also known as an Ion Scanner, is a type of trace detecting device that measures the deflection of particles after they are exposed to an electric field. The speed in which the particles move helps to determine the type of larger particle from which they came (US Department of Justice, 2000). In a correctional setting, the Ion Scanner may be placed at the front entrances or within the mail room of the prison. Here, it is possible to swipe any object— a piece of mail, a driver's license, a wallet, or a purse, for example— and submit the sample to the IMS unit. Within seconds the IMS unit identifies whether or not there are drug particles or vapors present on the item in question. Some models of IMS units include the desktop model Barringer IONSCAN Model 400B, and

IonTrack's ITEMIZER, as well as the handheld Barringer SABRE 2000 and IonTrack's Vapor Tracer (SCA Inc., 2001). A study by Sandia National Laboratories gave excellent reviews to an Ion Scanner known as the Hound II system which is portable, accurate and user friendly; however at a cost of $44,000, it is may not be considered affordable (Falcon, 2005).

Mass Spectrometry (MS)

Mass Spectrometry (MS) differs somewhat from Ion Mobility Spectrometry in that it vaporizes ions and records the deflection of particles while simultaneously recording the molecular mass (Sandia National Laboratories, 2006). It is through the mass of a particle that identification of various particulates can be established (Sandia National Laboratories, 2006). Due to the complex nature of its particle detection, this type of trace detector is a stationary piece that is considerably larger than an Ion Scanner. The time required to measure the mass of any given particle (from milliseconds to minutes) is also slightly longer for MS devices in comparison to IMS (Sandia National Laboratories, 2006). While there are some advantages to Mass Spectometry including that the high sensitivity rate, the ability to identify unknown particles, and the fact that it does not require a radioactive source, its main disadvantage is that the machinery required is both bulky and expensive. One model, the Viking Spectra Trak Gas Chromatograph/Mass Spectrometer weighs 68 kg, and costs approximately $70, 000 US (US Department of Justice, 2000). Research has been undertaken to design a miniature MS device (US Department of Justice, 2000).

MS technology could potentially be used in a correctional environment to identify particulate collected from mail or visiting centres. At the moment, however, these devices are only found in laboratories that employ skilled technicians able to calculate which particles correspond to the indicated mass.

Mistral Security

This method of drug detection is both economically and operationally feasible. Swiping an item's surface and then exposing the swiping pad to a specific combination of mistral chemicals can identify four major substances: crack/cocaine and related substances, heroin and related substances, methamphetamines and secondary amines (such as epinephrine), and marijuana and other cannabinols (US Department of Justice, 2000).

‘Cannabispray’ is a common mistral spray used for the identification of cannabis, hashish and related products and ‘Coca-Test’ is used for detecting cocaine, crack and other related drugs (SCA Inc., 2001).

The context in which the mistral spray is administered requires that the substance to be detected be known. Specifically, an individual needs to choose the correct product to test for a specific drug metabolite. This is challenging in a prison setting as staff are often unaware for which drug they are searching. However, if there is a suspicion that ‘X drug’ was being used by a certain inmate, a mistral spray may prove to be advantageous for a quick search of that person’s cell to identify the presence of any trace elements.

Use of Trace Detection Methods in CSC

Ion mobility spectrometry – IMS - devices are used within CSC institutions for non-intrusive routine searching of inmates as well as mail and parcels received at institutions. Mass detection devices and Mistral Spray are not utilized within the CSC. The IMS devices used within CSC are the IONSCAN and the ITEMISER (Correctional Service Canada, 2004). These devices detect minute traces of substances programmed into the unit. Within six seconds after samples are collected, by wiping or vacuuming objects and then placing the filter or swipe into the unit, the results are displayed. Threshold or alarm levels have been determined for the devices being used within CSC institutions.

Benefits and Limitations

Efficiency and portability of IMS units have made them a marketable tool in combating drug supply. The device is relatively user friendly, typically requiring only a few hours of training (US Department of Justice, 2000). Additionally, in comparison with other trace detection devices, IMS machines are moderately priced, and their annual maintenance costs are low (US Department of Justice, 2000). In addition, the scan time is measured in seconds, with positive detections alerting the operator through sound and visual indication that a certain drug has been identified (US Department of Justice, 2000). Lastly, most of the IMS devices are portable enough to fit inside a mid-sized vehicle for easy transport between facilities (US Department of Justice, 2000).

Unfortunately, IMS is not able to trace a drug to its source, unlike drug detecting canines (SCA Inc., 2001). Another drawback of IMS technology is the fact that it measures drug particulate down to the nanogram, identifying 'false positives' frequently (SCA Inc., 2001). Its oversensitivity needs to be buffered by employing other detection strategies, such as manual searches, or drug detecting canine units (National Law Enforcement and Corrections Technology Centre (NLETC), 2002).

Being a radioactive instrument, Ion Scanners require penitentiaries in the United States to apply for a license from the Nuclear Regulatory Commission (US Department of Justice, 2000).

In their report, the National Institute of Justice mentioned that they believed a thirty second scan time for IMS was too long a time to wait for busy commercial areas such as border crossings or airports (US Department of Justice, 2001a). This holds true for a prison mailroom as well, which has to process upwards of 3,000 pieces of mail a day (Butler, 2002). However, for a prison visitor's area, its use could be feasible.

The use of trace technology (IMS and MS) is intended primarily for prison mail rooms and visiting areas. However, there is a concern that cross-contamination is more prevalent than originally foreseen. Because trace technology can detect as small as one millionth of a gram, and particles of powdered drugs can be dispersed easily, a threshold of contamination must be established (National Criminal Justice Reference Service (NCJRS), 2008).

An evaluation report from Pima County prison in the United States found that when 'swiping an object' to pass through the ion spectrometry detector, there is a chance that the side/part of the object swiped was never in contact with a prohibited substance (NCJRS, 2008). Thus, knowing where to swipe on any given object is paramount. Difficulties also arise when operators are presented with a large quantity of objects to process but are unsure where to take a sample to ensure maximum efficiency in procuring a positive result.

When the IMS unit prints out its analysis, usually in a chart form, there seems to be little discrepancy between the charted graph of heroin and the chart of marijuana (US Department of Justice, 2001b; Butler, 2002; SCA Inc., 2001). More specifically, their graphs appear almost identical and are therefore difficult to differentiate. While these are two substances that should obviously never be allowed into correctional settings, there could be

potential problems if marijuana use would ever be legalized and there is an inability to distinguish between it and heroin. Furthermore, the fact that the ion spectrometer differentiates poorly between these two substances raises the question of what other substances, illicit or not, could be confused with other drugs such as cocaine, methamphetamines, or ecstasy.

Other studies (Dussy, Berchtold, Briellmann, Lang, Steiger and Bovens, 2008; Shaw and Harrington, 2000) have demonstrated that results for IMS technology may not be as clear-cut as hoped. For example, Shaw and Harrington (2000) found that the Barringer Ionscan may not confirm the existence of methamphetamine when a sample is contaminated with nicotine. In another study, Dussy and colleagues (2008) discovered that, in certain concentrations, several detergents gave false positive results for heroin. They also noted that other substances such as atropine and papaverine[1] interfered with the detection of cocaine and heroin. However, in both cases, the authors indicate that these potential limitations of IMS methods of detection may be offset by altering the chemometric method for analyzing data collected with the IMS instruments[2] (Shaw and Harrington, 2000).

The fact that powdered or liquid forms of drugs are the forms best detected by IMS units poses a problem when prisons also need to detect drugs in pill form. Pills, which are often well packaged, would be extremely difficult to detect by IMS units (Butler, 2002).

Although Mass Spectrometry can be more accurate than IMS, it may not be suitable for correctional purposes due to the time it takes to transport the sample and analyze the results as well as the bulk of the machines and the training required to use them effectively. (Sandia National Laboratories, 2006).

With respect to the Mistral Spray, drug specific paper is needed to swipe the surfaces of an object and then must be treated with the correct chemical agents. In reality, correctional workers do not necessarily know which drugs are present on any given object, so it renders this method somewhat less efficient (Butler, 2002).

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[1]According to the authors "atropine has been fournd as an admixture of cocaine in recent cases all over Europe and papervine is a natural accompanying compound of heroin, but to {their} knowledge neither substance is available on the public market" (Dussy et al., 2008, p. 108).

[2] SIMPLISMA – SIMPLe-to-use-Interactive Self-Modeling Mixture Analysis – was used on data from a Barringer Ionscan instrument to overcome a real-world problem. SIMPLISMA reduces noise, resolves overlapping peaks, and helps detect peaks that may not otherwise be discernable (Shaw and Harrigton, 2000).

Price could also be a limitation as devices can cost upwards of $45,000 for an IMS unit with annual maintenance fees ranging from $500 to $700 while an MS unit can cost approximately $70,000 (NCJRS, 2008; Sandia National Laboratories, 2006).

BULK DETECTION

Bulk detection specializes in identifying larger objects being smuggled into prisons, such as weapons, cellular telephones, or large quantities of drugs (Wright & Butler, 2001). Bulk detection techniques may be employed on a person (as seen in airport security areas) or on an object. Methods used in correctional facilities include Backscatter X-Rays and Computed Tomography Scan (CT scan) X-Rays.

Backscatter X-Ray

These devices, although originally developed for medical purposes, have proven to be useful in identifying certain items hidden within parcels, luggage, storage bins, etc. Backscatter Image X-Rays are devices employed outside the medical community for the detection of prohibited objects (US Department of Justice, 2001b). For correctional contexts, this technology is more effective in searching for larger objects (e.g., weapons being smuggled into the prison), but can also be used for identifying significant quantities of drugs hidden in packages or parcels (Wright & Butler, 2001). Backscatter X-Rays can also be utilized to examine visitors (US Department of Justice, 2000). Currently, the Federal Bureau of Prisons in the United States employs these devices in some of its prison mailrooms to help identify prohibited materials (Butler, 2002).

With respect to the use of Backscatter X-Rays for searching people, both a front and back X-ray are taken and then projected onto a screen. A qualified operator can be trained to differentiate between organic materials (less dense) and metallic materials (more dense), and between the density of two organic compounds in the case of people carrying narcotics on their person (US Department of Justice, 2000). Consequently, a Backscatter X-Ray machine could be used to screen for drugs in a prison by stationing them by the front entrance to scan visitors and in the prison mailroom to scan parcels and letters (NCJRS, 2008). Similarly, the Federal Bureau of Prisons, in conjunction with the National Institute of Justice, employs X-ray machines in the visiting centres of some of its institutions (Butler, 2002).

The AS&E MODEL 66Z is a portable X-Ray machine on wheels which is useful for prison mailrooms and prison checkpoints. It efficiently processes small packages, mail, and hand-held luggage (SCA Inc., 2001).

Computed Tomography Scan X-Ray

A computed tomography scan (CT scan) takes a variety of X-rays in different positions to compile a three dimensional image of an object (SCA Inc., 2001). CT scanners, such as InVision Technologies' CTX 2500, are useful in locating the exact position of the object in question in addition to its mass (US Department of Justice, 2000). These types of X-rays are exclusive for use with objects that are not bigger than a large suitcase.

Use of Bulk Detection Methods in CSC

CSC employs tools such as X-ray machines for the searching of personal effects of staff and visitors entering federal institutions. In addition, parcels that enter CSC facilities through mail delivery are also subject to X-ray screening. The use of X-ray technology within CSC is dependent on the individual search plan of the institution, but national policy dictates that all maximum and medium security facilities will, at a minimum, conduct an identification, sign in, X-ray and/or visual examination of baggage, and metal detection of all persons (including staff) entering facilities (Correctional Service Canada, 2001).

Benefits and Limitations

The primary benefit of bulk technology seems to be its ability to identify large quantities of contraband hidden in larger parcels (US Department of Justice, 2001b). However, X-rays are not able to see inside body cavities, which are a common route to smuggle drugs into prisons (US Department of Justice, 2001b; Gravett, 2000). As well, similar to the concerns regarding trace technology mentioned above, one must know the location of the object to be detected and therefore the location where the X-ray should be taken. Additionally, technologies such as CT scans can only be used on objects no larger than a piece of luggage (US Department of Justice, 2001b).

Bulk detection machines are less portable than trace detection devices and are typically much more expensive. For example, Backscatter X-ray machines cost approximately $400,000 and CT X-Rays can cost upwards of $1 million (US Department of Justice, 2001b). These devices are also less sensitive than trace detectors (Wright & Butler, 2001). Furthermore, bulk detection technologies are more difficult to operate, and require

expertise with the functioning of the Backscatter and Computed Tomography scanning equipment, as well as training in interpreting the digital results (SCA Inc., 2001).

Although concern regarding exposure to x-ray radiation has been raised, there is no potential threat to the health of an average person but there may be some risk to people using personal medical electronic devices such as cardiac pacemakers, cardiac defibrillators, etc. (US Department of Justice, 2001b).

Finally, privacy concerns have been raised regarding the use of Backscatter X-ray machines, as these devices are able to give a full anatomical view of a person (US Department of Justice, 2001).

Mandatory Drug Testing

In addition to interdiction techniques aimed at restricting the flow of illicit substances into correctional facilities, it is also important to have mechanisms in place to monitor the effectiveness of these measures, as well as track drug activity within an institution. In correctional facilities, Mandatory Drug Testing (MDT) is an effective tool in determining the percentage of inmates using drugs. Specifically, MDT allows correctional officers to randomly select a percentage of their prison population to undergo drug testing. On the basis of this data, it may be possible to extrapolate the rate at which drugs are entering facilities.

The random testing of inmates is only one of the methods of selection for MDT. Those who have been previously caught using or bringing drugs into the facility are often selected to provide a sample, as are those who are returning from day parole, or lengthy periods of time outside of the institution (Gravett, 2000). Various correctional programs include participation in voluntary drug testing, where the inmate is required to submit a clean urine sample as mandated by the program (Gravett, 2000). In addition, in the jurisdictions examined, if there are reasonable grounds to lead an officer to believe someone is abusing drugs within the institution, a urine sample can be requested (Gravett, 2000).

Four main biological specimens that are typically used for MDT are urine, blood, hair and saliva. When a person consumes a drug, its decomposition within the body reduces it to its respective metabolites and these metabolites act as fingerprints identifying the drug consumed. Since the metabolites are excreted through the body via urine, collecting urine samples provides correctional staff with a concentrated base of possible drug metabolites with which to determine the presence of drugs in their facilities (Makkai, 2000). With increasing use of drugs over a long period of time, urine will become more concentrated with metabolites (Makkai, 2000).

Metabolites are not only found in urine, they are also present in blood, which is filtered through the liver and kidneys eventually transferring the metabolites into urine (Makkai, 2000). Blood testing is a more intrusive and costly process than urine screening. Great Britain, Australia and Canada do not use blood testing in their prison systems (Hughes, 2000; Makkai, 2000). One advantage of using blood for testing is that it is more difficult to alter blood samples than urine samples, however, urine samples allow for detection of

metabolites for a longer period of time and are much easier to collect than blood. In addition to blood and urine screening, hair assays are gaining popularity in non-correctional settings. Drug metabolites are excreted into hair which can act as a kind of calendar, mapping the time frame of drug use. This occurs because as the hair grows, the metabolites become fused with the hair (Lewis, 2001). Although hair testing has the advantage of providing a much longer timeframe in which to observe whether or not drugs have been ingested, are difficult to intentionally alter (Lewis, 2001) and are easy to store and ship, there are several disadvantages that renders it less useful than urine testing in a correctional environment. For example, given that hair does not grow at the same rate on all individuals and hair thickness and growth rates seem to be ethnically determined, the chances of a positive result are inconsistent. Furthermore, those without head hair or choose not to have head hair are another challenge and the use of body hair is even more unpredictable (Feucht and Keyser, 1999). In addition, it is possible to test positive for drugs for having just been in the proximity of drug use but not necessarily using the drugs (Crouch, Day, Baudys, & Fatah, 2005).

Finally, there is research suggesting saliva is a favourable biological specimen for drug testing. It is possible to detect ethanol, methamphetamines, amphetamine, barbiturates, benzodiazepines, heroin, cocaine, and cannabinoids in oral fluid samples (Crouch et al., 2005). This form of MDT relies on particles left in the mouth when a substance is smoked or orally ingested and remnants are left in the oral cavity and are trapped by saliva (Lewis, 2001). Taking and testing saliva samples is gaining popularity in the world of drug testing but it has a number of limitations that render it ineffective in an institutional setting. For example, saliva testing is only useful for testing substances that have been smoked or ingested. In addition, on average, testing saliva is effective within twelve hours after a drug has been ingested or smoked limiting its value in a testing program (DuPoint & Saylor, 2003).

A review of the literature indicated that urine testing is the only type of mandatory drug testing that is regularly used within correctional settings. This may be due to the disadvantages and challenges currently met with by other forms of testing.

Urine

Urine testing, also known as urinalysis, is by far the most heavily relied upon MDT technique. In Britain, inmates are required to provide a urine sample under the following circumstances:

- *Risk Assessment – they are being considered for a position of trust*
- *On Reception - when inmates return from any outside activities*
- *On Reasonable Suspicion- when correctional officers have any reasonable ground in which to believe consumption of drugs has taken place*
- *The Frequent Test Programme – those who have previously misused drugs will be tested frequently to ensure they are no longer using*
- *Random Testing- a computerized list randomly draws 5% of the prison population to be tested each month (Gravett, 2000).*

There are then three stages to testing an individual's urine sample. The first is the *screening test*. These samples sent away to a laboratory where they are put through immunoassay - a straightforward procedure which will identify whether or not the sample contains drugs (Gravett, 2000). It functions by using antibodies to detect the presence of drugs in a sample (Makkai, 2000). Though the screening test identifies whether or not drugs are present, it does not identify *which* drug or drugs are present, or more precisely, which metabolites are present (Makkai, 2000). The immunoassay utilized by Britain and Australia is the Enzyme Multiplied Immunoassay Technique (Makkai, 2000). In Britain, if the result comes back as positive, the individual will be charged. Should they plead not guilty; their proceedings will be stayed until a *confirmation test* has been issued on the sample.

A confirmation test utilizes gas chromatography and mass spectrometry technology, which essentially results in a more accurate and reliable breakdown of the components in the urine (Gravett, 2000). This process is so precise that it can distinguish between drug misuse and prescribed medication (Gravett, 2000). According to statistics gathered from Her Majesty's Prison Service (HMPS) in Britain, 89% of screened positive samples are confirmed positive through the confirmation test stage (Gravett, 2000).

Finally, within HMPS, an *Independent Laboratory Analysis* can be conducted for individuals who maintain their innocence with respect to positive drug testing. By paying £100 the individual may have their specific sample sent off to a private lab for analysis.

According to HMPS this three step process is imperative for maintaining a due diligence towards those incarcerated. In order to periodically test the reliability of MDT, HMPS operates the Blind Performance Challenge Program, whereby random urine samples, both spiked positive and control, are sent from various prisons to determine if their MDT laboratory is performing adequately (Gravett, 2000).

Australia uses a similar protocol with their MDT program where samples are sent away to a laboratory for testing. Regardless of the type of biological specimen collected, a positive screening test is always followed by a mandatory confirmation test (Rouen, Dolan, and Kimber, 2001). The screening tests use the immunoassay method, and the confirmation test uses chromatography (Rouen, Dolan, and Kimber, 2001).

Although the process of testing the samples may vary slightly from jurisdiction to jurisdiction, one consistency is that any positive samples found are kept and stored for future examination (DuPoint & Saylor, 2003; Rouen, Dolan, and Kimber, 2001; Gravett, 2000).

With respect to potential shortcomings of urine testing, one of the primary concerns is the varying length of time during which different drug metabolites are detectable in urine. **Table 1**, which shows the Australian standards of drug testing for six classes of drugs, highlights this issue.

Table 1
Biological Half-life of Consumed Drugs in Urine

Class of Drug	Cut-off Levels	Length of Time Detectable in Urine (Average)
Sympathomimetic Amines[1]	300ng/ml	2-4 days
Benzodiazepines	100ng/ml	2-14 days
Cannabis	50ng/ml	Up to 30 days
Cocaine	300ng/ml	24-36 hours
Opiates	300ng/ml	6 hours to 3 days
Opiates (Pure)[2]	300ng/ml	2-3 days

1 Sympathomimetic Amines includes Amphetamines and Methlyamphetamines.
2 Pure opiates refer to the active ingredients of opiates namely, Codeine and Morphine.
Source: *Drug Use Monitoring in Australia (DUMA): Drug Detection Testing* (No. 25), by T. Makkai, 2000, Canberra, ACT: Australian Institute of Criminology.

The large amount of variability is influenced by factors such by the quantity of drug taken, combinations of drugs taken at the same time, deliberate attempts to flush the metabolites out of one's system (by over hydrating for example), and a person's own metabolic process (Makkai, 2000). When trying to determine the rate at which drugs are entering facilities, the validity of the test results can become compromised by these varying drug half lives. Specifically, due to the fact that marijuana can be detected for up to 30 days following use, the probability of monthly MDT identifying marijuana as opposed to cocaine (which is typically detectable for only 24-36 hours) is significantly higher, regardless of the actual level of use. In addition, some have raised the concern that these differing half lives may encourage inmates to shift from soft drugs, such as marijuana, that remain in the system for longer, to hard drugs, such as heroin or cocaine, which are metabolized more quickly and thus less likely to be detected (Gore, Bird, and Ross, 1996). Evidence supporting this hypothesis is limited.

One of the biggest challenges with respect to urinalysis is the possibility that results may be tampered with and therefore distorted (Cramer, 2005). An analysis of the available masking products that can be purchased online by the United States Government Accountability Office (GAO) revealed that drug masking paraphernalia is widely available

on the internet (Cramer, 2005). Even though incarceration makes it difficult to acquire these masking products, it may still be possible to add dilution substances to urine, take cleansing substances to detoxify urine samples, use adulterants to urine to destroy or alter the chemical make-up of the drug, or purchase synthetic urine to switch with the real sample (Cramer, 2005). For example, an inmate in a British Pilot project on MDT revealed that he would put little pieces of soap underneath his fingernails and then when he turned to provide his sample would flick the soap morsels into his sample (Hughes, 2000). This, in turn, contaminated the sample, and when he was asked for another sample, his system was clean of the drug.

Another concern with respect to urinalysis is the cut-off level. The cut-off level refers to the minimum amount of drugs that needs to be present in order for a sample to be considered positive (Makkai, 2000). The establishment of cut-off levels are necessary to minimize potential false positives that could occur if an individual may have been in the vicinity of drug use, but did not actively participate in the use (Makkai, 2000). Conversely, if a test does not establish a certain sensitivity level, the risk of having more negative samples which are actually positive is higher (i.e., false negatives) (Makkai, 2000). Therefore, it is beneficial to have a sensitivity rate that maximizes the highest number of detections and, although there may be higher risk of false-positives, they can subsequently be challenged through confirmatory tests or third party tests (Makkai, 2000). The concern lies in knowing where to set the cut-off level. Every person will absorb drug metabolites at different rates, so it becomes difficult to determine a universal level that is not too lenient on some and too harsh on others (Makkai, 2000). These factors must be considered in interpreting urinalysis results, and in determining the most efficacious cut-off level, which has the highest sensitivity rate possible without compromising on the rate of false negative.

Use of Urine Testing in CSC

Although other methods of drug testing are available within Canada urinalysis is the only type of mandatory drug testing utilized within CSC institutions. Urinalysis was first introduced into CSC in 1985 as a measure to detect drug use by offenders, assess baseline levels of current drug use, identify trends in drug use behaviour, and serve as an identifier for offenders who may be in need of treatment (MacPherson, 2001). Random urinalysis testing was introduced across the country in 1995.

Currently, urinalysis in federal institutions can be requested for several reasons according to sections 54 and 55 of the CCRA (1992). Offenders can be asked to provide a sample when there are reasonable grounds to suspect the offender is using or has used in the recent past; if they are participating in a program or activity subject to community contact and this contact may provide the offenders with access to intoxicants; or as a condition of participation in a substance abuse treatment program. Finally, offenders are required to provide a urine sample if their name has been chosen to participate in the random testing program.

Commissioner's Directive 566-10 (Correctional Service Canada, 2008c) provides instruction on the use of random urinalysis testing in institutions with the overall objective of establishing the procedures for the collection, storage, shipment, and testing of urine samples in institutions. Each month a random sample of 5 % of the total incarcerated population is selected for testing by the National Urinalysis Program Coordinator.

Similar to Britain and Australia, the Correctional Service of Canada (CSC) has a specific and regulated manner of testing urine samples for the purpose of urinalysis. Cloned Enzyme Donor ImmunoAssay (CEDIA) reagents are used by an independent laboratory for the initial screening of several drug classes. All presumptive positive tests results from the initial screening must be subject to confirmation tests. For confirmation, CSC uses gas chromatography and mass spectrometry technology (GC-MS) similar to the practices of Britain and Australia. GC-MS eliminates the possibility of false positives that may be found in immunoassay screening tests.

According to policy, offenders are subject to disciplinary action if they test positive or if they refuse a request to submit a urine test. The consequences for offenders found guilty of taking an intoxicant or refusing to provide a urine sample may include: warnings, loss of privileges, restitution orders, fines, performance of extra duties, segregation from other inmates, transfer to a higher security environment, withholding or refusing recommendations for temporary absence, or referral to a substance abuse program.

Recently available analyses of data indicate that approximately 7.8% of random urinalysis tests occurring in 2009-10 were positive for one or more drugs. Among these, the most common types of drugs for which offenders tested positive were thc (71%), opiates (e.g., morphine/codeine metabolites) (14%), methadone (9%), and cocaine (4%). **Evaluations**

The following section reviews the current evaluations that have taken place in the area of drug interdiction in prisons. Although the various methods discussed have been shown to detect drugs in prison, it is important to determine whether or not they have any effect on the quantity of drugs entering prisons as well as their utility in assisting to identify the ways in which drugs enter correctional facilities.

With respect to evaluating drug interdiction efforts, it is important to note that an increase in drug seizures does not necessarily indicate a successful interdiction strategy, and conversely, the absence of seizures does not mean that the strategy is not working (US General Accounting Office, 1990). Since the actual amount of drugs entering the country (or prisons) is never known, it is difficult to know whether smugglers have been deterred or rather just forced to become more creative.

Perhaps due to this issue, there are only a small number of published evaluations examining the efficacy of drug interdiction practices. The few studies and evaluations that could be found are described below.

Drug Detecting Canines

The majority of research on the utility of drug detecting canine units has been conducted outside of a correctional context.

In the United States, a 1996-1997 customs office report revealed that canines were responsible for 9,220 seizures of narcotics and other dangerous drugs (US Department of Justice, 2000). The estimated value of the 189,892 kg of marijuana, 21,926 kg, of cocaine, 402 kg of hashish, 148 kg of heroin, and 97 kg of opium seized from canine detection was $3.1 Billion (US Department of Justice, 2000).

In Canada, figures from the Canada Border Services Agency demonstrate that the use of canines has contributed to drug detection. Between 1999 and 2005 approximately $983 million worth of drugs were confiscated as a result of canine detection in 3,339 separate seizures (Canada Border Service Agency, 2006). While there was a reduction in the overall number of seizures during the last three years reviewed, the quantities of narcotics seized were worth significantly more than in previous years (Canada Border Service Agency, 2006). Officials have questioned whether this reduction in instances of seizures is due to the

increased use of canine detection units over the years, which may have resulted in smuggling operations moving to less high-traffic ports where canines may not be present (Canada Border Service Agency, 2006).

The reduction of seizures with the Canada Border Service Agency has also been related to innovative tactics used by traffickers to hide the scents of drugs (Canada Border Service Agency, 2006). These tactics, such as improving the plastic wrappings on marijuana or using different storage containers (heavier, metallic), are being discovered as larger quantities of narcotics are being seized (Canada Border Service Agency, 2006). Although the evidence of their effectiveness is not empirically documented, these efforts to fool canine senses would not be employed if the canines were not proving themselves effective against the importation of drugs.

One study in New South Wales examined the results of a drug detection operation conducted by the police. Drug detection dogs were used to screen the outside of vehicles stopped at a check point or within search areas located in certain areas of New South Wales. This operation included 13 static operations (a fixed checkpoint at which police stop vehicles for screening) and 10 mobile operations[3] (involves police moving around to search areas rather than remaining static at a fixed checkpoint). They were also used to enter and screen the luggage holds of coaches and cargo areas of commercial vehicles such as trucks (New South Wales Ombudsman, 2008). Police officers applied for an authorisation to conduct a drug detection operation and would be granted authorisation if the senior police officer was satisfied that there were reasonable grounds to suspect that the proposed search area was being used for drug trafficking. During the one-year review period, a total of 7,527 vehicles were stopped and screened by drug detection dogs, and a total of 591 vehicles (8% of all vehicles stopped) and 537 persons were searched. However, the rate of finding drugs after an indication by a drug detection dog was 23%[4] (133 of 591). The authors cited a number of possible reasons for the low rate of finding drugs including: (1) that drug detection dogs

[3] Mobile operations were added after police acknowledged that the results of static operations were 'disappointing'. These operations were smaller in scale, shorter in duration and more flexible and mobile. It was hoped that mobile operations would be less predictable and more difficult to evade.

[4] Similar results were found during another police operation in border areas. Specifically, a total of 3,809 vehicles were stopped and screened by drug detection dogs, of which 291 vehicles (approximately 8% of all vehicles stopped) and 411 persons were searched, and a rate of drug detection of approximately 31% (89 of 291) after an indication by a drug detection dog was found.

detected cannabis smoke among those who had recently used or been around people using cannabis, (2) that the dogs had detected prescription drugs, (3) that the drug detection dog made a mistake, (4) that the police did not conduct thorough enough searches, (5) that quality control and training needs were not properly addressed, (6) that the measure of accuracy of drug detection dogs via the rate of finding drugs after an indication may not be the best method to test accuracy. Regarding the test of accuracy of drug detection dogs, one officer indicated that the only way to test the accuracy of drug detection dogs is to put them through a validation program that would measure the objective performance of the dogs in a controlled environment. Although this data is not from a correctional setting, and the study itself was weak in its research design and methodology, it does provide some empirical evidence regarding the potential false positive rate by drug detecting dogs.

Currently there is little evidence to demonstrate the effectiveness of drug detecting canine units in a correctional setting. The National Drug and Alcohol Research Centre (NDARC) in Australia published an annual assessment of drug interdiction strategies in 2004 focusing almost exclusively on canine units and urinalysis techniques. It is important to note that, although all the data was presented through the NDARC, the report indicated that these values should not be compared to each other due to the different collecting methods and procedures employed within each state and institution. Some of the findings are listed below:

- In New South Wales, of the 46,000 visitors screened by canines in 1999, illicit drugs were detected 72 times representing 0.16% of the visitor population. In 2000/01, 300 visitors were banned as a result of canine detection representing 0.1% of all visitors (Black et al., 2004).
- In Victoria, in 2002/03 of 41,748 dog searches conducted, 293 seizures of illicit drugs were made (Black et al., 2004). This represents 0.7% of the searches that had taken place that year[5].
- In Acacia Prison, in Western Australia, though there were fewer inmates and therefore fewer canines, there were 246 drug detections on 3,316 canine searches

[5] It was not specified whether or not it was the visitors or the inmates who were searched.

(Black et al., 2004). This represents 7% of the searches that had taken place that year.

Despite the fact that there has not been clear empirical evidence to determine whether, in isolation, drug detecting dogs are an effective interdiction tool in a prison setting, many correctional employees support the effectiveness of canine detection (US Department of Justice, 2003). Her Majesty's Prison Service (HMPS), the National Drug and Alcohol Research Centre in Australia, the Northern Ireland Prison Service, and the US Department of Justice insist that the mere presence of canines in their facilities is deterrence enough for some visitors (Black et al., 2004, US Department of Justice, 2000, Gravett, 2000; Northern Ireland Prison Services, 2007). M. Wheatley (personal communication, December 5th 2008) with the National Offender Management Service in Britain indicated that HMPS institutions see an increase in the contents of their amnesty bins[6] whenever detector dogs are present. Even though this evidence is purely anecdotal, in light of the lack of empirical data, it is noteworthy. Given the low rate of detection of drugs in the use of drug detecting dogs, a cost-benefit analysis of their use may be warranted. Furthermore, given the limited data on the accuracy of drug detection among drug detecting dogs who indicate, further research is required to determine the level of accuracy in a controlled setting.

Summary

In summary, the United States, Australia, Canada, and United Kingdom all continue to use detecting dogs in their drug interdiction endeavours. Additionally, they have shown that detector dogs are capable of identifying large quantities of drugs. However, there have been no conclusive links demonstrating the effect that they have on reducing the introduction of drugs into facilities aside from anecdotal information from the U.K. regarding an increase in the contents of amnesty bins when the dogs are present.

[6] Amnesty bins are drop-boxes placed in an un-surveyed area, which encourage visitors to dispose of illicit items intended for passage to inmates, without the risk of being persecuted due to anonymity.

Trace and Bulk Detection

There have been two major evaluations of trace technology in the United States: the Mailroom Scenario Evaluation and an experiment in the Pima County's jail mailroom (NCJRS, 2008), and one in the United Kingdom (Sheldon, Smith, Doherty, Waddell, Donelly & Parker, 1998). In addition, a smaller scale evaluation was conducted by the Federal Bureau of Prisons (Hogsten, 1998).

The most extensive evaluation of Trace and Bulk Technologies is the Mailroom Scenario Evaluation Plan, conducted in 2001-2002. In this evaluation a simulated mailroom was constructed, and six different detection units were tested (Butler, 2002). The six units tested were the:

- Barringer "IONSCAN Model 400B" (Desktop IMS)
- Ion Track "ITEMIZER" (Desktop IMS)
- Barringer "SABER 2000" (Handheld IMS)
- Ion Track "VAPOR TRACER" (Handheld IMS)
- Mistral Security "Cannibispray" & "Coca-Test" (Mistral Spray)
- AS&E "Model 101" (X-Ray Transmission Backscatter Scan)

Two factors were tested in this study, the rate at which false positives were identified (indicative of contamination within the mail service) and the capability of certain units to detect drugs (Butler, 2002). To establish cut-off levels for the drugs, marijuana, cocaine, heroin, lysergic acid diethylamide (LSD), ecstasy, and methamphetamines were first tested (Butler, 2002). However, due to a perceived risk of working simultaneously with all six drugs in the experiment, only cocaine and marijuana were selected for the spiked mail test (Butler, 2002). The mock-style mail room consisted of both regular mail and spiked (laced with cocaine or marijuana) mail (Butler, 2002).

The Bulk detection unit (AS&E " Model 101") performed well in its desired effect to identify concentrated amounts of drugs within parcels and mail. As expected, the Bulk detection unit was not able to identify drugs which were spread out on a surface (marijuana spread out within a package for example). The bulk detection unit correctly identified marijuana in 17% of spiked mail, with a 3% false alarm rate and cocaine in 38% of the

spiked mail, with a 3% false alarm rate (Butler, 2002). It was concluded that, in scenarios where mail cannot be opened and checked, the unit would be beneficial. However in this experiment, as in some real life prisons, mail is opened and thoroughly checked and thus the need for the bulk detection unit is not as critical (Butler, 2003).

The Mistral Spray (Cannibispray & Coca- Test) in this experiment was ineffective, and it was assumed to be due to the type of packaging surrounding the drugs (Butler, 2002). The authors hypothesized that the levels of drugs were too low to be detected with the amount of packaging used (as well as the expertise in concealing of the drugs within the packaging) (Butler, 2002).

Finally, of the four Ion Spectrometry Units, there was no clear-cut winner (Butler, 2002). The Ion Track and Barringer Desktops had a 100% and 94% detection rate with a 50% and 31% false-positive rate respectively, and the Ion Track and Barringer handheld units displayed a 90% and 89% detection rate, with an equal false-positive rate of 8% for cocaine (Butler, 2002). The large distinction of false positive rate is attributed to the ability of desktop units to acquire a higher degree of sensitivity than portable handheld units. Thus, it is possible to adjust the sensitivity to account for the degree of contamination in individual establishments (Butler, 2002). Rates for marijuana differed drastically, and the reasoning is attributed to the fact that the particles of marijuana are not nearly as fine as those of cocaine, and thus, are more difficult to be detected by the unit (Butler, 2002). For example, detection rates ranged from 1% for the Ion Track and Barringer Desktops to 18% and 24% respectively for the Ion Track and Barringer handheld units. Notably, for both drug types the amount of drug used in the mailroom test had no significant impact on the ability to detect the drug.

A second evaluation of trace technology is provided in a report regarding the introduction of trace technology at the Pima County Jail, located in Tucson, Arizona. Although the Pima County evaluation is less empirical than the Mailroom Scenario study described above, it does provide a qualitative account of the impact of introducing trace technology best-practices within the mailroom of an institution. Specifically, the evaluation describes how the number of 'positive hits' in proportion to mail received decreased following the introduction of trace technology in their institution (NCJRS, 2008). Prior to the implementation of trace technology, positive findings in the mailroom averaged around zero a month. After the introduction of trace technology, that average grew to 10 to15

positive tests a month, which was found to be statistically significant (NCJRS, 2008). After these original observations were made, there was a noticeable reduction in the positive tests in the mailroom (although the trace technology was still in place) (NCJRS, 2008). They attribute this reduction to the inmates becoming aware of the new measures in place to combat drugs and therefore communicating with their contacts to stop sending drugs through the mail (NCJRS, 2008). Unfortunately, Pima County does not conduct random urine testing and therefore measuring whether or not inmate drug use over time decreased was impossible to quantify (NCJRS, 2008).

In a study conducted in the United Kingdom, at the request of Her Majesty's Prison Service, the United Kingdom Home Office Police Scientific Development Branch tested six electronic drug detectors. These systems were subjected to laboratory tests aimed at comparing the instruments' ability to detect cocaine, crack, heroin (free base and hydrochloride), cannabis, amphetamine sulphate, benzodiazepines and a range of other drugs (Sheldon et al., 1998). Laboratory tests were performed on the Barringer "Ionscan" (IMS), the Ion Track "Itemiser" (IMS), Ion Track "Vapor Tracer", Graseby "Narcotec" and IDS "Ariel", and Scintrex NDS 2000 (two versions). One overall finding from the laboratory trial was that none of the instruments could detect cannabis.

A field evaluation also occurred in which members of the staff were each given a numbered package containing either a drug or icing sugar and were asked to hide it on themselves and subsequently asked to wash their hands. Then, if they had pockets, they were asked to put their hands in their pockets. Following this, they were searched using one or more machines where each volunteer's hands and pockets were sampled. The trial was double blind where neither the instrument operators nor the persons being searched were aware of what was in the package. The drugs used in this trial included two types of heroin (brown – mostly freebase and off-white – mostly hydrochloride), cocaine, crack cocaine, amphetamine sulphate powder and temazepam tables. The general observations made from this field evaluation were that (1) cocaine (both types – powder and crack) was the only drug reliably detected by any instrument, (2) heroin and amphetamine sulphate were poorly detected, and (3) there was some detection capability for temazepam. At the time that this study took place in 1998, the authors concluded that trace detection systems did not seem to be a reliable tool for this type of searching unless cocaine is the target. However, this study

occurred over ten years ago and advances may have been made to the technology that would allow for more reliable detection. It is important to note, however, that this is the only available study to examine the reliability of drug detection on a person using IMS technology under realistic conditions.

A United States Federal Bureau of Prisons (BOP) pilot project placed an ion scanner unit in the lobbies of both the Metropolitan Detention Centre (MDC) in Los Angeles, California and the Federal Correctional Institution (FCI) in Tucson, Arizona (Hogsten, 1998). Their findings reported significant reductions in drug-related offender misconduct - 86% in the FCI and 58% in the MDC (Hogsten, 1998). To demonstrate that their results were most likely related to the pilot project, the BOP compared the reduction in drug-related offender misconduct at various other institutions during the same time period that did not use ion trace technology, and found a maximum drop rate of only 27%. Unfortunately, the make and model of the ion spectrometry devices used in the study were not noted.

Of all the literature reviewed in this evaluation of trace technology, all projects took place in the United States, with the exception of one that took place in the United Kingdom. However, according to Steve Gravett, author of "Drugs in Prison: A Practitioners Guide", there has not been adequate evidence regarding the effectiveness of trace technologies to begin adopting them in Britain (Gravett, 2000). The state of Victoria in Australia purchased a Barringer Saber 2000 Ion Scanner in 2002 for a trial in addition to the use of passive drug dogs. However no information on the success of the trial has been released (Black et al, 2004).

Of the jurisdictions examined, the United States was the only one outside of Canada to routinely employ the use of trace technology in a correctional environment. Trace technology was found to have the capacity to identify many of the drugs of concern to correctional staff, with the greatest capacity for detection of cocaine and lowest capacity for the detection of cannabis (Butler, 2002; Sheldon et al, 1998). With regards to the impact of trace technology on the rate of the introduction of drugs, in both the Pima County study and the Federal Bureau pilot project, a reduction in the introduction of drugs in the institution after implementation was reported (Hogsten, 1998; NCJRS, 1998).

Mandatory Drug Testing

The empirical evidence regarding whether mandatory drug testing (MDT) is effective in reducing drug consumption rate in prisons is variable. The following are the results of various international pilot projects and studies conducted on the effectiveness of MDT.

In Australia, NDARC published the results of New South Wales, Victoria, and Western Australia's urinalysis programs:

- In 1999-2000, New South Wales, with a prison population of 8,957, conducted both targeted and random urinalysis within its institutions. Of 11,130 urine tests that were conducted, 14% (1,589) were found to be positive, and 86% (9,541) were found to be negative. There were 333 reported instances of tampering with urine samples. It was not indicated whether or not the tampering of a sample resulted in a positive classification of the sample in question. The drug most frequently identified was marijuana, contributing to 1,235 of the positive urine samples. Following this publication, a small survey (37 inmates) was conducted to determine the inmates' perspectives on the effect of urine testing in their respective facilities. Twenty-four prisoners (65%) claimed drug testing did not impede overall drug usage. Eighteen prisoners (50%) claimed to have tested positive for drugs, after which 11 admitted to decreasing their drug usage. Twenty (54%) said they believed mandatory drug testing to be fair, and a further 18 (50%) claimed that testing should focus on hard drugs only (test for heroin instead of marijuana) (Black et al, 2004).
- The state of Victoria, with a prison population of approximately 3,540, claims to have the most vigorous correctional urinalysis testing program in all of Australia. It has been conducting urinalysis testing since 1992. In 2002-03 there were 30,718 tests conducted within the jurisdiction of Victoria: 4,606 were random, 13,348 were targeted, and 2,020 were voluntary[7]. Of the random urine tests, 3.6% tested positive for drugs (a decrease of 1.2% over five years). The results for the targeted and voluntary tests were not released. Similar to the results in New South Wales, marijuana was the drug most frequently identified amongst the random positive samples (122 hits). A survey of 74 inmates indicated that 64% claimed drug testing

[7] These three categories account for only 61% of the urine tests that were conducted. There are no further details given on the remaining 39% of tests.

did not deter drug usage, 59% of whom said that drug testing was easy to fool (Black et al, 2004).

- The majority of Western Australia's drug testing is targeted (95%). This state has a prison population of 2,800 inmates. In 2001-02, 3,662 urine tests were conducted with 3,472 of these tests being targeted. Thirty-seven percent of tests showed positive results, again with marijuana as the most frequently identified drug. No information was provided on the inmate reaction to these types of tests, nor were any baseline figures given in order to compare the effectiveness of urinalysis on drug usage in Western Australia (Black et al, 2004).

Another Australian report, although somewhat dated, provides some information on drug interdiction strategies from 1997/98 (Australian Bureau of Criminal Intelligence [ABCI], 1999). One Queensland institution claimed to have reduced its drug use from 39% to 9.4% between the years of 1996 and 1997, due to moving inmates who tested positive to higher security institutions (ABCI, 1999). It was also noted that, although correctional services respondents praised drug testing as being an excellent detection technique, they doubted its deterrent effect in the absence of harsh penalties for testing positive (ABCI, 1999). In addition, the report also compared the detection of certain drugs in the prison itself with the detection of drugs in the visiting center. In 1997-98, 1,499 seizures of cannabis were made in the institution. This figure was higher than the total number of seizures made in the visiting centre (just over 800), thus leading correctional staff to believe that either the visiting centre was not the main point of entry for cannabis, or the prison population was not as concerned as visitors about having cannabis detected inside the prison (ABCI, 1999). The largest difference was seen between the recorded seizures of pharmaceuticals inside the prison (over 1,400) and those from the visitor area (just over 200), suggesting that medication was either being stolen from the infirmary or improperly prescribed (ABCI, 1999).

The California Department of Corrections conducted a pilot project during 1999 and 2001 in four of their institutions with the aim of identifying whether or not certain drug interdiction strategies would help decrease the usage of drugs within the facility (Prendergast, Campos, Farabee, Evans, and Martinez, 2004). Sanctions were issued for samples that tested positive as well as refusals to provide a sample. These sanctions included

MDT testing of up to four tests per month for one year, suspension of privileges for up to ninety days, confinement for up to ten days, and mandatory substance abuse education (Prendergast et al, 2004). The baseline rate of positive samples was 8.9%, with a refusal rate of 6%. After six months of implementing weekly urine testing on the prisoners with graduating sanctions (e.g., sanctions that increased in severity when multiple occurrences of positive tests occurred) for testing positive, the positive rate was lowered to 1.64%, with a refusal rate of 2.3% (Prendergast et al., 2004). The final phase consisted of additional drug interdiction efforts in combination with the weekly urinalysis. More specifically, drug detector dogs, search and seizure techniques, as well as trace technology were put in operation along with urinalysis. This reduced the positive rate to 0.33% eight months later, with a refusal rate of 1.24% (Prendergast et al., 2004). This reduction in positive rates between the baseline period and the end of phase one shows promising results for the efficacy of using appropriately harsh sanctions when testing positive or refusing to provide a sample for MDT as well as the combination of various interdiction practices adopted in the final phase.

Gore and colleagues (1996) examined the results of a pilot study in eight prisons in England and Wales in 1995 that attempted to determine the efficacy of the MDT program. The mandatory drug testing pilot study was non-randomised but the authors indicated that it had the statistical virtue of adequate power to discern important changes (Gore et al., 1996). They found that from February to May 1995, there were 1089 random tests (a subset of the over 3000 tests that occurred during the pilot), of which 29.1% (362) were positive for cannabis and 4.1% (44) were positive for opiates or benzodiazepines. From this time to the second period examined, June to December 1995, the number of random tests increased to 2282, of which 29.1% (663) were positive for cannabis and 7.4% (168) were positive for opiates or benzodiazepines. This represented an increase of 80% in the percentage of inmates testing positive for opiates or benzodiazepines from the first to the second phase of random testing. However, the authors noted several limitations to these findings, including the lack of consistent data on refusal rates and the late and therefore limited contribution of data from one site that may have skewed results. In addition, there was inconsistent availability of data regarding those testing positive for opiates or benzodiazepines who also tested positive for cannabis during the two time periods. If there was a conversion of use from cannabis to

opiates, a decrease in cannabis use would be expected in the second period and none was observed. Due to the caveats noted, the authors expressed the concern that the danger of inmates changing their drug of choice to opiates in an attempt to avoid detection could not be definitively discerned from the data. Therefore, it was noted that there is a need for appropriate data and performance indicators to better inform policy and practice in this area (Gore, Bird and Ross, 1996).

A subsequent study by Gore, Bird, and Cassidy (1999) explored the opinions of inmates with respect to drugs and drug problems in their respective prisons. Of those who responded to the surveys, 84% (n=174) of prisoners who mentioned MDT viewed it as negatively affecting the prison population. Furthermore, 29% of both using and non-using prisoners (n=107) stated that they believed that the implementation of the MDT program in their institutions resulted in a trend to switch from using cannabis to heroin (Gore et al, 1999). A further 68% of those surveyed suggested that MDT be lifted for cannabis usage, as they found heroin to be the biggest problem in their institutions (Gore et al, 1999).

A Pennsylvania pilot project conducted between the years of 1996 and 1998 examined both the urinalysis and hair assay results of its participants (Feucht & Keyser, 1999). They determined that initiating the MDT program in their facility had a positive effect on the rate of drug use, as the rates of positive results for marijuana, cocaine, and opiates all decreased in both urinalysis and hair assay testing over the two year period examined (Feucht & Keyser, 1999).

A pilot project assessing the degree to which youth were influenced by the adoption of a mandatory drug testing endeavour revealed that the more frequently they were tested, the more frequently negative results were produced (US Department of Justice, 1998). Researchers admit that this result may have been due to the increased security in all areas of the project itself. For those institutions that did not test as frequently or tested infrequently, the positive test rates were considerably higher (US Department of Justice, 1998). However, the frequency of testing was not under the control of the researcher and therefore many factors may have affected the patterns of testing. Furthermore, the authors note that a couple of possible explanations may account for these findings. First, it is possible that when youth are tested with sufficient frequency and positive results lead to consistent consequences, there may be a deterrent effect on further substance abuse. Second, a higher frequency of

testing might also be correlated with a higher level of supervision of the youth, thereby potentially influencing their decisions about engagement in drug use. Further research is required to determine the impact of these factors on outcomes.

A review of mandatory drug testing costs versus benefits in Scotland led to reductions in the emphasis and resources devoted to mandatory drug testing through urine testing (Dean, 2005). Specifically, after a BBC interview with inmates highlighted that 75% of those interviewed were not deterred from using drugs within the facility despite the chance of testing positive through mandatory drug test, the Edinburgh prison decided that drug testing would continue only for those who were participating in programs aimed at reducing their drug use, and the cost savings from reduced urinalysis would be redirected at the problem of drug entry into their facilities (Dean, 2005).

In an English qualitative study, researchers conducted interviews with 17 ex-prisoners who had participated in MDT while serving their sentences to explore their opinions on MDT as an effective deterrent to drug use in institutions (Hughes, 2000). Testimonies from former inmates indicated that instead of abstaining from drugs, they were constantly searching for the newest method of avoiding drug detection. The study also noted that, due to the sanctions imposed for testing positive for drugs, those addicted may have been dissuaded from coming forth and asking for help (Hughes, 2000).

Finally, a Home Office Report examining the impact of MDT in prisons in England and Wales determined that the primary reason for inmates electing not to use cannabis in their institutions was due to their knowledge of the sanctions that would arise following a positive result on a drug test (Singleton, Pendry, Simpson, Goddard, Farrell, Marsen & Taylor, 2005). This same population however, was not equally deterred from using heroin for the same reasons; they maintained that they were more nervous of the health risks and addictive properties of opiates (Singleton et al., 2005). However, overall it was determined that the MDT seemed to have a positive effect on reducing drug use in prison, particularly for cannabis (Singleton et al, 2005).

Summary

In summary, with respect to Mandatory Drug Testing, urinalysis proved to be the preferred method. The literature demonstrates that urinalysis consistently identifies drug

metabolites in inmate urine samples. Conclusions on whether or not this practice adequately deters inmates from using are inconclusive.

Conclusions and Recommendations

As noted throughout this report, there are several methodological limitations in the existing research that make it difficult to draw definitive conclusions. These include:

- The absence of pre-test or baseline data prior to the introduction of an interdiction technique.
- The implementation of a single technique or technology not occurring in isolation of other interdiction procedures, thereby rendering it impossible to evaluate the impact of any single approach.
- The lack of a consistent method of collecting and recording data on interdiction techniques, even within the same country, making it difficult to compare results across evaluations.
- Different prisons within the same jurisdiction having different guidelines to follow with respect to interdiction techniques, again leading to a lack of consistency between evaluations.
- A lack of information regarding false positives. Whether this information is not recorded or just not published is unknown. However, this information is critical in terms of evaluating the reliability of any individual interdiction technique.

Furthermore, it is not known which route of entry yields the highest proportion of drug access to the prison. Therefore, it is difficult to determine whether or not a result obtained in an evaluation was actually related to the implemented practice. There seems to be an overall consensus within the literature that there is more than one way for drugs to be trafficked into prisons: drugs gain access to facilities through visitors, prisoners, staff, mail, poorly guarded perimeters, and deliveries (Gravett, 2000). In the evaluations examined in this paper, the focus was often placed on one mode of entry, ignoring the others, and thus the findings cannot be placed into the broader context in considering all modes of entry. Thus, having an idea of which mode of entry is expected to lead to the highest rate of access to drugs is paramount to evaluating subsequent drug interdiction efforts.

Despite these methodological limitations of the existing literature on drug interdiction techniques, there are still several findings which are most notable, enabling some conclusions to be drawn. For example, it is evident that:

- **Canines detect drugs** (Black et al. 2004). They can be trained to detect most or all drugs of interest to CSC (Gravett, 2000). A major limitation of drug dogs is the short duration of time that they can work (1 to 2 hours maximum). However, even when off duty, anecdotal evidence suggests that their presence at an institution may still be useful due to the deterrent effect they have on those entering prisons (M. Wheatley, personal communication, December 5, 2008).
- **Trace detectors detect drugs** (US Department of Justice, 2001; NCJRS, 2008; Hogsten, 1998). The high specificity and variability of trace detection can enable it to detect any substance. However, trace detectors are more likely to identify substances which yield a larger amount of particulate, and thus are extremely sensitive to drugs such as cocaine and marijuana (SCA Inc., 2001). Those jurisdictions that can afford the technology and ensure the required level of training for staff will be likely to implement trace detectors with success. However, several jurisdictions have decided to not use trace technology (particularly Ion Scanners) stating that they have not been adequately documented in the literature as successful tools to combat drug smuggling. This is primarily due to their high specificity and high false positive rate.
- **MDT detects drugs** (Black et al, 2004; Feucht & Keyser, 1999; Prendergast et al, 2004). Of the four biological specimens that can be tested for drug metabolites, urine is the most widely accepted amongst all jurisdictions examined. This may be partly due to its wide-spread availability of testing technology, and the fact that it can test for all drugs of interest to the correctional environment. Urine, however, is the easiest biological specimen to alter, although methods exist to account for this possibility. Additionally, it seems that the variability in metabolite half-lives is the largest issue concerning all forms of drug testing. Firstly, adequate indication of overall drug use is compromised by varying metabolite half-lives, and secondly, there is a concern that inmates who do not wish to receive the sanctions associated for testing positive for marijuana may

willingly switch to other drugs with shorter half-lives that are more difficult to detect with current drug testing technologies.

It is clear that these drug detection tools are all capable of detecting drugs. However, each method comes with certain benefits and drawbacks, sometimes in a complementary fashion. What remains unclear is which tool or tools yield the most accurate (low false positive and false negative), cost-effective results. However, an analysis of the available research does suggest some promising areas of future research. Existing research in the area are fraught with methodological limitations that result in gaps in knowledge and quality information, thereby making it difficult to draw conclusions. To address these problems there is a need for studies on the efficacy of drug interdiction practices to include methodological controls, such as baseline and pre- and post-implementation measures regarding the drug situation in an institution that are built into the research protocol. Furthermore, in order to isolate the effect of specific drug interdiction practices, future research into the efficacy of drug detection tools and technologies must either implement these tools one at a time at a single site or separately at different sites. This would assist in disentangling the impact of multiple technologies on the drug situation in an institution. In addition, future studies must ensure that measures are consistent across all sites in order for the results to be comparable. This should include a standardized method of recording all searches, all uses of detection tools, and all results whether positive or negative. Finally, there is a need for research that examines both the costs and benefits of each drug interdiction tool or technique, including any unintended consequences that may result from the introduction of an interdiction method (e.g., increased violence due to a disruption in the drug trade).

Although challenging, conducting this type of research will enable a controlled examination of the individual impact of different interdiction tools and techniques on the drug usage among inmates, attempts at drug smuggling, and actual drugs seized. It can then be determined whether or not continuing or increasing the investment in these practices is recommended on the basis of clear empirical findings.

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