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Drug Abuse Testing in Prevention and Treatment



The Journal of Global Drug Policy and Practice is excited to devote this edition to the critical role of drug testing in combating the worldwide scourge of addiction. Before the advent of laboratory based technology that paved the way for drugs of abuse screening, concerned clinicians, parents and law enforcement representatives had to rely on observation and basic behavioral testing to determine the presence of a drug high or intoxication. Abusive agents that depressed brain activity led to more easily identified victims of abuse. It was not that difficult to spot the individual intoxicated on alcoholic beverages, using tranquilizers like valium or xanax or nodding off from opiates like heroin. However, the detection of marijuana, cocaine, ecstasy or LSD use poses a much greater challenge because of their subtle effects on behavior. The ability to qualitatively and then quantitatively assay the presence of agents of abuse represents a tremendous step forward in promoting the health of our citizens.

The Journal is proud to have assembled a group of true experts in the field of addiction and drug testing. We are fortunate to have Dr. David Martin provide an overview on the laboratory and technical side of this field, in addition to future technology strides that are in the works. Dr. Robert Dupont is well known to clinicians and policy makers in the field of addiction and for his foresight and wisdom in communicating the clinical aspects of drug testing. Attorney David Evans has singlehandedly marshaled the forces to promote drug-free schools through the aid of student drug testing. Finally, Professor Calvina Fay, who started her career in the trenches of the drug-free workplace movement, will provide us with an overview of this area and thoughts on future directions as we try to protect the workplace from the destabilizing effects of drug abuse.

David A. Gross, MD, DFAPA
Editor in Chief
Journal of Global Drug Policy and Practice

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An Overview of Present and Future Drug Testing

David M. Martin, Ph.D.

Abstract

This article will provide a brief overview of existing drug testing technologies and approaches in a number of settings. It will offer a personal commentary from three decades of drug testing experience and participation in the development of the industry. It will also provide suggestions on the use of various specimens such as urine, hair and saliva alone and in combination. It will also address alternate testing specimens such as sweat, breath, surface and emerging technologies all with the goal of providing consumers of drug testing products a broader understanding of the current drug testing technologies available to them and a glimpse into the future.

Introduction

Over the past thirty years drug testing has evolved from a series of obscure laboratory tests to a multibillion dollar global industry that is constantly in the media and our lives. Athletes are in the press when they fail a drug test, but there are literally thousands of positive drug tests every day in a variety of industries. This is because drug abuse has been a part of our society for centuries; it is transcultural, international in scope and routinely found in a wide range of human endeavors causing injury, accidents and death. For decades the connection between drugs, weapons, crime and terrorism has been made abundantly clear and unfortunately has become a growth industry. The Drug Enforcement Agency (DEA) has identified at least seventeen foreign terrorist organizations with potential ties to the drug trade (narcoterrorism). A primary mission of the Department of Homeland Security (DHS) is to monitor and eliminate the connections between illegal drug trafficking and terrorism thereby cutting off their financing.

Drug funded terrorism and violence is not restricted to remote war zones but has crossed our country's southern border from the drug wars in Mexico to virtually every community in America. The fact that trafficking in illegal drugs finances not only criminal behavior but has been linked to international terrorism creates a new urgency to keep our society drug free. Recreational drug abuse is not a victimless crime. It finances and promotes criminal behavior, gang violence and international terrorism worldwide. Drug testing is no longer simply a workplace safety issue or a tool to level the playing field in a sporting event; it is part of the effort to stop narcoterrorism and maintain our international security.

This article will provide a brief overview of existing drug testing technologies and approaches in a number of settings. It will offer a personal commentary from three decades of drug testing experience and participation in the development of the industry. It will also provide suggestions on the use of various specimens such as urine, hair and saliva alone and in combination. It will also address alternate testing specimens such as sweat, breath, surface and emerging technologies all with the goal of providing consumers of drug testing products a broader understanding of the current drug testing technologies available to them and a glimpse into the future.

Drug Testing Origins, the 1980s and Test Standardization

Drug testing falls into the area of forensic toxicology. This is one of the oldest practical applications of chemistry originally used by law enforcement for the detection of poisons in man, crime scenes and the environment. Tests for arsenic were performed by laboratories as far back as the late 1700s. In 1840, drug testing solved a murder investigation in the landmark Lafarge murder case in France by identifying arsenic in the victim. Laboratories continued to develop their own tests, standards and methods for determining poisons and other drugs. Unfortunately, there were no uniform standards, creating conflicting results from laboratory to laboratory. It wasn't until the 1980s that drug testing as we know it today became standardized. This was the result of a series of separate but related events in workplace, medical and sports drug testing.

In May of 1981, in unusually rough seas, a US Navy fighter jet was making a nighttime landing on the aircraft carrier USS Nimitz. The landing failed, and the crash resulted in the death of 14 crew members and injury to 40 others onboard the carrier. Forensic testing reported the presence of drugs in crew members. This created a series of investigations and recommendations that eventually led to President Ronald Reagan's issuance of Executive Order 12564 in 1986, establishing a drug free federal workplace. This laid the foundation for the establishment of drug testing programs for all federal employees. However, at that point drug testing technology was still not standardized and varied greatly from laboratory to laboratory.

At the same time, methadone maintenance programs in the United States were expanding and needed reliable drug tests to determine the medical compliance of methadone therapy and insure patients were abstinent. There were widespread complaints in the industry that laboratory results did not match clinical

findings and could not be trusted. This initiated a blind study from the Centers for Disease Control (CDC) that highlighted the nature of this problem. The study resulted in a 1985 publication in the *Journal of the American Medical Association* entitled "Crisis in Drug Testing" which documented the problem of inconsistent results and widespread laboratory errors.

To address this issue, Executive Order 12564 charged the National Institute of Drug Abuse (NIDA) to develop standards that all laboratories would need to adopt in order to be accredited to conduct tests on federal employees. The "NIDA 5" drug testing panel was established. It tested urine specimens for marijuana, cocaine, amphetamines, opiates and phencyclidine (PCP) at specific screening and confirmation levels. This program is now under the Substance Abuse and Mental Health Service Administration, and the drug test panel is also referred to as the "SAMHSA 5". This test became the standard of the industry, and for the first time screening/confirmation guidelines, the Medical Officer Review processes, chain of custody procedures and other standards were established by NIDA all to be implemented nationwide on January 1, 1990 by laboratories wanting to perform drug tests on federal employees. This was a landmark in the history and standardization of the drug testing industry. The largest federal program to use these standards was in the Department of Transportation and is still used as a benchmark for drug testing programs today.

The 1980s were significant for international sports drug testing as well. At the Olympic Games and international competitions, record breaking performances were made by the Soviet Union athletes. Suspicion about the use of hormones and other drugs had been circulating since the 1950s. At the 1988 Seoul Olympics one of the first comprehensive drug testing programs was put into place, resulting in the suspension of gold medal winner Ben Johnson after testing positive for steroids. This shocked the sporting world and opened up a new industry - sports drug testing or anti-doping programs. However, similar to drug testing in the United States prior to Executive Order 12564, the new anti-doping programs did not have consistency from country to country or sport to sport. In 1999 an independent agency was ultimately set up to monitor all Olympic sports - the World Anti Doping Agency (WADA). Drug abuse was not restricted to Olympic events but also spread to professional sports and athletes. The fact that performance enhancing drugs worked, allowing athletes to win events and obtain lucrative endorsement contracts, created an entire illicit industry to promote and mask the abuse of performance enhancing drugs in athletes. Scandals in the Tour de France uncovered an elaborate network of medical doctors, trainers and pharmacies providing performance enhancing drugs and high tech programs to avoid detection which quickly spread internationally. In the United States federal investigations and prosecution of BALCO laboratory in San Francisco uncovered drug abuse scandals in Major League Baseball, athletics and other sports. These illicit programs create technical challenges for anti-doping programs and will persist as long as the sports industry and general public place such high monetary rewards on winning, regardless of how a victory is achieved or the long term consequences on the health of athletes.

"NIDA 5" and Expanded Urine Drug Testing

Executive Order 12564 mandated a drug free federal workplace in the United States and established the legal and technical basis for the drug testing of federal employees. In the 1990s federally mandated programs were the largest consumers of drug testing services in the country. An entire industry of accredited laboratories, third party administrators, medical review officers and specimen collectors was developed to address the new mandated guidelines. However, today the federal government is no longer the largest drug testing entity. Non-mandated programs eclipsed the federally mandated programs and continued to grow. Non-mandated programs are those that test employees not covered by the Executive Order for industries such as construction, sales, retail, professional services, treatment facilities, schools and the criminal justice systems. There are now more non-mandated employees that are drug tested than federally mandated employees, and a significant technical advance has occurred in this sector. Initially, all non-mandated testing mimicked the NIDA 5 panel as that was the most studied, litigated and used form of drug testing. However, non-mandated programs have a distinct advantage as they were not covered under Executive Order 12546 which limits the specimen tested to urine and only for the NIDA 5 drugs. This allowed non-mandated employers to expand their profiles to drugs not included in the NIDA 5 but emerging as problems in the workplace such as synthetic opiates like Oxycotin. Non-mandated employers were also free to test alternative specimens such as hair and saliva. They were also free to use instant testing which could be done at an employer's worksite, saving time and money.

Mandated programs established a firm legal and technical basis for testing the "NIDA 5" drugs in urine but have not progressed in the last 20 years to include alternative specimens such as hair, saliva or instant testing which are routinely used in a number of non-mandated industries. Nor have the mandated programs expanded to include additional drugs such as the synthetic opiates, barbiturates, benzodiazepines, antidepressants and other prescription drugs that are routinely abused today. In fact, mandated program guidelines prohibit the testing of additional drugs or alternative specimens at this time. Some mandated companies have addressed this limitation by collecting a second specimen under a separate company policy in order to test for drugs not currently in the NIDA 5 panel.

Arguments vary as to why expanded drugs and alternative specimens have not been included in mandated programs. It took years to codify the current mandated program and literally a decade to work out all the aspects of its implementation. Federally mandated programs have been very successful in reducing workplace drug abuse and will evolve with time. Employers who are mandated to have drug testing programs need to be aware that it is possible that some drug abuse may go undetected simply because only five drugs of abuse are screened under current mandated programs. The "NIDA 5" drugs are often abused in combination with other drugs that are not tested and as such may still be valid

"signature" drugs to trigger an in-depth medical review by a substance abuse professional which may reveal a more extensive drug abuse pattern.

Today, the technology is routinely available in large laboratories to cost effectively test urine for expanded panels of 12 different classes of drugs. Some laboratories provide even more expanded panels of over 50 classes of drugs. These are panels that are routinely used by substance abuse treatment facilities that are rapidly making headway into non-mandated programs. Impaired Professional testing programs have led the way in the development of these expanded testing panels. These are workplace drug testing programs for recovering physicians, nurses and pharmacists who are tested several times a month to maintain their employment. Such health professionals have access to a wide variety of prescription drugs, and testing for the "NIDA 5" alone would be negligent.

If a zero tolerance program is required, it is these expanded panels that are entering Impaired Professional workplace testing as well as other non-mandated workplace programs. Innovative programs have been established by a number of State Physician Health Programs, laboratories and third party administrators that manage Impaired Professional testing programs. These programs cost effectively test for wide variety of drugs through adjusting profiles by expanding and contracting the drugs tested in panels over time. This way a donor never knows which drugs will be tested when called to provide a specimen. Also, these programs have the ability to test hair, saliva and other specimens if there is need to confirm a conflicting or challenged urine test result.

Adjusting profiles and specimens is a very effective emerging drug testing strategy: one week all the synthetic opiates as a class could be tested, and the next week all the stimulants as a class would be tested. A policy can be written that when a reasonable suspicion drug test is ordered and a specific class of drug is suspected (e.g. if a cache of barbiturates is found in the workplace), an expanded barbiturate panel could be ordered. The cost would be less because not all classes of drugs are tested and more effective as the suspected drug class is tested in an expanded form.

Blood, Urine, Hair, Saliva and Sweat Drug Testing

Originally, only one specimen or specimen such as urine would be used in a drug testing program, and policies were built around that specific specimen. This was the model originally used by the federally mandated programs. Today, several types of specimens are available for drug testing, each having its own advantages and limitations (Table 1). Modern drug testing programs now can use multiple samples to more effectively identify drug abuse. The Olympic anti-doping programs now collect both urine and random blood specimens as human growth hormone and erythropoietin (EPO) can only be measured in a blood specimen. In a recent athletic doping case a hair specimen was collected and the negative result used to demonstrate that an extremely low urine concentration of cocaine could be the result of inadvertent exposure and not the result of chronic abuse.

Drugs of abuse are rapidly absorbed into the bloodstream once taken and then distributed to various tissues, excreted into saliva, urine and deposited into hair in that order. This makes each specimen unique in its concentration of drugs, detection times and ability to be used in drug testing programs. It is now possible to consider multiple specimens when evaluating an individual's drug testing result, especially when the results of a single specimen are inconclusive or contested by the individual.

Urine testing is the gold standard for drug testing as drugs exist in concentrations several hundred to a thousand times more in urine as they do in saliva, blood or hair. Also, urine has been tested for decades with a wealth of technical and legal support in the world body of literature. However, urine is difficult to collect, direct observation is limited and expensive, and urine specimens can be easily diluted or adulterated to produce false negatives. There is an entire industry that provides a number of products to mask drug presence in urine by adding materials to the specimen, drinking various preparations and even using devices that produce drug free urine at body temperature through life like prostheses. For all these reasons, alternative specimens to urine for drug testing have long been sought and the top candidates are currently hair and saliva.

Hair testing offers the advantage of directly observing the specimen collection while having the ability to look back in time up to 90 days for drug abuse. Drugs enter hair follicles from the blood stream and are permanently incorporated into the strands of hair. However, hair only grows about ½ inch per month, and it takes an average of 5-10 days after a drug is abused for that drug to enter a follicle and grow above the scalp line in sufficient length to be tested. In its current form, hair testing would not be able to detect recent abuse within the past few hours and as such is not applicable to post accident and has limited application to reasonable suspicion cases. Hair is routinely used in pre-employment and random drug tests and is extremely helpful in zero tolerance programs often detecting drug abuse that urine, blood or saliva would miss. There are also very little possibilities to cheat on a hair drug test even though a myriad of shampoos and other products claim to do so.

Saliva holds the most promise near term as it is the only sample that can be easily collected under direct observation, is not readily adulterated and can be tested instantly. Also, saliva drug concentrations parallel those found in blood so it can potentially be used to determine impairment and has been done so for alcohol intoxication. The use alcohol concentrations in blood have been well documented to indicate intoxication and these levels have been extended to breath and now saliva. Other drug concentrations in blood that cause impairment such as cocaine, marijuana, benzodiazepines and others are being established, and the possibility of extending these levels to saliva is encouraging. However, saliva specimens have very low concentrations of drugs similar to blood, making instant detection technically

challenging at this time. Laboratory based saliva testing has addressed this issue while providing confirmation of any instant screening results.

Sweat testing has a number of technical complications, and this factor has limited its growth in the industry. Sweat testing is accomplished by placing a patch on a donor's skin for up to 14 days. The patch is removed and sent to a laboratory where the drugs, if any, are extracted and tested. Because of problems with false positives and chain of custody documented in several court cases, sweat patches are limited to applications in the criminal justice system where positives are often confirmed by the collection of urine specimens. There have been suggestions that sweat can be swabbed from a forehead and tested for drugs. Although theoretically possible, the variability of specimen production and collection makes this approach not practical at this point.

Another technology for sweat alcohol testing has been the SCRAM Program or "Secure Continuous Remote Alcohol Monitoring" used by a number of state and federal corrections and parole programs. This approach employs a sensor the size of a small cell phone on an ankle bracelet that detects transdermal (through the skin) alcohol in both sweat and vapor phase as it is excreted through the skin. The readings are transmitted to a receiver in the donor's house that transmits the results to a central monitoring agency. The cost is about \$10 per day and often paid for by the parolee as a condition of parole. This technology offers great promise as other drugs of abuse can be detected transdermally as demonstrated with the sweat patch. Even though more research is needed on testing drugs of abuse transdermally prior to routine application, this is clearly a path for the future of drug testing in specific applications.

Instant vs. Laboratory Based Screening

Instant urine drug tests using lateral flow technologies similar to those in pregnancy tests were developed in the early 1980s and worked well. However, there was a move to cut manufacturing costs, and this shifted manufacturing offshore where quality control and lack of standardization created a new crisis in drug testing. Instant tests were unreliable, and in addition to false positives, the greater concern was false negatives allowing drug abusers to return to work. In the 1990s these shortcomings were addressed, and now instant drug testing kits potentially outsell laboratory based tests and are used in a wide variety of industries. Instant tests are available in many forms; the most popular are the single test dip sticks, multiple test cassettes or multiple tests built into the collection cup. These tests now have technical performance characteristics similar to lab based tests for the NIDA 5 panel. It is important to keep in mind that these are screening tests, and as with laboratory based screening tests, positives must be confirmed preferably by gas chromatography/mass spectroscopy. Instant drug tests are the wave of the future as they will accurately screen out the negatives with lab based accuracy. Negative tests account for up to 90% of routine employment drug tests; rapidly screening these tests on site will save time and money.

These instant urine drug tests now sell in panels of ten or more tests including synthetic opiates. They also can test for adulteration or substitution through technology built into the collection cup. Instant drug testing products are widely available on the internet and have important applications in the substance abuse treatment market. Inpatient or outpatient programs do not need to wait days for a negative drug test result; negatives are instantly available and only positives need to be sent to a lab for confirmation. As with the impaired professional programs, these tests can be used with adjusting profiles to fit the individual tested or the behavior observed by the clinician. Simply having this capability is a deterrent to substance abuse. However, the difficulty of collecting a urine specimen limits the application of instant urine testing technologies to treatment facilities, doctor's offices or mobile collection vans with bathrooms. As more sophisticated adulteration techniques enter the market, the integrity of a urine specimen can never be guaranteed 100 percent of the time, despite direct observation of the collection. Even under such close scrutiny, advanced lifelike internal and external prosthetic devices and procedures will enter that market that can deceive even the most careful direct observer.

Instant and laboratory based saliva tests hold the promise of solving the problem while providing discreet observation of the specimen collection to insure its integrity. The low amount of drugs in saliva limits on-site instant testing to the NIDA 5 at this time, and the detection of marijuana remains a technical challenge. As such, instant saliva testing still needs further development to test for expanded panels similar to urine testing. Laboratory based saliva testing is now filling that technology gap to test for additional drugs while providing gas chromatography/mass spectroscopy confirmations of positives.

The market to cheat on drug tests is an internet phenomenon that has grown into an industry of products, pharmacies and professionals with ever ingenious methods of beating drug tests. Some of these products do indeed work, and direct observation of specimen collection is the first step to curtail cheating. Direct observation of urine collections presents logistical and gender specific problems that prevent its routine application and is usually reserved for the most problematic of cases. Even in sports anti-doping programs where direct observation is routine, some athletes claim they were able to circumvent the observation with prosthetic devices.

In summary, drug testing today has its strengths and limitations. An individual hair, urine, saliva or blood specimen alone will not give a complete picture of an individual's drug abuse pattern. Each sample has its own characteristics and detection time for specific drugs of abuse. The only way to insure the most complete drug test is done on an individual is to collect multiple specimens; a urine sample, a hair sample and a blood or saliva sample at the same time.

The Future of Drug Testing

Drug abuse has been part of the human experience for centuries; it destroys lives, families and literally costs billions of dollars of year in lost productivity, accidents and theft in the United States alone. Drug trafficking has become a global growth industry and fuels crime and terrorism internationally. The legislative initiatives to decriminalize drug possession along with the movement promoting the medicinal use of marijuana and other drugs create a de facto endorsement of drug abuse behavior. These related facts alone will make more drugs available in our society, and as such drug abuse will inevitably increase. As drug abuse increases, so will the need for drug testing. These tests will evolve to include wider panels, prescription medications and designer drugs that are being made in black market pharmacies. Drug testing has been demonstrated without a doubt that it deters drug abuse. The Quest Drug Testing Index has tracked employment testing for the last 19 years and has noted a steady decline in drug testing positives in workplace drug testing. For example, in 1988 13.6 percent of workers tested positive for drugs of abuse while in 2008 only 3.6 percent of the combined U.S. workforce tested positive for drugs. This is a phenomenal achievement, and our efforts to stop drug abuse in the workplace by drug testing have been successful and must continue. It is important to note that while there is a lowering of overall drug testing positives in these workplace populations, the studies primarily use the NIDA 5 drug testing panel and do not include tests for the abuse of prescription medications which are on the rise. Clearly, we have the mechanics set up to do the testing and reduce drug abuse; what is needed is to expand the scope of drugs tested and to insure specimen integrity.

As government regulations led the way for the establishment of drug testing in America in the 1980s, law enforcement's current need for an early warning system to detect drugs entering the country have pointed to new drug testing strategies. Testing systems are now being used to detect drugs on surfaces to give law enforcement reasonable suspicion to search vehicles, cargo and luggage at airports and border crossings. There are various methods to test for drugs on surfaces using swabs to directly test items or areas and indirect methods using scanning technologies. Both have their advantages and disadvantages. These surface testing systems are not limited to law enforcement but are now being used in the workplace and schools to insure the environment is drug free. If drugs are found in a specific area, this creates reasonable suspicion to increase surveillance in that area or to drug test individual's urine, hair or saliva in that area. In addition, new technologies can readily detect drugs in the ambient room air and have been used to test for drugs in homes and industrial environments. Drug testing of the future will not be limited to the collection of biological specimens but will rely on environment testing of surfaces and ambient air to insure that an area, whether a workplace, school or living space is truly drug free.

New sensing technologies will expand transdermal testing to include not only alcohol but drugs of abuse as well. Initially, these technologies will be used by law enforcement in parole programs for continuous monitoring of individuals under house arrest. This technology will rapidly be developed into handheld instruments designed to instantly determine drugs on transdermal specimens and potentially surfaces and air. Positive results would trigger more invasive testing of urine, hair, blood or saliva, depending upon the circumstance. Another specimen also receiving attention in diagnostic medicine is the breath specimen. Breath testing has been used for decades to detect alcohol abuse and other medical illnesses such as lung infections, lactose intolerance, bacterial overgrowth of the small bowel, celiac disease and, recently, lung cancers. It is not inconceivable that breath testing for drugs of abuse will also be developed as new and more sensitive detection technologies are developed and introduced into the industry. Transdermal, saliva and breath are the specimens that offer the most promise for roadside drug testing where the need is greatest. Drugged driving, driving cars under the influence of drugs, has now eclipsed drunk driving in a number of international studies and will only increase as the prescription and street drug abuse continues. Screening for drugs on the roadside by law enforcement, aided by private industry using a number of emerging technologies, will be as common as roadside screening for alcohol is today. It is a matter of public safety and is being done in Europe, Canada and Australia on a limited basis.

Anti-doping programs in sports will expand as more designer performance enhancing drugs will be made in clandestine pharmacies specifically to enhance performance while avoiding detection. In the future is the looming threat of gene doping in professional sports; this is an extension of today's genetic engineering therapies used to treat severe medical disorders. Researchers in this field have already been approached by weightlifters and other athletes about this technology's performance enhancing potential. In gene doping, rather than injecting genetic material into a medically ill patient to build muscle damaged by disease such as cancer, healthy athletes would be injected with the same genetic material to build muscle and enhance performance. The ethical and moral implications with this form of substance abuse and methods to detect and stop it are staggering.

Although drug abuse has been ingrained into our society, it has been proven to be reduced by drug testing, education and prevention programs. One of the best prevention initiatives is to eliminate an individual's ability to work if they abuse drugs. The true value of drug testing, whether in the workplace, sports, schools or in law enforcement is that it gives individuals a tangible reason not to abuse drugs. If an individual wants to continue to work in their chosen profession, stay in school or remain unincarcerated, abusing drugs is not an option.

This has been exquisitely demonstrated over the past decade with the results of Impaired Professional testing programs where their success rate has been reported to be a remarkable 78% when combined with a comprehensive treatment plan. Unfortunately, those with the lowest success rate are in the entertainment field where testing is infrequent and treatment for substance abuse is at best limited. Impaired Professional testing programs use multiple specimens, expanding and contracting drug panels

and several random testing systems. All this, along with the removal of license to work in their chosen profession, has led to a remarkable success rate. Drug testing has played an important part and will continue to play a front line role in the future of these and other programs. New drugs of abuse, designer drugs and methods of cheating are continually being developed and move from one industry to another, requiring drug testing scientists and professionals to constantly improve their drug detection technologies and ability to detect specimen adulteration.

A wide variety of technologies are now entering the drug testing industry driven by law enforcement's need to control drug trafficking, the point of care testing programs to reduce medical costs and the development of new detection technologies. All these will converge into a comprehensive drug testing program in the future where entire work areas will be tested. Air, surface and individuals will be tested using multiple specimens and expanded panels with the goal of insuring that we all can live and work in a safe, drug free environment.

Table 1. Comparison of blood, urine, hair, saliva, and sweat patch testing for NIDA 5 test (marijuana, cocaine, amphetamines, opiates and PCP)

Characteristic	Blood	Urine	Hair	Saliva	Sweat Patch
Cost of Lab based screen	\$150	\$40	\$90	\$40	\$40
Cost of Instant on-site screen	NA	\$10	NA	\$10	NA
Number of drugs tested	Large	Large	NIDA 5	NIDA 5 and alcohol	NIDA 5 and alcohol
Detection Window	4-24 hours	1-20 days	10-90 days	4-24 hours	1-20 days
Collection Invasiveness	Significant	Moderate	Minimal	Minimal	Minimal
Determine impairment	Yes	No	No	Possibly	Possibly
Possibility of cheating	Low	High	Low	Low	Low
Best application	Post accident, reasonable suspicion	All types of testing	Pre-employment, clinical	Post accident for alcohol, clinical	Criminal Justice, clinical

Note: These are general guidelines; individual drugs will vary in time detected

Author Information

David M. Martin, Ph.D

Over the past 30 years David Martin has not only been actively involved in psychiatric and substance abuse research but also has co-founded several commercial drug testing and specialty laboratories. He was a member of the International Olympic Committee (IOC) Medical Commission special working group to harmonize sports anti-doping programs, Anti-Doping Administrator for the International Tennis Federation and National Hot Rod Association, and built one of the first NIDA now SAMHSA federally accredited drug testing labs in America. He is currently a courtesy Assistant Professor in the Department of Psychiatry at the University of Florida, the Chairman-Elect of the Drug and Alcohol Testing Industry Association (DATIA), the President and Chief Executive Officer of JMJ Technologies and the Scientific Team Leader of a U.S. State Department, Bureau of International Narcotics and Law Enforcement program studying Opium abuse in Afghanistan in women and children.

Conflict of Interest Statement

The author declares that he has no competing interests or conflicts of interest, and that this article was not paid for, inspired, reviewed or edited by a commercial sponsor.

Suggested Reading

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Drug Testing in Clinical Settings

Robert L. DuPont, M.D.

Abstract

Drug testing, the pinnacle of modern biotechnology, has evolved beyond urine testing to include testing in hair, saliva, and sweat and has moved out of the laboratory to include on-site testing with results available in a few minutes. Alcohol and drug abusers characteristically lie about their substance use to anyone who might want them to stop their use. Drug testing is now highly reliable in detecting the recent use of specific drugs as well as alcohol, thereby greatly enhancing substance abuse treatment and prevention. Drug testing is also useful in schools and in family-based efforts to prevent drug use. The biology of substance abuse as well as the technology of testing needs to be understood by anyone seeking to use testing to detect the recent use of addicting substances.

Keywords

Drug Testing, Detection of Drug Use, Addiction, Substance Abuse, Drug Testing in Drug Treatment, Criminal Justice Drug Testing, Toxicology of Drugs of Abuse

I. Introduction: Background

Drugs of abuse are chemicals that hijack the brain's reward system to produce far more powerful feelings than are produced by the natural rewards of food and sex.⁽¹⁾ Humans in their relentless exploration of their environments have discovered, and more recently invented, a relatively small number of chemicals that overwhelm the brain's reward system. Drug abusers, regardless of the drug they choose or the way they get the drugs into their bodies, seek the effects of these chemicals on their brains. Since the drugs are carried to the users' brains in their blood, the drugs are found in all parts of users' bodies and in all body fluids including urine, saliva and sweat. Drugs are quickly metabolized in the liver and the blood so that even when the drugs themselves are at very low levels their metabolites can sometimes be detected.⁽²⁾ ⁽³⁾ Drugs can also be detected in hair, producing a veritable tape recording of drug use in the prior ninety days or even longer.

The same high level of biotechnology is used to detect drugs and their metabolites regardless of the matrix that is tested. This means that the same high level of reliability is achieved whether the drug test involves blood, urine, oral fluid (saliva), hair or sweat. The choice of what to test involves consideration of cost, ease of access and the desired detection window. By far the most common drug testing matrix is urine where the drugs and their metabolites are found in relatively high concentration and where the drug tests can be done without expensive extraction.

Drug testing needs to get beyond the urine cup. There are important advantages to other matrices in many cases. Generally, urine identifies drug use in the few hours to 3 days before the test. Oral fluids have a shorter detection window – generally from a few hours to 1 or 2 days. While hair tests cannot detect drug use within the week prior to sample collection, a standard inch and a half sample detects drug use in the prior 90 days. Sweat testing involves wearing a patch similar to the patch worn when stopping smoking. Sweat patch testing identifies drug use while the patch is worn, usually for 1 to 3 weeks. Urine is particularly appropriate for frequently repeated random testing (for example in treatment and the criminal justice system).

Hair testing is particularly valuable for scheduled tests, such as pre-employment drug testing, when a detection window beyond 3 days is desirable and when cheating is a risk. Sweat patch testing is especially valuable immediately following treatment or in initial return to work settings. Oral fluid testing is especially valuable in many settings where urine is used because it is easier to collect and resistant to cheating. Roadside testing is an excellent application of oral fluid testing.

Urine is the matrix most subject to cheating, a serious problem that is virtually non-existent with the other matrices. Drug tests can be done at a laboratory or at the site of collection using on-site drug test kits. Laboratory testing can be used to test for a wider range of drugs than the other matrices, but results are not available from the laboratory for 1-3 days after the sample was collected. On-site testing gives results within a few minutes of sample collection. On-site test kits are available for urine and oral fluid testing but not for hair or sweat testing, both of which are available only through large laboratories. A more expensive confirming test is possible with either laboratory or on-site drug testing but is seldom needed in clinical settings where testing is frequently repeated and where the consequences of a positive test result are seldom severe. Most positive drug test results lead to immediate admission of use by the donor. This is the best confirmation.

Whatever the setting in which drug testing occurs, success is enhanced by using smarter drug testing including testing that rotates the matrix and the drug panel to reduce cheating and to extend the preventive power of the drug tests. This strategy is described in a related article.(4)

Drug abusers deny recent drug use to anyone who may want to separate them from their drugs. Drug tests overcome denial and dishonesty. They are essential to detecting recent drug use in any setting where no-use is the standard. Without drug tests it is difficult, and often impossible, to identify recent drug use. In this article we look at drug tests in three settings – treatment, the criminal justice system and the family. Other articles in this series explore drug testing technology and testing in the workplace and schools.

Drug tests do not identify impairment or addiction. Drug testing does identify the recent use of specific drugs. Drug tests are limited and can only identify the specific drugs in their panels; they do not identify “drug use” generally, so when using a drug test it is essential to know what drugs were in the panel that was used. Use of drugs outside that panel will not be identified, not matter how much of them were used, how recently they were used or how impairing that use was. Many drug test panels are limited to the SAMHSA-5 drug panel used in federally mandated testing: marijuana, cocaine, morphine/codeine, amphetamine/ methamphetamine, and PCP. There are many more drugs that are commonly used including Ecstasy, LSD, and a wide range of prescription drugs including Valium, Xanax, Oxycontin and Vicodin. If abuse of these drugs is suspected, it is essential to include them on the panel of the drug test that is selected. Although alcohol is most often detected in breath tests, alcohol can also be detected in urine, blood and oral fluids but not in hair or sweat patches. Because alcohol is rapidly metabolized, these tests are seldom positive more than a few hours after drinking stops. Nicotine’s metabolite cotinine is detected in urine.

Most illegal drug users, even very severe and chronic users, have been off alcohol and drugs many times – sometimes involuntarily. Their central problem is not stopping, it is staying stopped. Put in other words, the clinical challenge for drug abusers is relapse. Since relapse is a long-term, often lifelong, risk of addicted people, the major challenge of helping these people maintain recovery is to prevent relapse. Drug testing plays a central role in reducing relapse as it does in drug abuse prevention in schools, workplaces and in many other settings.

II. Clinical Contexts for Drug Testing

Drug testing is useful in any setting in which drug use is a problem.(5) (6) (7) Common settings for drug use include:

Substance Abuse Treatment. One of the most important contexts in which drug testing is substance abuse treatment where testing is generally inefficiently used. The standard for clinical drug testing is set by the nation’s Physician Health Programs (PHPs) which monitor addicted physicians for 5 years or longer. These programs typically use random drug testing so that on each workday participating physicians call a phone number to see if they need to go in for testing that day. In the first national study of PHPs, 79 percent of the physicians did not have a single positive test for either alcohol or drugs, and of those who had a positive test, two thirds never had a second positive test. Treatment programs should adopt similar strategies to insure careful long-term monitoring which produces outstanding long-term outcomes.(8) Drug testing is not drug abuse treatment, but drug testing makes drug treatment far more successful because it identifies drug use, thereby permitting swift and certain, but not necessarily severe, interventions to stop alcohol and other drug use and to promote long-term recovery.

Criminal Justice System. About 5 million Americans are being supervised on parole or probation. As many as 80% of these convicted offenders have substance abuse problems including alcohol and other drugs of abuse. This is one of the heaviest drug using and most problem-generating segments of the population of about 20 million American illegal drug users. New data on frequent random drug testing linked to immediate consequences, as is also true for the PHPs, has been shown to greatly enhance outcomes for offenders in the community. Prolonged random testing with a zero tolerance for continued substance use not only produces dramatic reductions in alcohol and other drug use but it also produces sharp drops in criminal recidivism and incarceration.(9) (10)

Family. While the community at large, schools and pediatricians are important when it comes to drug abuse prevention, the family is ground zero for the prevention of substance abuse. The family is also a primary location for relapse prevention after substance abuse treatment which rarely lasts more than a year. Families can improve their success in both prevention and recovery by implementing family-based drug testing – especially for high risk family members. This often

means drug testing teenagers and other family who have had problems with alcohol or other drugs of abuse. Families need help selecting drug tests and knowing how to handle positive tests results when they occur. A related article details a strategy for family drug testing.(11)

Families generally do not have access to laboratory-based drug testing unless they use their physician or a teenager's pediatrician, or a drug treatment program. However, families have access to drug tests through the Internet and through commercial outlets including most drug stores and many other retail stores. The drug test kits come with instructions for their use as well as phone numbers where questions can be answered. The range of drugs tested for with these kits is often very small, so it may be useful to work with a laboratory or a physician to have access to a wider range of drug tests.

When to Test, What to Test for and How to Select a Test Matrix

In each of the three settings described here, it is usually desirable to start with urine testing for a relatively inexpensive panel of 5 to 10 drugs. These tests are accessible through most clinical laboratories for organizations such as treatment and criminal justice programs. There are many advantages to expanding the testing to include more drugs both on a rotating basis and when there are concerns about a specific individual's use of specific drugs that are outside this basic test panel. There are also advantages to using matrices beyond urine, especially hair and oral fluids in a rotating basis and in special situations including when cheating is suspected since these alternative matrices are resistant to cheating.

When confronted with a result that is difficult to interpret and when the donor of the tested sample convincingly disputes a positive result, it may be desirable to contact the testing laboratory or when using test kits for on-site testing, the manufacturer of the kits that are used. They have toxicologists available who can interpret the specific result. As an alternative, it is possible to contact a certified Medical Review Officer (MRO) – a physician who is trained to interpret drug test results. To find an MRO, please visit the following: American Association of Medical Review Officers (AAMRO) www.aamro.com; Division of Workplace Programs (SAMHSA) <http://dwp.samhsa.gov/DrugTesting/>; or Medical Review Officer Certification Council (MROCC) www.mrocc.com. For more information about drug testing visit the Drug and Alcohol Testing Industry Association (DATIA) web site (www.datia.org).

Summary

Drug testing is the pinnacle of modern biotechnology. Drug testing technology is continuing to improve and to become both more effective and less expensive. Drug tests identify recent drug use by detecting drugs and their metabolites in urine, oral fluids, hair and sweat. Drug testing detects only the drugs on the specific panels selected for each test.

The use of drug tests to detect recent drug use is valuable in many clinical settings including substance abuse treatment, the criminal justice system and in the family. By detecting recent drug use, drug testing plays a central role in prevention, treatment and long-term relapse prevention.

Author Information

Robert L. DuPont, M.D.

President, Institute for Behavior and Health

For more than 30 years, Robert L. DuPont, M.D. has been a leader in drug abuse prevention and treatment. Among his many contributions to the field is his leadership as the first Director of the National Institute on Drug Abuse (1973-1978) and as the second White House Drug Chief (1973-1978). From 1968 to 1970 he was Director of Community services for the District of Columbia Department of Corrections, heading parole and half-way house services. From 1970 to 1973, he served as administrator of the District of Columbia Narcotics Treatment Administration (NTA), the city-wide drug abuse treatment program that was the model for the federal government's massive commitment to drug abuse treatment in the early 1970s. Following this distinguished public career, in 1978 Dr. DuPont became the founding president of the Institute for Behavior and Health, Inc.

Dr. DuPont has written for publication more than three hundred professional articles and fifteen books and monographs on a variety of health-related subjects. His books include *Getting Tough on Gateway Drugs: A Guide for the Family*, *A Bridge to Recovery: An Introduction to Twelve-Step Programs* and *The Selfish Brain: Learning from Addiction*. In 2005, Hazelden, the nation's leading publisher of books on addiction and recovery, published three books on drug testing by Dr. DuPont: *Drug Testing in Drug Abuse Treatment*, *Drug Testing in Schools*, and *Drug Testing in the Criminal Justice System*.

Throughout his decades of work in addiction prevention, Dr. DuPont has served in many capacities. His activities in the American Society of Addiction Medicine (ASAM) include chairing the forensic science committee and he is a Life Fellow. He is also a Life Fellow of the American Psychiatric Association (APA) and was chairman of the Drug Dependence Section of the World Psychiatric Association (WPA) from 1974 to 1979. In 1989 he became a founding member of the Medical Review Officer Committee of ASAM.

A graduate of Emory University, Dr. DuPont received an M.D. degree in 1963 from the Harvard Medical School. He completed his psychiatric training at Harvard and the National Institutes of Health in Bethesda, Maryland. Dr. DuPont maintains an active practice of psychiatry specializing in addiction and the anxiety disorders and has been Clinical Professor of Psychiatry at the Georgetown University School of Medicine since 1980. He is vice president of Bensinger, DuPont and Associates (BDA), a leading national

consulting firm dealing with substance abuse, founded in 1982 by Dr. DuPont and Peter Bensinger, former Director of the Drug Enforcement Administration.

Dr. DuPont's signature role throughout his career has been to focus on the public health goal of reducing the use of illegal drugs.

Conflict of Interest Statement

The author declares that he has no competing interests or conflicts of interest, and that this article was not paid for, inspired, reviewed or edited by a commercial sponsor.

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Drug Testing of Students

David Evans, J.D.

Abstract

This article contains a legal overview of some issues surrounding student drug testing, a recounting of the benefits of testing, and a description of the testing process that protects the integrity of the procedure and the validity of the results.

The Law

Drug testing of students has been upheld by the courts or authorized by state statute when there was some "reasonable suspicion" of drug use. "Reasonable suspicion" means that the school believes the actions or appearance or conduct of a student are indicative of the use of a controlled substance or alcohol.(1)

In addition, the United States Supreme Court decided that random testing of high school athletes and students in extracurricular activities was constitutional in the cases of *Vernonia School District v. Acton* (athletes) and more recently in *Board of Education of Independent School District No. 92 of Pottawatomie County v. Earls* (extracurriculars).(2)

The primary legal concerns in student drug testing are the constitutional search and seizure protections. Drug testing is considered a search because a drug test "searches" a bodily fluid. Generally, courts have held that the educational setting may justify a search in order for the school administration to provide an orderly learning atmosphere. In addition, there is the concept of "in loco parentis" that enables the school to act in the role of a parent in supervising and protecting the child.

There have also been several cases arising under state law. The courts have generally upheld student random drug testing, and there are state statutes that provide for drug testing of students. (3)

The Studies Support Student Drug Testing

Several studies have supported the effectiveness of student drug testing. (4) These studies were discussed at some length by the New Jersey Supreme Court in the case of *Joye v. Hunterdon Central Regional High School* and elsewhere.

The Checks and Balances in the Drug Testing Process

Drug testing in schools is usually done by a three step process:

1. an initial immunoassay screening test that if positive, 2. is confirmed by an alternate technology, then 3. the final results are reviewed by a Medical Review Officer who reports the test result.

Specimen Collection

Drug testing begins with the collection of a urine or saliva specimen. Hair can also be used for testing. There are well-established procedures for collecting specimens. The chain of custody of the specimen must be protected. Chain of custody is the documentation of the specimen collection and then safe handling of the specimen from collection to analysis. Urine and saliva testing can be done on-site or in a laboratory. Hair testing requires use of a laboratory.

Confirmation of Tests

Initial immunoassay drug tests are generally confirmed by a process called gas chromatography/mass spectrometry (GC/MS). This process meets legal accuracy standards.

Medical Review Officer (MRO)

Positive results should be reviewed by a Medical Review Officer, a physician trained in evaluating drug test results who will consult with the student if the test is positive to determine if the drug use was legitimate due to a doctor's prescription or was illegitimate.

The results should be kept confidential and only released on a need to know basis. Confirmed positive drug test results can then be used to deny privileges and/or to initiate further evaluation of the student.

Drug Testing Is Cost Effective

Only a small percentage of the students needs to be tested in order to make it effective. Deterring drug use in the school by drug testing also saves a lot of hidden costs such as staff time, medical costs due to staff being assaulted by students, damage to school property due to vandalism, and insurance costs.

Any concern schools had about being able to pay for testing has now been solved because the recent federal *Leave No Child Behind Act of 2001* permits schools to use federal education funds for student drug testing. Student drug testing is a specific program initiative listed in this landmark law. See sections 4002 and 4115 of H.R.1.

Student Confidentiality Is Protected Under Federal Law

Student confidentiality is protected by two important federal laws. The first is the *Family Educational Rights and Privacy Act* which prohibits student records from being released, including drug and alcohol testing results, without the consent of the parents or if the student is 18, without the student's consent (20 U.S.C. 1232g). In addition, student treatment records are protected by the federal *Confidentiality of Alcohol and Drug Abuse Patient Records* regulations that carry federal criminal penalties for improperly releasing information (42 CFR Part 2. Section 2.1(f)).

Student Attitudes

The ACLU has criticized student drug testing because they claim that giving drug tests to students who participate in extracurricular activities will make the activities less attractive to students. They claim that by having less participation in extracurricular activities students will choose to participate in drug related behavior. While it is true that extracurricular activities help students to lead a positive life, there is no evidence that there is a drop off in participation because of drug testing. The ACLU could not present any such evidence to the U. S. Supreme Court. In fact, students report that drug testing gives them a reason to say 'no' to drugs and still be 'cool' with the other students. In a recent *Seventeen Magazine* poll, 54 percent of young people said they would take a drug test "no problem." (5) A *USA Today* poll showed that 70 percent of adults support testing of students in athletics and extracurricular activities. (6) Many schools find great value in using random drug and alcohol testing as part of their anti-drug programs. The goal of testing is to deter drug and alcohol use. Students who know they may be detected are less likely to use drugs or alcohol.

Drug and alcohol testing are effective and extremely accurate if properly administered and student dignity and privacy are preserved. Some parents have concerns about testing. In most cases they do not understand how testing works and how accurate it is. Once it is explained to them and they understand the protections built into a good testing process, their concerns are relieved. Most parents support testing. They recognize that student drug and alcohol use is often difficult to detect from observation alone.

Author Information

David Evans, J.D.

David Evans is a Special Advisor to Drug Free America Foundation. Mr. Evans practices law in Flemington, New Jersey. He is admitted to practice before the United States Supreme Court and has written several amicus briefs for the US Supreme Court on student drug testing, "medical" marijuana, and drug testing.

Mr. Evans has written several books dealing with substance abuse and the law, including books on designing effective drug testing programs and on kids, drugs and the law. His books on drug testing are: *Drug Testing Law Technology and Practice* and *Designing an Effective Drug-free Workplace Compliance Program* published by Thomson/West.

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Drug Testing In The Workplace: An Historical and Economic Examination

Calvina Fay

Abstract

Considerable evidence exists to show that drug abuse contributes to the frequency and intensity of many types of crime, from white-collar offenses and political corruption to property offenses and violence. Similar evidence exists to show that safety in the workplace and the profitability of businesses are directly affected by substance abuse.

Improving our understanding of the factors that influence abuse both on and off the job is important in developing interventions and strategies to reduce drug-related problems. Although we have not found the right answer to eradicating drug abuse, some progress has been made in reducing it and in defining the many facets of the problem.

We know that young people are at increased risk where there is parent–adolescent conflict, favorable parental attitudes to drug use, parental alcohol and drug problems, and parental approval of drug (e.g. alcohol) use in childhood or early adolescence, making it imperative that we reach out to parents/adults and educate them about the harms of drugs. One of the very few places that we have parents/adults as a captive audience is the workplace, making it an ideal arena for providing drug education and influencing their attitudes about drug use.

The federal government and much of the private business sector have adopted policies of making illicit drug use unacceptable either socially or in the workplace and utilized drug testing to enforce those policies. This strategy is aimed at reversing the levels of drug abuse and the losses that flow from it. This concept has garnered much support in Congress, the state legislatures, the business community, and a broad cross-section of the public in the United States and, to some extent, in other countries. It is not a total answer but is definitely a step in the right direction.

This article will examine the history of the evolution of drug-free workplace programs with drug testing as a cornerstone of such programs and will explore the cost/benefit ratio to such programs.

Keywords

absenteeism, accidents, deterrent, detection, drug testing, employee assistance program, impairment, rehabilitation, workplace

Introduction

Drug abuse and the crime and social problems that flow from it constitute one of the most serious and frustrating challenges faced by Americans. This challenge is serious because of the social and economic costs imposed by drug abuse, and it is frustrating because we have not yet found a way to deal with it effectively enough to eliminate it.

Many people in our society, especially our youngsters, use illegal drugs and misuse alcohol and some legal drugs. Many drugs that did not even exist a few decades ago such as crack cocaine and drugs that are slightly different chemically from controlled drugs but have the same effects known as “designer drugs” have spread rapidly through all segments of society. Hospitals are reporting alarming increases in rates of drug-related emergency cases and the public continuously rank drugs and crime as major concerns.

Considerable evidence exists to show that drug abuse contributes to the frequency and intensity of many types of crime, from white-collar offenses and political corruption to property offenses and violence. Similar evidence exists to show that safety in the workplace and the profitability of businesses are directly affected by substance abuse.

Improving our understanding of the factors that influence abuse both on and off the job is important in developing interventions and strategies to reduce drug-related problems. Although we have not found the right answer to eradicating drug abuse, some progress has been made in reducing it and in defining the many facets of the problem.

We know that drugs interact with other complex social, psychological, and pharmacological factors to influence the behavior of abusing individuals. We also know that young people are at increased risk where there is parent–adolescent conflict, favorable parental attitudes to drug use, parental alcohol and drug

problems, and parental approval of drug (e.g. alcohol) use in childhood or early adolescence, making it imperative that we reach out to parents/adults and educate them about the harms of drugs. One of the very few places that we have parents/adults as a captive audience is the workplace, making it an ideal arena for providing drug education and influencing their attitudes about drug use.

The federal government and much of the private business sector have adopted policies of making illicit drug use unacceptable either socially or in the workplace. This strategy is aimed at reversing the levels of drug abuse and the losses that flow from it. This concept has garnered much support in Congress, the state legislatures, the business community, and a broad cross-section of the public in the United States and, to some extent, in other countries. It is not a total answer but is definitely a step in the right direction.

Drug abuse in the workplace is not a new phenomenon. Drug abuse, especially the abuse of alcohol, has always been present in the workplace. The problem has gone uncorrected in the past not so much because business failed to address it but because society in general has been unable to understand the dimensions of drug abuse, find a cure, and set up effective prevention measures.

Marijuana is the drug most commonly found through urinalysis in the workplace and causes one of the greatest concerns for employers. It probably is not necessary to state the obvious but – smoking is smoking. Whether it is marijuana or tobacco that is being inhaled, the harm is being done. Research has shown that smoking retards fetal growth and doubles the danger of delivering a low-birth-weight baby. With employers paying for much of the health insurance for many employees, this is, of course, a bottom-line issue for employers in the United States.

In recent years, research has repeatedly linked marijuana and/or other drug use with a myriad of health issues such as psychosis, reduced blood flow to the brain, impaired brain development in fetuses and adolescents, pulmonary complications, emphysema and other respiratory problems, bone disease, increased risk for stroke, infertility, an increase in premature newborn babies, a decrease in the function of the immune system, impairment of the learning process, short- and long-term memory loss, and an increased risk of various forms of cancer such as head, neck, throat, and bladder. Research has clearly established that marijuana is addictive both physically and emotionally and that it has a gateway effect into the use of other illegal drugs.

A strong correlation has also been scientifically established between marijuana and other drug use and an increased risk for accidents, including traffic and workplace mishaps which put us all at risk. This fact has led to the evolution of an extremely effective drug demand reduction policy being utilized by employers: drug-free workplace programs.

Some members of the business community developed and applied some of the earliest programs for ridding the workplace of drugs. Many of the testing programs that have been adopted by the criminal justice system to identify drug abusing criminals and prisoners are based upon programs conceived in the business sector.

While the examination of employees through the years to determine their fitness for work is not new, the techniques employed since the 1980s for examination are. For instance, the technology on which urinalysis is based has advanced almost to the point of 100 percent accuracy. In addition, drug testing serves a dual process - it both deters and detects drug use. Drug abusing employees who know they will be discharged or disciplined if identified through testing are motivated to stop drug use. The identification of employees with drug problems is the first step toward treatment and recovery. Within a comprehensive drug-free workplace program, however, testing is only one of several tools available to help management eliminate drug abuse in the workplace. Others include education, training, discipline, counseling, and rehabilitation.

Drug Testing in the Federal Workplace

The rationale for drug testing in the federal workplace arose from the experience of America's largest employer, the U.S. military. In 1980, roughly 27 percent of military personnel surveyed admitted that they had used an illicit drug within the month preceding the survey. In 1985, only 9 percent reported similar use. A drug testing program within the military was instituted during that five-year period, and 64 percent of the military personnel polled said that they believed drug testing was the main reason for this decrease in drug use. Three years later, drug use in the military dropped to 5.3 percent, a decline of more than 80 percent in eight years.

Responding to the military's drug crisis, President Ronald Reagan issued Executive Order 12564 on September 15, 1986, mandating a drug-free workplace with the intent that the federal workforce would serve as a model for all American businesses. The order required that all federal employees refrain from using illegal drugs on or off the job. It directed that federal agency heads do the following:

- Develop policies regarding the use of illicit drugs and the consequences of policy violations
- Implement Employee Assistance Programs (EAPs)
- Conduct training of supervisors in drug abuse recognition and intervention
- Provide for supervisory referrals and self-referrals of employees to treatment
- Instigate drug testing to identify employees who are in violation of policy

The order allows agency heads to require urine testing in the following cases:

When candidates apply for federal employment
After an accident or unsafe practice has occurred
When there is a reasonable suspicion that an employee uses drugs or is unfit for duty
As a follow up to drug counseling or rehabilitation
On a random basis among employees who are employed in positions that are deemed as safety or security sensitive in nature

On July 11, 1987, the U.S. Congress passed legislation for implementation of Executive Order 12564 under Section 503 of Public Law 100-73 (the Supplemental Appropriations Act of 1987). Section 503 established uniformity among federal agency drug testing plans, ensured confidentiality of drug test results, and centralized oversight of the government's drug testing program, in addition to providing funds to carry out the executive order.

The Secretary of the Department of Health and Human Services (DHHS) was, under Section 503 and the executive order, tasked with promulgating technical and scientific guidelines. On April 11, 1988, the DHHS published the Mandatory Guidelines for Federal Workplace Drug Testing Programs, sometimes referred to as NIDA (National Institute on Drug Abuse) guidelines. These guidelines play an essential role in ensuring that the requirements of the executive order are met. All federal agencies must follow the procedures outlined in these guidelines and may not deviate from them without written approval of the DHHS.

The guidelines require that all federal agency programs must test for marijuana and cocaine at a minimum. Agencies also may elect to test for opiates, amphetamines, and PCP without additional authorization. No other substances may be tested for without written authorization from the DHHS.

The rationale for this testing plan was based upon recognition that marijuana and cocaine are by far the most frequently abused drugs, with opiates, amphetamines, and PCP the next most common drugs of abuse. Although alcohol abuse is very prevalent in society, testing for it was intentionally omitted for a variety of reasons.

The guidelines spelled out what components were required for a federal drug-free workplace program such as a written policy statement, employee assistance program, employee education, supervisor training, etc. They also established cutoff levels for drug testing, how to report test results, etc. The guidelines even spelled out the requirement and role of a licensed medical doctor known as a Medical Review Officer to review and sign off on all positive test results before they are reported to employers.

Since these guidelines were originally issued, they have undergone numerous minor revisions, but the original intent remains intact.

On November 21, 1988, the United States Department of Transportation (DOT) issued rules to require drug-free workplace programs through its six operating administrations: 1) Federal Highway Administration; 2) Federal Railroad Administration; 3) U.S. Coast Guard; 4) Federal Aviation Administration; 5) Urban Mass Transportation Administration; and 6) Research and Special Programs Administration.

The DOT program requires a DOT employee to be removed from federal service under several circumstances: 1) refusal to enter or successfully complete a drug rehabilitation or abatement program; 2) repeated use of drugs; 3) refusal to provide a urine specimen for drug testing; 4) adulteration or substitution of a urine specimen; 5) on-duty use of illegal drugs; or 6) a determination that the employee has engaged in illegal drug trafficking. If a covered employee tests positive on a drug test, they must be removed from the job until they successfully complete treatment, can pass a drug test and are recommended to be returned to duty by a Substance Abuse Professional.

Each of the six DOT agencies subsequently issued more specific rules for their specific employees.

In addition to the six sets of rules of the DOT agencies, the DOT published a modified version of the DHHS's Mandatory Guidelines for Federal Workplace Drug Testing Programs. The DOT version is called the Procedures for Transportation Workplace Drug Testing Programs and is codified in 49 CFR Part 40.

The DHHS procedures apply to the physical and organizational circumstances of federal agencies, whereas the DOT procedures apply specifically to drug testing programs in industries regulated by the DOT's operating administrations. These procedures were meant to clear up any confusion regarding the application of the DHHS procedures in the industrial context. The revisions removed much of the potentially confusing terminology and left intact the safeguards for accuracy and privacy in drug testing.

Drug Testing in the Private Sector

While the government was creating a "green light" for drug-free workplace programs to include drug testing, the private sector was busy establishing similar programs. Programs that included drug testing were, of course, the most controversial. While employee education, employee assistance programs, and treatment options had existed for a number of years, drug testing and even dog searches and personal searches only emerged in the 1980s. This expansion to drug-free workplace programs came about in response to recognition that a significant portion of the workforce was using illegal drugs.

Testing for drugs in the private sector by means of urinalysis started on the oil rigs. Employees who were performing extremely dangerous work on the rigs and could put other workers at risk were the first to undergo drug testing. Upon learning that the positive rate was higher than expected, oil and chemical companies then moved to test employees in their refineries and other locations where safety-sensitive work was being performed.

Recognizing that a significant portion of workers in the refineries were not employed by the owner/operators but rather were contract employees, the next logical step was to require that all contractors, subcontractors, and vendors implement testing of their employees.

As larger companies expanded their testing and discovered significant drug use among workers, mid-size and small business owners began to worry that drug users may end up working in their companies as a result of being screened out by the larger companies. Ultimately, even the smaller companies began to implement drug-free workplace programs that included drug testing.

Due to the explosion of drug testing in the late 1980s and early 1990s, it became necessary for state regulatory agencies to address the problem and to establish guidelines for this phenomenon. Agencies regulating workers' compensation and unemployment benefits stepped in to create rules and regulations on how to handle claims when employees failed drug tests. Some states even enacted workers' compensation laws that encouraged the establishment of drug-free workplace programs by providing discounts on annual insurance premiums.

Since many of the larger companies operate internationally, including all of the larger airlines that fly into or out of the United States and major oil companies (which are regulated by the DOT), drug testing has expanded beyond the borders of the United States into other countries.

Value of Drug-free Workplace Programs

A drug-free workplace program typically contains one or more of the following components:

- policy statement;
- employee orientation and drug-awareness education program;
- supervisor training;
- an employee assistance program (EAP), including intervention and treatment referral components; and
- testing for certain categories of drugs.

A study conducted by Forward Edge, Inc. in the mid 1980s found that 38 percent of all workers tested in the Freeport/Lake Jackson, Texas community could not pass a drug test. Following a year of aggressive random drug testing, the positive rate was reduced to less than 10 percent and continued to decline in following years. It was concluded that drug testing had both detected drug users and eliminated them from the workplace, either because of provisions of treatment or termination, and had also deterred use by those employees who were not necessarily addicted.

But was this community typical of the rest of America, and did the reduction of the level of drug abuse really have much of an impact?

A review of the scientific literature on the effects of illicit drug use on employees' health and performance reveals that there is a good deal of information about the health risks associated with illicit drug use, and a fair amount about some of the ways in which drug abuse affects human performance. Only limited information is available about the actual effects of illicit drug use in the workplace, but the information we do have clearly indicates the significance of this problem.

Major Findings

In the United States, where this issue has been studied to some extent, one out of every 12 employees and one out of five employees between 18 and 25 use some illicit drug at least once a month. The youngest age group - those just entering the workforce - has by far the greatest prevalence of use. This should be a great concern for employers as they bring on future workers. The drugs most commonly abused are cannabis, cocaine, barbiturates, amphetamines and opioids, with cannabis (marijuana), by far, being the most prevalent.

It is estimated by the National Institute on Drug Abuse that approximately 70 percent of the adult illicit drug users in the U.S. are employed. Cannabis is the drug most frequently abused in most workplaces, with 7 percent of all full-time employees and 17 percent of those aged 18 to 25 using in the course of a month. Cannabis significantly impairs the worker's ability to perform relatively complex tasks such as driving, posing what may be the greatest performance and safety risk for employers.

This connection of drug use and impairment is reinforced by a study conducted in the late 1980s by Forward Edge, Inc. wherein 68 percent of all employees tested following accidents during a 6-month period could not pass a drug test, with an overwhelming majority testing positive for marijuana.

Studies indicate the impairment caused by cannabis use can persist as long as 24 hours - even though the user may no longer be aware he is still impaired. Therefore, observation of employees may not detect potentially unsafe employees which could be detected through drug testing.

Effects in the Workplace

Current research documents the problems most frequently reported about drug-using employees as:

- increased use of health services and insurance benefits;
- greater absenteeism;
- more frequent job turnover;
- increased risk of accidents; and
- decreased productivity.

According to the United States Occupational Safety and Health Administration (OSHA), 47 percent of all industrial accidents in the United States are related to drugs and/or alcohol. Drug and alcohol abusers file about 5 times as many workers' compensation claims as non-abusers. National statistics also indicate that drug and alcohol abusers will utilize 300 percent greater medical benefits than non-abusers.

Analysis of corporate records from 10 worksites of five large firms in the United States has suggested that substance users have between 1.5 and 3 times the illness rates of those who do not use illicit drugs or alcohol. One national survey of executives of large U.S. firms showed that a majority believed that the absenteeism rate of substance abusers was two to three times that of other workers and that drug abuse caused increased absenteeism in their own firms.

But does the cost of eliminating drugs in the workplace outweigh the benefits?

Cost/Benefits of Interventions

The cost-effectiveness of EAPs for clients with drug or alcohol problems seems well established. A representative case is the United Airlines EAP that achieved a 7-to-1 benefit-to-cost ratio over five years, or nearly 17-to-1 over the clients' expected careers.

There have been relatively few systematic attempts to study the cost-effectiveness of interventions directed at illicit drug use alone, including drug testing programs. However, the findings of the largest and best-designed of these studies consistently demonstrate that such programs are extremely effective in reducing prevalence of drug abuse in the workforces studied and that the net savings achieved are significant.

A scientific study completed in December, 1995, conducted by Houston's Drug-Free Business Initiative (HDFBI), in collaboration with the University of Houston at Clear Lake, reinforced the belief by many employers that drug testing reduces injuries and workers' compensation claims in the workplace. The study, although scientifically inconclusive, found that companies engaged in random drug testing in combination with preemployment testing reduced their mean workers' compensation claims per 100 employees per year by 63.7 percent over a 4-year period while the "control group" of employers (employers not conducting drug testing), experienced a 19 percent increase during that same time period.

The HDFBI study also captured employers' attitudes about the cost effectiveness of drug intervention strategies in the workplace. It found that well over half of the responding employers believed that the benefits of drug testing outweighed the cost and just under half felt that the benefits of an EAP outweighed the cost. When asked to select one strategy over the other, 40.6 percent of the respondents stated that it was more important to conduct drug testing than have an EAP, while only 7.8 percent thought it was more important to have an EAP than to test. However, 51.6 percent thought drug testing and EAPs were of equal importance.

An examination of the outcomes of drug-free workplace efforts by the U.S. military, the U.S. Postal Service, and private employers indicates that drug-free workplace programs are an effective drug demand reduction policy. The following are just a few examples:

United States Military

Perhaps the most dramatic decrease in the prevalence of illicit drug use after the institution of a drug-testing program has been reported by the U.S. military forces. Although some drug testing began in the military in 1972, the program evolved slowly. The crash of a jet fighter on the deck of the aircraft carrier Nimitz in 1981 focused attention on the issue of impaired performance and widespread random testing began in earnest toward the end of that year. Self-reported drug use among military personnel began its dramatic decline in 1982, decreasing by almost 50 percent in each of three studies over a six-year period. In 1986 positive tests had already dropped to only about 4 percent.

In a 1980 survey of drug use among U.S. military forces around the world, 27 percent of the respondents reported having used an illicit drug during the previous 30 days. A random drug-testing program was introduced widely in 1982, and successive repetitions of the survey found a progressive drop in reports of recent use of illicit drugs: down to 19 percent of the respondents by 1982, 9 percent in 1985 and 4.8 percent in 1988. Analysis of the data has shown that this decline cannot be attributed primarily to either shifting demographics of new recruits or changes in drug consumption among the civilian population. In

the opinion of a Navy captain who has been associated with the program from inception: "The single most important factor in bringing down drug use in the Navy has been the urinalysis program and... the ability to take punitive action from a positive urinalysis."

In the 1980 study, the percentage of respondents reporting use during the past year was 35 percent for marijuana, 13 percent for amphetamines, and 11 percent for cocaine. Three percent of all Department of Defense personnel were judged to have been physically dependent on a drug at some point in the previous year. In 1988, only 6 percent reported marijuana use, 2.5 percent reported cocaine use, and 1.6 percent reported amphetamine use during the previous year. Virtually no evidence of dependence on illicit drugs was seen.

United States Postal Service

One of the best designed attempts to estimate the strength of the association between a positive drug test in a pre-employment screen and subsequent rates of absenteeism has been the study of 395 U.S. postal workers who were hired despite a positive test and entered into a two-year evaluation study between the fall of 1987 and spring of 1988.

Analysis revealed that the mean absence rate was 6.63 percent for the employees who tested positive, compared with 4.16 percent for those who tested negative. The absence rate of those who tested positive was 59.4 percent greater than that of the negatives, and the positives were 1.97 times more likely to be among the heaviest users of leave (i.e., those with average rates higher than 3.0 percent).

Employees who tested positive on their pre-employment drug tests were 1.7 times more likely than those testing negative to file an above-average medical claim. In addition, the average claim for those who tested positive was \$487 per year, compared to \$260 per year for those testing negative. Although the rate of substance-abuse related claims was relatively low for both groups of employees, positive testers filed 3.4 times as many drug- and alcohol-related claims.

According to study results, the postal service would have saved \$52 million by 1989 had it screened out all drug-positive postal service applicants in 1987. By June of 1991, this figure more than doubled - \$105 million - emphasizing that workplace-related alcohol and drug-abuse problems continue to develop and impact the workplace throughout the course of employment.

Southern Pacific Transportation Company

Declines in drug use have been reported by the Southern Pacific Transportation Company after initiating a drug-testing program in 1984. In addition to using the tests to screen prospective employees, current employees could be tested for reasonable suspicion, as well as after any accident. In the first year of testing, 22.9 percent of the tests were positive for drugs or alcohol, but in 1985, only 11.6 percent were positive and the downward trend continued, with 5 to 6 percent positive in 1986 through 1988.

By the beginning of 1988, personal injuries per 200,000 man hours worked had dropped from 15.5 to 5.8. During the same period, train accidents attributable to human failure dropped from 22.2 per million train miles to 2.2.

In most years, marijuana has been the drug most frequently detected, with cocaine detected about half as often, usually more frequently than alcohol. An evaluator of the program concluded that "Drug testing does act as a powerful deterrent to drug use on the job." He further concluded "Drug testing does make the workplace safer and increases overall public safety by substantially reducing accidents and injuries."

Utah Power and Light Company

Evaluation of a small number of employees of the Utah Power and Light Company who tested positive for illicit drugs (primarily marijuana) showed that they were five times more likely to be involved in an accident than a matched control group. Accident rates had been rising in the utility company in the two years previous to the introduction of drug testing (both pre-employment and "for cause") in 1985, after which rates fell significantly.

Employees who tested positive for illicit drugs were found to have averaged 63.8 hours of unexcused absences over the two years of the study, versus the 18.7 hours of a match control group - a ratio of 3.4 to 1. Those who were in rehabilitation for substance abuse averaged 32.2 unexcused absences, versus 10.1 for their control group.

Overall benefits of the drug testing program are estimated to have exceeded costs by 37 percent.

Georgia Power Company

In a study of the previous performance of 198 employees of the Georgia Power Company who were dismissed after testing positive for illicit drug use, it was found that the employees who had tested positive had averaged 165 hours of absenteeism, compared with 47 hours for their control group and 41 for the workforce as a whole - a ratio of four to one.

Georgia Power estimates that it saved as much as \$1.7 million by discharging and replacing 198 employees who failed drug tests between 1983 and 1987. This figure was arrived at by calculating savings from excess medical claims, absenteeism, and workers' compensation payments.

Georgia Power also estimated that the cost to the company for its drug-testing program - combined with the costs of legal challenges, lost productivity, recruiting, and training expenses - ranged between \$7,287 and \$8,063 per employee.

The investigators in the study concluded that the average benefits to be realized per employee dismissed were between \$9,548 and \$15,824. This meant that the net savings were somewhere between 18 percent and 195 percent of the total cost of detecting, dismissing and replacing the employees who had tested positive.

United Airlines

About 2,000 of the first 5,100 clients at an EAP of United Airlines had problems with alcohol or drugs, often both. Absenteeism of participants during the first year of participation dropped 74 percent below that of the previous year in Chicago and about 80 percent in San Francisco.

The benefit-to-cost ratio, based chiefly on reduction in sick leave, and taking into account all costs associated with the EAP itself, was seven to one projected over five years and nearly 17 to one over the client's expected career. Similar results are widely known such as the EAP program at Phillips Petroleum which produced reductions in accidents and sick leave that netted more than \$8,000,000.

Brown & Root (now known as the Halliburton Company)

Since the implementation of its drug abuse prevention program, Brown & Root (The Halliburton Company) has witnessed remarkable improvement in several areas. For example:

The recordable injury accident rate declined from 9.73 in 1986 to 4.11 in 1991, the most recent year for which data was tabulated (the industry average for the same periods was 14.5 and 14.2 respectively);

Pre-employment positive drug test results dropped from 8.8 percent in 1986 to 3.6 percent in 1991; and

Random employee positive results dropped from a high of 6 percent in 1987 to 2.6 percent in 1991.

Chamberlain Contractors

Chamberlain estimates that it saves in excess of \$70,000 a year, plus additional savings as the result of quality workmanship and fewer "go backs" on jobs already completed. Part of that savings does include approximately \$50,000 in reduced workers' compensation insurance premiums.

Emergency One

Emergency One's management attributes the continuing overall decrease in the number of positive tests for all types of testing to random testing. Since 1987, Emergency One's pre-employment positive rate decreased from 33 percent to two percent. Workplace accidents also decreased by 50 percent over the last four years, thereby producing significant savings on workers' compensation costs.

Emergency One "looks at the program as an investment rather than an expense." The company spends \$17,000 per year for testing, which is \$14.78 per employee.

Hoffman Construction Company

Hoffman experienced 45 lost-time accidents in 1984, before the drug and safety program was implemented. In 1985, the year in which the safety program began, the number dropped to 33 accidents. In 1986, with the drug-testing program in effect for six months, there were only six accidents. With both programs fully operational in 1987, Hoffman experienced only two lost-time accidents.

Workers' compensation losses in 1984 with no program in place were \$986,000. By 1987, with both programs in place, the company's losses had decreased to \$118,000.

The Upjohn Company

Upjohn carefully tracks and evaluates the costs and savings of its substance-abuse prevention program. In 1993, Upjohn's program cost the company approximately \$476,000. With gross savings of more than \$1 million, the company realized a net savings of approximately \$560,000 - in 1992 alone. Savings of \$799,000 were realized in two areas alone: reduced absenteeism (\$450,000) and reduced turnover (\$349,000).

Warner Plumbing

The owner of Warner Plumbing estimates his company saved \$385,000 in compensation and insurance premiums. By early 1993, the company saved an additional \$31,000. Also, because there has been less turnover since the implementation of drug testing, the company saves at least \$20,000 annually on personnel advertising and hiring costs.

Regarding the cost of training new employees, Warner says the number of apprentices who complete the two-year course has increased from 25 percent to 75 percent, resulting in a savings of about \$165,000 per year.

Additionally, workers' compensation claims decreased from 111 annually to just 35.

W. W. Gay Mechanical Contractors

W. W. Gay had spent a total of \$67,000 by the end of 1993 on drug testing since the program was started in 1990 but had gotten back \$19 for every dollar spent. This includes the decrease in workers' compensation bills and savings in medical costs on denied benefits for failures in post-accident testing.

When the company began testing, the failure rate was 17 percent. A more recent reported rate was only one percent. Furthermore, the company experienced only eight lost-time accidents in 1992, indicating that the loss ratio dropped by 15 percent since testing began.

The most convincing evidence of the program's success is, however, the savings in insurance premiums. Prior to the start of drug testing, W.W. Gay paid \$2 million a year in claims; however, the company paid only \$1.26 million in claims the year the program was established. At the close of 1993, the total for insurance claims was only \$264,000.

Conclusion

In the light of the evidence reviewed above, it seems clear that the benefits of reducing illicit drug use in most workplaces should outweigh the costs entailed. Considering the obvious importance of reducing such risks as that of occupational accidents, it seems unnecessary even to raise the question of economic savings in many contexts, such as among employees in any safety-sensitive positions.

We do not have a plethora of reliable data on the relative cost-effectiveness of various types of interventions within specific industries, much less across industries. Indeed, only a relatively few studies have attempted true cost/benefit evaluations of actual interventions, and these studies reflect that we are in only the very early stages of learning how to apply econometrics to these evaluations.

Nonetheless, the few studies of this kind that have been reported provide an intriguing look at the early exploration of a particularly complex field of research, as well as substantial encouragement for the proposition that it is not only possible, but cost-effective, to reduce drug abuse in the workplace.

We now have sufficient statistical data from which we can convincingly show in a courtroom that:

Drug use in the workplace is a reflection of drug use in our society.

It is simply not true that a drug user or alcohol abuser leaves his habit at the factory gate or the office door.

Drug testing does make the workplace safer and increases overall public safety by substantially reducing accidents and injuries.

Drug testing does act as a powerful deterrent to drug use on the job.

Drug abuse prevalence in a work force is related to many variables, including the nature of the work, the culture and traditions of the industry, the operating philosophies of management, the orientation of supervisors, and the social mores of the employee population. A direct variable is the influence of countermeasures effected by the employer. Counter measures are effective to the extent that they are weighed against actual (not imagined) prevalence. The use of drug testing as a countermeasure should be based on an objective analysis of need. For example, it would not be effective to only conduct random tests of plant workers when the drug problem exists within the office workers.

An employer that demonstrates zero tolerance for illegal drugs in the workplace can be a model for spreading the antidrug message to the community. After all, the majority of our community segments are workplaces, be it government, private companies, schools, churches, or non-profit organizations.

The success that an employer will have in ridding the workplace of drug abuse depends to a large extent on employee perceptions. Enforcing an antidrug policy, testing for drugs, educating employees, and training supervisors are activities that strongly shape employee perceptions. Another activity that influences these perceptions is respect for employees' privacy expectations.

Many companies that have initiated drug testing programs report dramatic reductions in medical costs, accident rates, absenteeism, as well as increased productivity and morale. Successful programs integrate employee education, supervisory training, and employee assistance. The companies that have achieved good results have managed to satisfy both the needs of employees to feel safe and secure at work and the needs of management to maintain a safe, secure, and productive environment.

It is important to remember that the majority of our employees, and indeed the majority of our citizens, are drug-free and deserve the benefits of drug-free workplaces that protect them from the harms of drugs.

It is also important to note that the government played an important role in encouraging the progression of drug testing in the United States and also was vital in establishing guidelines to create consistency in the programs.

Recommendations

Governments should initiate efforts to support and promote drug-free workplace programs that include drug testing, including government mandates and financial incentives.

More research needs to be conducted to measure the effectiveness of drug testing and other components of a drug-free workplace program, with a specific emphasis on individual industries. The knowledge and experience that has been obtained from drug testing in the workplace should be applied to other arenas such as schools to develop similar programs that can be effective in pushing back against drug abuse.

Author Information

Calvina Fay is the executive director of Drug Free America Foundation, Inc. and Save Our Society From Drugs (S.O.S.). She has served as an advisor to the White House's Office of National Drug Control Policy as well as several political leaders, including former President Bush, on drug policy issues. In 2008, she received special recognition from then President George W. Bush for her exemplary efforts in drug prevention. She is also the recipient of the **2009 President's Award** from the National Narcotics Officers Associations Coalition. Professor Fay has over 25 years of experience in the drug prevention field and is considered a pioneering expert on workplace drug abuse prevention programs. She has authored several books, including *The Supervisor's Handbook For Preventing Drug Abuse in The Workplace* and *Starting a Drug-Free Business Initiative*, as well as numerous newsletters and publications in the field that have been published at regional and national levels. She was the managing editor and a co-author of *A Report on Employer Attitudes and the Impact of Drug Control Strategies on Workplace Productivity*. She also served as the managing editor of a monograph titled *Drug Abuse in the Decade of the Brain*. Professor Fay holds a masters degree in business administration and is an honorary professor at the Argentina Universidad del Salvador. She has founded, built and sold two successful businesses.

Conflict of Interest Statement

I declare that I have no proprietary, financial, professional or other personal interest of any nature or kind in any product, service and/or company that could be construed as influencing the position presented in this paper.

Where views are expressed they are my own. The findings are based strictly on research and my personal experience with drug-free workplace efforts throughout the years.

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