

Drug Testing: Shaky Science May Nullify Good Intentions

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Issue Paper no. 4-90, April 3, 1990. More by Kopel on the [drug war](#).

[For more information on this topic, we recommend the following books:

[The Drug Screen Manual](#): The Tests, the Technology, the Risks, the Reality. By Dr. John Mrozek. Focus on human errors which can produce false positives.

[Pass the Test](#): An Employee Guide to Drug Testing. By Dr. Beverly Potter J. Sebastian Orfali. Topics include legal substances which cause false positives, how long various substances stay in one's body, and the legal rights of employees.

[Ur-Ine Trouble : How Drug Users Are Passing and Nonusers Are Failing](#) . By Kent Holtorf, Angie Vandaele. Examines over 200 medical studies about the accuracy, racial bias, and cost-efficiency of drug testing. Reports medical steps which some people use to evade tests.

PLEASE DO NOT CONTACT THE INDEPENDENCE INSTITUTE FOR INFORMATION ABOUT DRUG TESTING. EVERYTHING WE KNOW ABOUT THIS SUBJECT IS CONTAINED IN THIS ISSUE PAPER. PERSONS CONCERNED ABOUT FALSE POSITIVE TESTS SHOULD CONTACT AN ATTORNEY.]

Executive Summary

- [If we value the rights of the innocent, we should question a technology that is wrong about up to half the people it "catches" -- even up to 91% of them according to AMA research.
- [Many drug testing labs are shoddy; government regulates them less strictly than restaurant kitchens.
- [False positives can arise from many patent medicines, bakers' poppy seeds, even natural body enzymes.
- [Re--testing for confirmation is also technically imperfect, and eventual exculpation will often fail to lift the shadow of doubt created about a person who scored false positive.
- [Congress has decided that lie detectors foster injustice rather than justice; the same appears true of drug testing at the current state of the art.
- [Some testing remains necessary, but strict guidelines for quality assurance should be observed; the author suggests nine such rules.

Introduction

Many people strongly believe that the war on drugs is as important as the Second World War. The reasoning herein makes no case for drug legalization, or even decriminalization.

There are a myriad of weapons useable in war on drugs -- but there is one weapon that is inappropriate, because it harms more innocent victims than real criminals. This is the confident reliance on urine tests implicit in several bills now before the Colorado legislature --including House Bill 1253 which would legitimate and encourage testing by businesses, House Bill 1170, which would impose extensive new testing requirements. and Senate Bill 26, which links testing with worker's compensation.

The current state of science for drug testing is too primitive for use in a society that respects the rights of innocent people. Until technology improves, drug tests will injure the innocent more than they will identify the guilty.

Simply put, false positives are the result of the imprecision of current testing methods, and the shoddy quality of many testing laboratories. Follow-up confirmation tests have their own limits, and cannot solve the problem.

AMA Sees 9 of 10 Falsely Accused

The explanation for why drug testing doesn't work is a simple mathematical truth "99% x 1% is the same as 1% x 99%." As the example below illustrates, this mathematical rule explains why the number of innocent people accused will be at least as large as the number of guilty people uncovered.

A laboratory runs a test to determine the presence of cocaine in the blood of the 10,000 employees. Ninety-nine percent of the employees do not use cocaine; one percent do. (This assumption overstates the rate of cocaine use among most groups of citizens with full-time jobs.) The results of the tests:

	99% Accurate Test	Results
9,900 Non-Users	x 99% (accurate)	9801--Innocent People identified as innocent
	x 1% (inaccurate)	99--Innocent People identified as guilty
100 Users	x 99% (accurate)	99--Guilty people identified as guilty
	x 1% (inaccurate)	1--Guilty person identified as innocent

Note the two items in bold: the number of innocent people accused, and the number of guilty people accused. The number is equal. There is nowhere else in our enforcement of our laws where we would tolerate a practice that

accused the innocent as often as it accused the guilty. As the *Journal of the American Medical Association* has detailed, as many as 91% of the "positives" in a test may be false positives.[\(1\)](#)

The Problem Of Laboratory Quality

No matter how good a test may be in theory, it is only as good as the laboratory that carries it out. Laboratories today are subject to virtually no regulation. The industry is enjoying a boom that comes with growing demand and a absence of effective regulation. Many laboratories are run by substandard operators. Some advertise in the classified pages of papers such as *Westword*. "U--R--INE LUCK" promises one ad for cheap mail--order drug tests.

Professor John Morgan, of the City University of New York Medical School, writes: "American laboratories perform poorly when sent standard samples for monitoring." Morgan cites studies by the Centers for Disease Control, showing that "drug labs perform even more poorly when such samples are disguised as if they came from a routine source rather than from a laboratory monitoring service."[\(2\)](#)

Dr. Eleanor Travers, Director of Pathology Services for the Veterans Administration, in a speech before the National Bureau of Standards, offered a list of 28 separate, documented causes of inaccurate laboratory results. Problems range from faulty temperature regulators to power brown--outs to failure of supervisors to check discrepant results to bacterial contamination and growth in the specimen.[\(3\)](#)

One of the most popular tests is the EMIT 20, which the New York government uses. The level of 50 parts per billion is the "detection limit" for the EMIT. Below that level the test has no accuracy at all. Yet, as the name "EMIT 20" explains, if a test shows the presence of drugs at 20 parts per billion, the test is called "drug positive." As result of a so--called "positive" result of 26 parts per billion, a transit employee may be fired, or a parolee may be sent back to prison.

Of course not all laboratories are equally bad. For example, labs used in federal employee drug testing are certified by the federal government to meet minimum standards. It must be remembered, though, that federal certification is no infallible guarantee of high quality --as anyone who has visited the Rocky Mountain Arsenal would attest. Notably, I.B.M., which runs a rigorous and limited testing program, believes that only one laboratory in the entire nation meets necessary standards of performance. In most states, laboratories are subject to less regulation than a restaurant kitchen. Would it be right to put a person's career and reputation in the hands of such operations?

False positives

Laboratory slip-ups are to blame for many of the mistaken test results. But even perfect labs running perfect tests will also find many false positives.

False positives are caused by:

- [Nasal decongestants such as Dristan, Neosynephren, Vicks Nasal Spray, and Sudafed, which cause false positives for amphetamines.
- [Poppy seeds like those on a dinner roll, which cause false positives for opiates. Even the highest-quality test currently available, the GCMS test, still confuses poppy seeds with heroin.
- [Pain relievers such as Advil, Nuprin, Midol, Trendar, or any medicine containing Ibuprofen cause false positives for marijuana.
- [Antibiotics such as amoxicillin or ampicillin cause false positives for cocaine.

The above list is only a beginning. Most substances which people have in their blood have never been tested to see if they cause false positives. Indeed, even some natural body enzymes cause false positives. According to research validated by the Congressional Office of Technology Assessment, **melanin, the natural pigment which makes skin dark, can cause false positives for marijuana.**

The Problems of Confirmation Tests

Even if confirmation tests were perfect, the initial "drug-positive" result would still stain a person's reputation. In a world of perfect experiment conditions, accurate confirmation tests would cure the problem of too many initial false positives.

But the confirmation test will be performed on the same specimen that the first test was based on. If the first laboratory mislabeled or accidentally switched the specimen with another, the confirmation test would not help. The second test would merely confirm the guilty results of the first test. The test could not discover that the first lab had mistakenly switched the labels on the specimen when it entered the door.

Moreover, standards in the new business of urine testing business are virtually non-existent. Dr. Morgan notes that confirmation procedures at many labs are rigged so that almost any result from a second test is claimed to confirm the accusation of the first test.>[\(4\)](#)

The Damage To Reputation Can Never Be Erased

In an ideal world, confirmation tests would provide innocent people with full scientific protection. Yet even in that ideal world, the injury done by a false positive could never be undone.

Consider a company president who was choosing which of two equal employees he would promote. The two employees were just as good --except

that several months ago, one employee had failed a urine test. A later follow-up test had exculpated her, theoretically. Yet the president might wonder just a little about what had caused the one employee to fail that first urine test. **Just as people remember the arrest rather than the acquittal people will remember the initial false positive test, rather than the confirmatory negative test.**

Employer Liability Issues

Under the existing doctrine of employment at will, businesses currently enjoy the right to fire an employee without proof of a "good cause." Unlike in other countries -- such as Italy -- an employer does not need to prove a good reason for dismissing the employee. Thus, if an employee's performance declines, the employer has the right to fire him, without any inquiry into why the performance declined. Drug testing, therefore, is an entirely unnecessary tool for companies which wish to fire substandard employees.

There are No Rights Without Responsibilities

If businesses arrogate for themselves the right to inquire into their employees' behavior away from the workplace, businesses will ultimately bear the responsibility for the employees' non-work behavior. Statutes may temporarily shield employers from liability for what their employees do away from work; but statutes cannot overcome the long-term shift in social consciousness which drug testing will engender. As businesses begin to use biochemical testing to find out what their employees do away from the office, businesses will saddle themselves first with moral responsibility, and ultimately with legal and financial responsibility. By taking on the governmental role of law enforcement, businesses will ultimately find themselves stuck with other governmental duties, such as being forced to pay for drug rehabilitation for low-performance employees, and being held financially responsible for off-the-job employee behavior.

Business losses caused by drug-using employees are often cited as a justification for widespread drug testing. Yet the studies cited are usually scientific nonsense. For example, it is commonly claimed that drug-using employees cause business losses of 60 billion dollars. That figure is derived from a single study by a North Carolina group which compared the incomes of drug users with the incomes of non-users. Unfortunately, the study failed to control for other factors which affect income. For example, if a young black who smoked marijuana five times a year lived in Harlem and earned less than a white man who never used illegal drugs and lived in a rich New Jersey suburb, the "study" would claim that the entire income difference between the Harlem black and the New Jersey white was due to drug use. Likewise, a college-educated Priest in Watts who occasionally used illegal stimulants might have his income compared with college-educated, drug-free oil company president in Beverly Hills. The \$100,000 income difference

between businessman and Priest would be labeled a \$100,000 business loss due to drugs, according to the North Carolina study.

Drug testing is like polygraph testing. Both are used to find guilty people. They operate on the basis of making a person furnish the accusation against himself, either by giving away his urine, or by letting the electrical impulses from his brain waves be scanned. Both polygraph testing and urine- testing result in huge numbers of accusations against innocent people. Congress recently outlawed the use of polygraphs, in order to protect workers from false accusations. To further the same laudable goal, Colorado should consider prohibiting urine testing until the state of technology and laboratory quality significantly improves.

Rejecting drug testing because of its technical flaws does not mean giving up in the war on drugs -- any more than deciding not to use poison gas meant we gave up on World War II. There was simply a decision that poison gas (like drug testing) might end up harming too many innocent bystanders.

In World War II, we used all of our national effort to achieve an essential goal. Yet in one particular step, America went too far.

American citizens of Japanese descent were herded into concentration camps. There was no proof that they had done anything wrong. We falsely assumed that if people looked like the enemy, they must be the enemy.

Drug abusers are the enemy in the war on drugs. People whose are claimed by laboratories to test "drug-positive" are often not the enemy. Most of those people are people who never use drugs. Simple mathematics guarantee that the result of widespread drug testing will lead to accusations mostly directed at the innocent. Future generations might look back at today's Colorado in astonishment, if we strive so hard to find the guilty that we condemn the innocent as well.

Drug Testing Guidelines

At a time when all indications show that drug use is down, and Drug Czar Bennett states that we have turned the corner in the war on drugs, drug testing is an unneeded and inaccurate weapon in the drug war arsenal. Nevertheless, there are certain situations where drug testing may be required. For example, federal procurement guidelines may force a bidder for a federal contract to use drug testing. The following list offers guidelines for testing programs. The guidelines help to protect the innocent from false accusations, and to protect privacy. While many public policy questions can be settled by "splitting the difference," drug testing guidelines should not be diluted. The citizens of Colorado deserve the fullest protection possible from unreliable tests which could ruin a person's career and grossly violate her privacy.

[Reasonable collection methods. Under no circumstances should a person's genitals be directly observed, nor should she be directly observed in the passing of bodily wastes. Further, employees should have the choice of urine tests or blood tests, so that each person can choose the method which is less personally intrusive. Blood tests are less likely to yield false positives, and are more likely to reveal recent on-the-job drug use, since drugs enter the blood stream long before they enter the kidneys. Reasonable regulations can ensure that the blood/urine choice does not interfere with the testing process.

[Protect individuals from mislabeled samples. So-called "site collection monitors" are usually minimum wage employees. If they mislabel a specimen, all the confirmation tests in the world will not protect an innocent person. All confirmation tests should be performed on separate specimens, separately obtained, and with their own chain of custody.

[Use good science. Testing procedures should conform to the highest and most reliable scientifically accepted standards. Testing should reduce to an absolute minimum the false positives caused by natural body chemicals such as melanin. (A melanin screen costs about five cents per test.) Confirmation tests using the best available technology (gas chromatography mass spectroscopy) should be mandatory. Test results at or below the detection limit should never be considered positive.

[Interpret the results responsibly. The federal testing programs require all test results be reviewed by a Medical Review Officer before disclosure to the employer. The Medical Review Officer should be a physician with experience in drug abuse and forensic science, who can accurately assess the significance of the test results.

[Protect employee privacy. Records of medical tests should be kept in secured files segregated from the employee's non-medical personnel records. The company should control access to such information with due regard for the privacy of the employee. In particular, line supervisors should not have access to test results.

An individual who takes prescription drugs, such as anti-depressant medication, may have to disclose intensely personal medical information in order to explain a false positive test result. Some people would prefer not to apply for a job, rather than to risk having to disclose confidential medical information to a stranger. So that a person can assess whether they wish to undergo the testing process necessary for a job, employers should disclose in

writing what tests they use, and what drugs they test for. With full disclosure, a prospective job applicant can be made aware that he will face a test for which anti-depressant or other medication might cause a false positive, and could choose not to apply for the job.

[Protection from false positives. The burden of disproving a reasonable explanation offered in writing by the employee should rest with the person or entity making the accusation.

[Make shoddy laboratories pay for their mistakes. Given the minimal/non-existent state of regulation, the only incentive for laboratories to act responsibly is the payment of damages to people they injure by their mistakes. Testing regulations should make it clear that laboratories may be sued for failure to adhere to highest duty of care with regard to the tested individual.

[Focus on drug abusers. No amount of paid advertising from the drug test lobby can avoid the basic rules of mathematics. The math illustration above -- showing that drug testing snares many innocent people along with the guilty --- goes by the name of "Boyes' Theorem." The theorem states that in a testing program where only a few of the tested subjects are "true positives," the number of "false positives" will be extremely large. For example, if 1% of a tested population are true cocaine users, the predictive value of the test will be 50% -- only 50% of people positively identified for cocaine will be actual users. No amount of rhetoric from the drug testing lobby can overcome mathematical logic of Boyes' Theorem.

The solution to Boyes' Theorem is to change the sample which is tested. If 50% of the tested individuals are actual users, then the test will have 99% predictive value; 99% of the positives will be true positives. Thus, effective testing programs must avoid sweeping testing of the population at large, which does not use drugs. Testing programs should focus on drug abusers.

Accordingly, testing should be performed only on employees for whom there is probable cause to indicate on-the-job impairment as a result of drugs. The probable cause standard will avoid unnecessary litigation, since probable cause has already been defined by the courts to mean a reasonable (but far from overwhelming) amount of evidence. With a probable cause standard, drug testing is a moderately effective device for identifying the guilty; without probable cause, drug testing is a trap for the innocent.

*Protect public transit passengers. Airline and bus passengers deserve the assurance that their pilot or driver is not impaired. Unfortunately, drug testing assures that the pilot did not use illegal drugs in the past few weeks, but provides no assurance that the pilot is not impaired from lack of sleep, mental stress, or other condition. Psychomotor tests (co-ordination tests on a

computer simulator) should be mandatory for all public safety employees. Such tests are the only assurance that a pilot or driver is really fit. The one-time costs of a computer and a simulator program are far less than the costs of a drug-testing program.

Proper management of drug testing is perhaps the most important civil rights issue for the 1990s. Unless testing is performed under the very highest standards of quality, assurance, it is mathematically certain that drug testing will destroy the careers and lives of tens of thousands of innocent Coloradans.

Notes

1. Council on Scientific Affairs, "Scientific Issues in Drug Testing," *Journal of the American Medical Association*, vol. 257, June 12, 1987, p. 3110.

2. Dr. John P. Morgan, *Journal of Psychoactive Drugs*, vol. 20(1), Jan. - Mar. 1988, pp. 112--13, citing H.J. Hansen, S.P. Caudill, D.J. Boone, *Crisis in Drug Testing: Results of the CDC Blind Study*, *Journal of the American Medical Association*, vol. 253: 2382--2387.

3. Dr. Travers' list:

Equipment Related :

- [Equipment improperly operated by technical staff
- [Equipment failure due to poor maintenance
- [Equipment not calibrated properly
- [Power "brown--out" that alters results
- [Faulty temperature regulator
- [Wrong amount of reagent added
- [Cheap, non--sensitive reagent, outdated reagents, or defective or damaged reagents
- [Failures in internal equipment components (like optics, fans, or heaters)

Human Errors :

- [Overworked and fatigued employees
- [Pressure to produce more work in less time
- [Failure of supervisors to check discrepant results
- [Inadequately trained or experienced employees
- [Noisy, environmentally uncomfortable work sites
- [Disgruntled, unrewarded employees

- [Failure to update methods
- [Failure to follow method as specified
- [Taking short cuts
- [Errors in computer or manual data transcriptions Alteration of specimen
- [Loss of specimen
- [Delay in analysis of specimen

Specimen-related Errors :

- [Improper collection of specimen
- [Insufficient amount
- [Wrong preservative
- [Insufficient mixing
- [Mix-up of specimen with another patient
- [Wrong label on specimen
- [Patient taking medication that interferes with test
- [Patient having illness that causes false positive result
- [Bacterial contamination and growth in specimen

"Drug Testing: What Can Go Wrong in the Lab," *Privacy Journal*, June 1988, p. 4.

4. Ibid. p. 112. When looking for very tiny traces of drugs (at the level of one billionth of a gram), the tests are beyond their practical detection limit. A result of "two parts per billion with drug traces" might just as likely be the result of scientific imperfections, rather than the actual presence of drugs. Yet such low-level results are used to accuse people initially, and to confirm the accusation later.

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