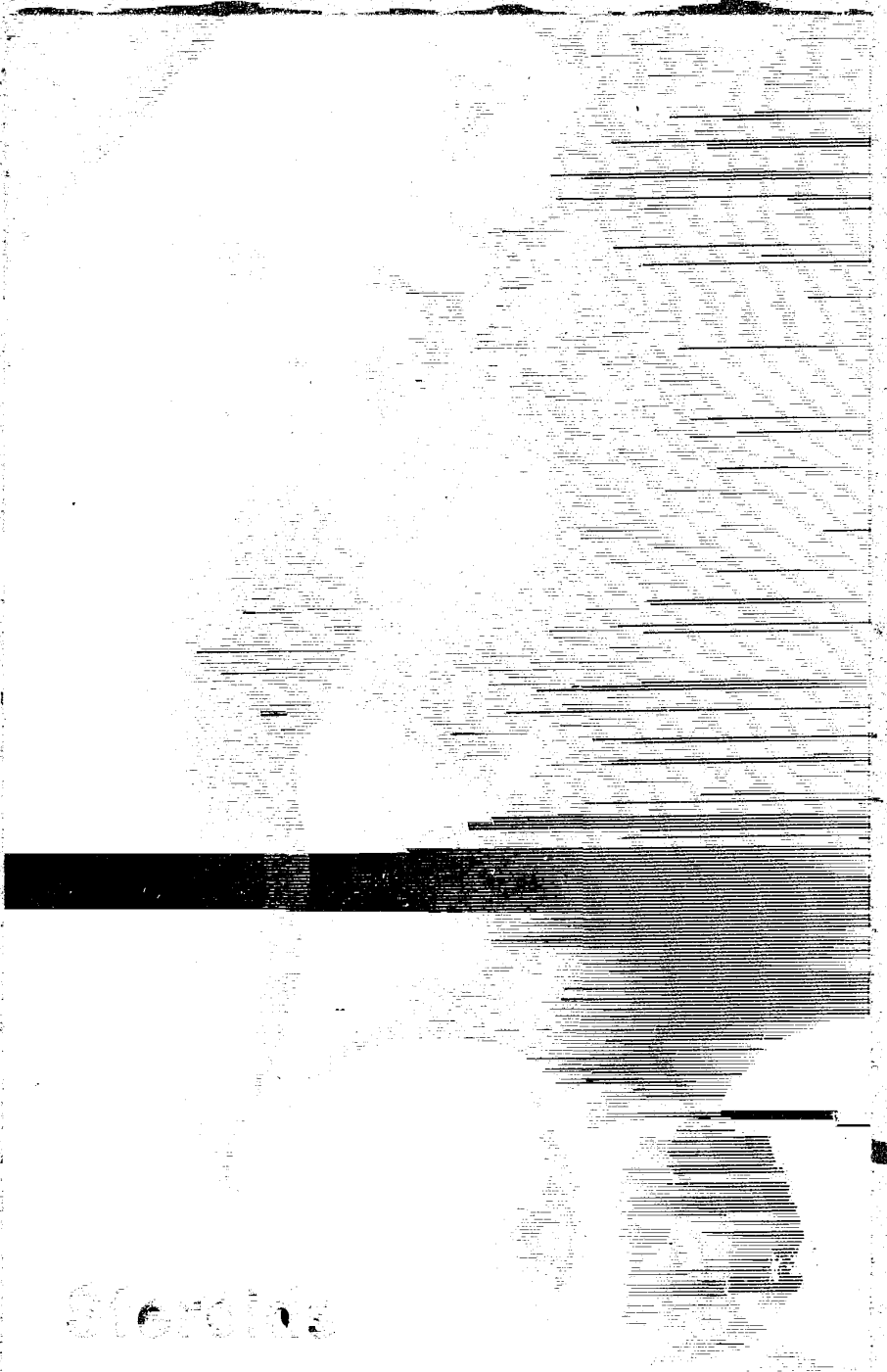
U.S. Department of Justice
Federal Bureau of Investigation

MFI



August 1994
Volume 63
Number 8

United States
Department of Justice
Federal Bureau of
Investigation
Washington, DC 20535

Louis J. Freeh
Director

The *FBI Law Enforcement Bulletin* (ISSN-0014-5688) is published monthly by the Federal Bureau of Investigation, 10th and Pennsylvania Avenue, N.W., Washington, D.C. 20535. Second-Class postage paid at Washington, D.C., and additional mailing offices. Postmaster: Send address changes to *FBI Law Enforcement Bulletin*, Federal Bureau of Investigation, FBI Academy, Quantico, VA 22135

FBI Law Enforcement BULLETIN

Features

Departments

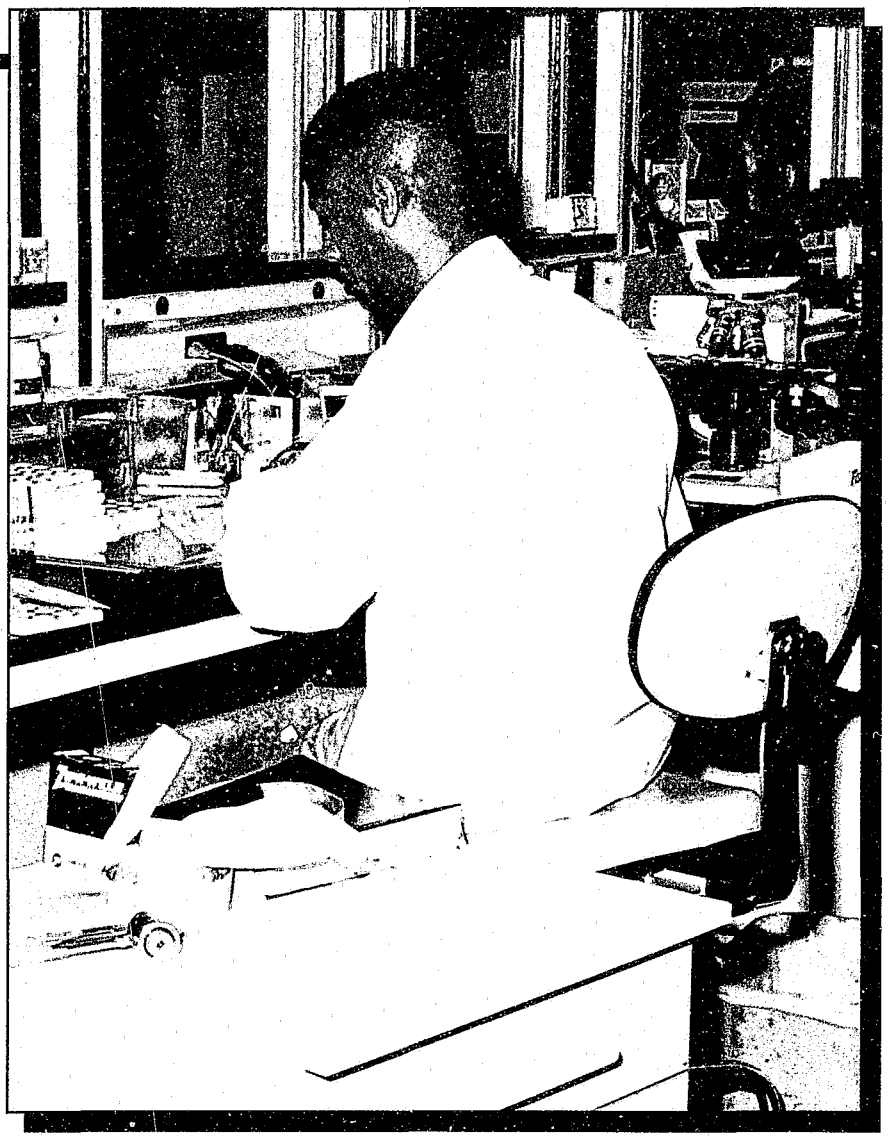
ISSN 0014-5688 USPS 383-310

149702

Drug Laboratory Efficiency

Shifting Paradigms

By
SHIV K. SONI, Ph.D.



Like many other large urban areas, Baltimore, Maryland, witnessed a record number of homicides (353) and drug arrests (17,687) in 1993, as the fatal combination of drugs and guns challenged already-strained law enforcement resources. With the increase in drug-related offenses, aggressive drug law enforcement remained a top priority within the city's police department. As a result, the department's Drug Analysis Unit (also referred to as the laboratory) confronted an enormous caseload, one that has doubled since 1982.

In 1993, the laboratory analyzed a record number of controlled dangerous substances (CDS) cases—18,010, containing 235,485 total drug units. CDS submissions increased nearly 40 percent over 1990 figures, while total drug units increased over 65 percent.

Numbers, however, do not tell the complete story. Drug analyses have become increasingly complex as drug abuse and distribution patterns evolve. For example, laboratory analysis revealed that two distinct qualities of heroin were being distributed on the streets of Baltimore: A low quality taken by injection and a high quality ingested primarily by inhaling.

New designer drugs also continue to enter the illicit market. In spring 1992, the laboratory played a major role in the analysis of Fentanyl, a street drug distributed under the name "China White." Use of this drug resulted in 30 deaths throughout Maryland, including 25 deaths in the City of Baltimore alone. In addition, analysis and identification of anabolic steroids—designated as controlled substances under separate Federal and State laws—involve a complex process, requiring the use of state-of-the-art analytical instruments.

To meet the challenge of increased caseloads and more complex drug analyses, while working within an environment of fiscal

restraints, the Drug Analysis Unit made a series of management decisions that ultimately led to greatly enhanced productivity and efficiency. This article describes the factors that led to the "paradigm shift" undertaken by the laboratory and the specific changes that produced positive results.

THE CHALLENGE

To support investigations adequately, drug analysis must be rapid, precise, and cost-effective. However, during the last decade, budgetary constraints often precluded staffing levels commensurate with the ever-expanding influx of drug cases. Nationwide, increased caseloads and demands for prompt analytical information by the courts placed tremendous pressure on laboratory services. In Baltimore, this situation was exacerbated by a reliance on manually operated, labor-intensive analytical instruments, as well as a resistance to standardization and to newly acquired automated procedures on the part of laboratory personnel.

The challenge to administrators, therefore, was to design a system that would eliminate the constant backlog, decrease turnaround time, increase individual productivity, and maintain high analytical standards for accuracy and precision. Any practical system must also effect a paradigm shift in the mindset of the personnel within the Drug Analysis Unit to make them more receptive to change and new ideas.

SHIFTING PARADIGMS

To meet the challenge and to escape the limitations of the former paradigm (the "old way of doing things"), managers carefully developed a new set of paradigms. These standards include:

- Expanded training and education of personnel
- Review and revision of the laboratory's standard operating analytical procedures
- Continuous quality improvement measures
- Acquisition and application of emerging technologies for analytical purposes
- Design of innovative laboratory forms
- Continued sensitivity to public interests.

Adapting to changes in the scientific and technological environment requires a constant acquisition of knowledge and skills. Eventually, the successful implementation of these concepts culminated in a more productive and efficient environment within the Drug Analysis Unit.

Training and Education

When setting out to improve efficiency, administrators understood that training and education constitute a basic, but easily overlooked, component of productivity. Therefore, the training and education program was expanded and redesigned to promote independent thought and sound scientific judgment in the use of automated procedures.

The multifaceted program covers drug analysis techniques, as well as the principles, applications, and limitations of the methods and techniques currently in use. To reinforce the training, managers encouraged chemists to use automated equipment and procedures in daily routines. The integration of automated procedures into the working routine, though slow and

Dr. Soni supervises the Drug Analysis Unit of the Baltimore City, Maryland, Police Department.

"...the Drug Analysis Unit made a series of management decisions that ultimately led to greatly enhanced productivity and efficiency."

cumbersome at first, gradually won widespread support among laboratory personnel.

Standard Operating Procedures

Managers thoroughly reviewed and streamlined standard operating procedures (SOP) to maximize productivity and consistency in the use of laboratory methodology among chemists. In order to enhance productivity, a basic tenet of the paradigm shift required that all chemists use identical techniques. Initially, laboratory personnel viewed such standardization as unconventional at best. Traditional practice in the field held that as professionals, forensic examiners could choose among any accepted analytical techniques available.

As part of the new program, each chemist was required to analyze and record all pertinent information[1] with respect to a particular drug. This information was then compiled, discussed, and approved by all the chemists, as well as by the Maryland State Department of Health and Mental Hygiene, the approving body for the certification of drug chemists and analytical procedures. Once approved, these analyses became the manual of standard operating procedures for all drug testing performed in the State.

The manual incorporates a standard operating procedure for training, which was developed with the cooperation of other State laboratories. An SOP of analytical procedures was also developed for all situations, especially those in which certain instruments become temporarily unavailable due to breakdown.

Quality Control, Assurance, and Improvement

Under the new paradigm, the Drug Analysis Unit's quality control system consists of quality control (QC) for operational techniques and activities and internal quality assurance (QA) to ensure that the laboratory achieves intended quality levels. To maintain high quality levels, the laboratory instituted several principles of quality control and assurance recommended by the American Society of Crime Laboratory Directors. These provisions are designed to:

> ***"...training and education constitute a basic, but easily overlooked, component of productivity."***

- Ensure the integrity of the chain of custody for evidence received by the laboratory
- Ensure the competence of the analysts through education, training, and proficiency testing
- Employ reliable equipment and methodology
- Ensure well-documented casework notes.

In addition, managers review laboratory reports for thoroughness and accuracy. Staff members also are encouraged to acquire, upgrade, and demonstrate their professional and scientific skills and to employ a team approach to problem solving.

To further promote quality, the new paradigm also incorporates a focus on continuous quality improvement (CQI). The CQI standard includes a regular review of organizational structure, responsibilities, procedures, processes, and resources.

Innovative Laboratory Forms

Another integral component of the paradigm shift entailed significantly revising the laboratory forms used by the Drug Analysis Unit. The formal, typed reports of the past were replaced with standardized, time-saving laboratory report/chain-of-custody forms. These fill-in-the-blank reports were designed to capture a broad spectrum of information, including:

- The submitting officer's description of drug evidence and the number of drug units in each item
- The chemist's verification of the officer's inventory
- An analytical laboratory report of the results and drug schedules for each item
- A chain-of-custody diagram containing the signature, date/time of each person who handles, opens, and reseals each package of drug evidence.

Under the new system, laboratory personnel hand write this information on a redesigned form, thus eliminating delays associated with typing and proofreading.

In addition to the redesigned forms, a worksheet was developed. One column of the preprinted worksheet contains all tests performed; a separate column lists each item analyzed for a particular drug submission. This assists laboratory personnel in keeping standardized, well-documented casework notes.

A statistical worksheet was also developed to track drug submission trends and to compute turnaround times for drug cases. This worksheet provided managers with an objective assessment of each chemist's efficiency and productivity.

Application of Emerging Technology

The technological backbone of the Drug Analysis Unit consists of two sets of fully automated instruments acquired in 1989 and 1990. Each instrument is equipped with an autosampler that includes autoinjection, sample tray, data system, and barcode reader to track sample identification. The data system prints the analysis data with the corresponding barcode number of the original item number for a case. The steps in the analytical scheme include well-documented representative sampling procedures, barcoding of samples for automated analysis, prescribed preliminary tests, quantitative analysis (if needed), and final confirmation by gas chromatograph/mass spectrometer or fourier transform infrared spectrometer.

The use of statistical sampling and automated procedures for testing drugs represents a dramatic shift from the labor-intensive methods of the past. While these ideas initially created some uncertainty, with proper training and education, the procedures became a hallmark of the laboratory's productivity and efficiency.

Public Interests

Police crime laboratories often deny access to defense attorneys and experts having legitimate interests in evidence and the results of analyses. Under its new paradigm, the Drug Analysis Unit maintains open communications with, and is responsive to, such agencies as the State's attorneys and public defender's offices, as well as to the public.

> ***"Upon fully implementing the paradigm shift, the Drug Analysis Unit completely eliminated its once-constant backlog of cases."***

The laboratory conducts training and tours for attorneys to explain the instruments and testing procedures. As a result of open communication and consistently high work quality, laboratory results are generally accepted on face value as valid in the courts. Consequently, chemists infrequently are called to testify in person, resulting in considerable time savings. On the average, each chemist from the Drug Analysis Unit spends only 1 to 2 hours per month making court appearances.

RESULTS

Upon fully implementing the paradigm shift, the Drug Analysis Unit completely eliminated its once-constant backlog of cases. It accomplished this task without expending any overtime pay. Other results of the paradigm shift were equally impressive and resulted in considerable cost-savings to the police department.

For example, the cost of analyzing CDS samples in the Drug Analysis Unit fell far below the cost of sending these same samples to private laboratories. Moreover, private laboratories require additional compensation for services that the Drug Analysis Unit provides free, such as training officers, lecturing State's attorneys, testifying in court, and providing facility tours.

Under the new paradigm, the 1993 rate of productivity per chemist rose significantly higher than the rates of years past—1,441 cases versus an average of 1,234 in other years. The current 3-day turnaround time (from seizure to completion of analysis) is the shortest in the history of the unit.

This time savings resulted from increased automation and allows chemists to participate in work-related projects. Laboratory personnel produced several reports outlining the demographics of drug use in Baltimore. To enhance understanding of the nature and extent of illicit drug activity, the laboratory shared results of these projects with the Governor's Commission on Drug and Alcohol Abuse, the Maryland State Police Crime Intelligence

Unit, and various divisions of the Baltimore City Police Department. Also, the laboratory recently conducted a study on the pricing structure and purity of street drugs, focusing on changes in trafficking patterns and supply.

To further support investigative and intelligence efforts, the laboratory now analyzes and evaluates (on a monthly basis) trends in drug submissions for the current and previous year. And, in collaboration with other crime laboratories, the Drug Analysis Unit developed a training program that provides instruction concerning analysis procedures.

CONCLUSION

The Baltimore City Police Department's Drug Analysis Unit worked with existing resources under considerable fiscal restraints to enhance its efficiency and productivity. An integral component of this transformation was to change the way laboratory personnel viewed innovation, technology, and their roles in the organization. In turn, the achievements of the unit add to the sense of esprit de corps among members of the laboratory. The positive results promote great pride in their resourcefulness, and fuel their desire to excel.

The positive outcomes also resulted from challenging old paradigms, and when needed, creating new and more effective ones. To remain efficient and productive in the 1990s and beyond, the process of change and innovation must continue.✦

Endnote

Substances are tested for name, structure, chemical formula, molecular weight, schedule, solubility, color tests, crystal tests, thin layer chromatography systems, UV spectra, Infrared spectra, gas chromatographic retention times, gas chromatographic/mass spectroscopic data, etc.

Crime Data

Law Enforcement Officers Killed—1993

During 1993, 69 law enforcement officers were killed in the line of duty, an increase of 6 officers from those slain in 1992. Preliminary national figures show that 65 State and local officers and 4 Federal officers were slain. Geographically, 31 officers were killed in the South, 11 in the West, 10 in the Midwest, 9 in the Northeast, and 8 in Puerto Rico.

Firearms were used in nearly all of the killings. Handguns were used in 50 of the murders, rifles in 14, and shotguns in 3. Two officers were slain with other types of weapons.

Arrest situations accounted for 29 officer killings—arrests of robbery suspects (10), drug-related situations (3), attempts to apprehend a burglary suspect (1), and attempted arrests for other crimes (15). Fifteen officers were slain while investigating suspicious persons or circumstances; 10 while enforcing traffic laws; 9 while answering disturbance calls; 4 in ambush situations; 1 while handling a mentally deranged person; and 1 while handling a prisoner.

Thirty-six officers were wearing body armor when they were killed, and 5 officers were killed with their own weapons. Law enforcement agencies have cleared 64 of the killings.✦