MINNESOTA DEPARTMENT OF PUBLIC SAFETY

BUREAU OF CRIMINAL APPREHENSION

FORENSIC SCIENCE SERVICE

2003 ANNUAL REPORT

MINNESOTA BCA FORENSIC SCIENCE SERVICE
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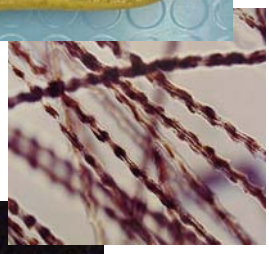
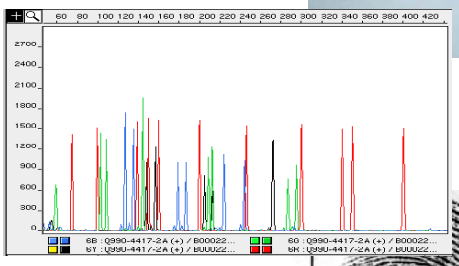




Director's Message:

2003 was a banner year for the BCA Laboratory. On the weekend of November 14 the lab was moved to the new BCA building at 1430 Maryland Ave. E. in St. Paul. The new facility is 3 times the square footage of the old building at 1246 University. The $65 million project was started in 1997 and has 224,000 square feet with about 106,000 square feet dedicate to Laboratory activities. The building also houses the other sections of the BCA and includes an auditorium, training rooms, an exercise room, and an atrium. Believe me this building is " better than sliced bread".

The project included several % for art projects that add significantly to the overall environment of the BCA facility. If you visit the BCA web sit at www.dps.state.mn.us/bca there are links to the web sites of the artists involved with two of those projects.

The BCA lab partnered with the FBI to establish a regional Mitochondrial DNA and is scheduled to go on line in 2005. The FBI will provide funding to hire nine forensic scientists as well as provide the necessary training.

The BCA lab received a State "Auto Theft" grant that will allow us to give priority to latent prints from auto theft cases by providing funding to hire two latent print scientists (one in St. Paul and one in Bemidji).

NIJ grants for DNA included a grant for Non-suspect cases as well as a grant for DNA Offender Database backlog reduction. The BCA is also working in co-operation with County and City Crime Labs and Medical Examiner Labs, with funds from the National Forensic Science Improvement Act, to assist all labs in the state to achieve Accreditation.

In the midst of all these changes the staff of the BCA lab continues to provide world-class forensic science services to our law enforcement clients in Minnesota. I would like to publicly recognize our outstanding scientific staff; they really are responsible for the BCA Laboratory's national reputation.

Frank Dolejsi, Director

BCA FORENSIC SCIENCE SERVICE

The BCA Forensic Science Service ("Laboratory") provides identification and comparisons of physical evidence for law enforcement agencies in Minnesota. Staff scientists with various scientific specialties prepare written reports and provide expert testimony to the courts on the findings and interpretation of their examinations. In conjunction with the BCA Training Unit, the scientists in the Laboratory provide specialized training to law enforcement agencies. The Laboratory's "Crime Scene Service" is available to process crime scenes for physical evidence in death investigations.

CASES RECEIVED	1997	1998	1999	2000	2001	2002	2003
Homicide & Attempted Homicide	124	105	122	97	95	103	71
Death Investigation	286	261	207	172	156	188	180
Controlled Substance	2,518	2,615	2,639	3,124	3,441	3,326	3,432
Criminal Sexual Conduct	510	510	514	506	551	689	718
Burglary/Robbery	420	526	441	479	337	455	612
Fire Investigation	178	140	185	166	132	178	159
Fraud/Forgery	172	130	152	124	78	87	94
DWI	9,239	8,147	7,702	7,466	5,633	5,200	5,168
All Other Criminal	960	956	1,073	1,314	1,365	1,553	1,565
Proficiency Testing	69	84	78	69	80	77	80
TOTALS	14,476	13,474	13,113	13,517	11,866	11,856	12,079

Specific scientific expertise is provided in the Laboratory sections. The following describes the types of examinations that can be made by each section:

BIOLOGY/DNA

The Biology scientists conduct several types of serological examinations on evidentiary materials, including the identification of blood, semen, saliva, and other body fluids. DNA testing is then performed in order to determine possible sources of the body fluids identified. This involves comparing the DNA types obtained from the questioned stains with the DNA types obtained from known blood and/or saliva samples from victims and suspects. Bloodspatter interpretation on clothing and at crime scenes can also be requested.

DNA profiles of convicted felons are developed and stored in a DNA computer database. DNA profiles developed from evidence in criminal cases are also entered into the database. Searches are made to compare casework DNA profiles with other casework profiles as well as with the offender profiles.

BREATH TESTING

The Breath Testing section trains law enforcement personnel in breath-alcohol testing procedures, and evaluates and maintains breath-alcohol testing instruments.

CRIME SCENE RESPONSE

The Laboratory's Crime Scene Response Teams provide on-site death investigation crime scene processing services to all Minnesota law enforcement agencies.

DRUG CHEMISTRY

The Drug Chemistry scientists analyze and identify suspected controlled substances. This includes clandestinely manufactured products as well as legitimately manufactured pharmaceutical products. The scientists also identify controlled substances found in various psychoactive plant materials.

FIREARMS AND TOOLMARKS

The Firearms and Toolmarks section conducts many types of firearms examinations: whether a questioned bullet or cartridge case was fired from a suspect firearm; the caliber and type of firearm possibly used to produce fired bullets and cartridge cases when no firearm has yet been recovered; the proximity of the firearm to the target material; whether a firearm is functional; and whether submitted ammunition is a commercial load or reload. The section also maintains a NIBIN database to use firearms evidence to link crime scenes.

The section also works with toolmarks to determine whether an evidentiary toolmark matches a recovered tool, the type of tool that may have been used to produce a toolmark, and whether a lock is in working order or how it may have been compromised. Serial number restorations on various item types are also performed.

LATENT PRINTS

The Latent Print sections compares unknown latent prints with elimination and suspect prints for identification purposes, uses the Midwest Automated Fingerprint Identification Network (MAFIN) and Automated Fingerprint Identification System (AFIS) to find a source for unknown latent prints, and develops latent prints for agencies that lack the necessary facilities.

PHOTOGRAPHY

The Photography section develops and prints crime scene photographs, photographs of evidence, photographs of a sensitive nature submitted by law enforcement agencies, and photographs for training purposes.

PROGRAM SERVICES

The Program Services Section provides support to all Forensic Science Service sections in the areas of Quality Assurance, Safety & Training, and the Laboratory Information Management System (LIMS). Quality Assurance programs are employed to monitor, document, and evaluate the quality of all Laboratory services for compliance with the accreditation standards of the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB). Training programs enable employees to develop new skills, maintain proficiency, and promote professional development. Safety programs furnish employees with a safe working environment and comply with occupational regulations. The LIMS is a tool for case management and a source for statistical information on Laboratory casework and employee professional activities.

QUESTIONED DOCUMENTS

The Questioned Documents section offers examination services in the areas of signature, handwriting, and hand printing identification; typewriter identification; indented writing; inks; papers; mechanical impressions; photocopier identification; alterations and obliterations; reconstruction of documents that have been burned or otherwise damaged; and the identification of counterfeit documents.

TOXICOLOGY

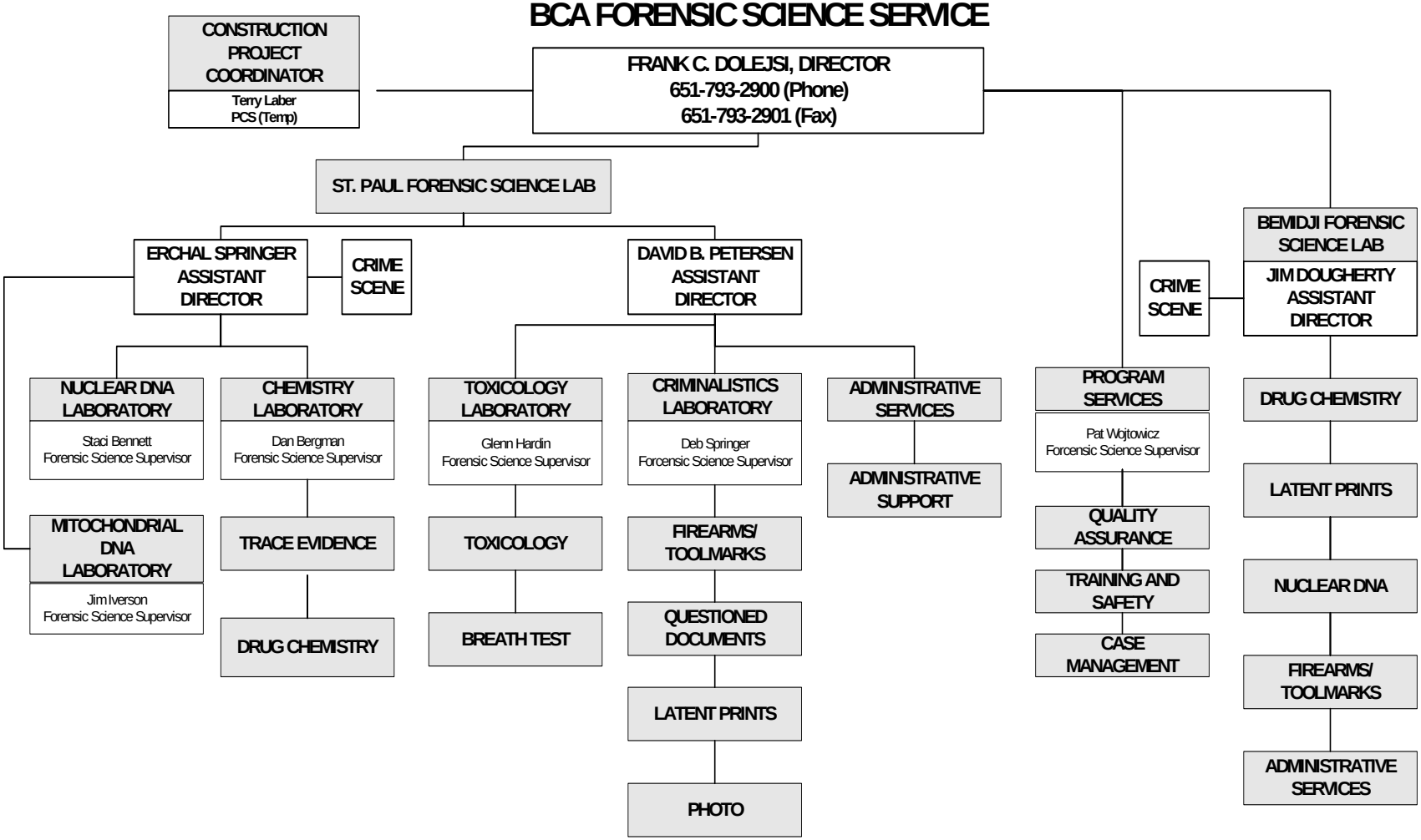
The Toxicology section analyzes blood, urine, and other biological samples for alcohol and other drugs.

TRACE EVIDENCE

The Trace Evidence section makes comparisons to determine if there is a similarity between known and unknown samples of glass, paint, fibers, wood, soil, and other materials. Other examinations include the comparisons of shoeprints and tire tracks, as well as physical matches of broken or torn objects.

Chemical testing examinations determine the presence of accelerants in fire debris.

BCA FORENSIC SCIENCE SERVICE



BEMIDJI LABORATORY

The Bemidji Laboratory of the BCA Forensic Science Service settled in nicely during its second full year of operation. The Lab was kept very busy, having been involved in several of the most high profile cases in the state, conducting research projects, and conducting specialized training in crime scene collection techniques.

The first snowfall of the year. Can you guess the date?

The total number of cases submitted to the Bemidji Lab was 13% greater than in the previous year. Every section of the Lab, with the exception of Drug Chemistry, saw very significant increases in caseload. The Firearms/Toolmarks section saw a 38% increase in cases, while the Latent Print section experienced an increase of 27% from 2002. The DNA section had a 37% increase in caseload and we responded to 41 crime scene requests, up from 26 responses in the previous year. While the Drug Chemistry section did not see an overall increase in caseload, the number of methamphetamine clandestine lab cases rose 33% over the previous year.

In addition to an increase in the number of cases, the complexity and overall visibility of Bemidji cases increased as well. In May 2003, the Bemidji Crime Scene Team responded to two triple homicide scenes and the Bemidji Laboratory processed the majority of the evidence in those cases. We were also involved in processing scenes and evidence in two high profile abduction cases in northern Minnesota and North Dakota.

Marty Koolen examines a firearm for latent prints

Steve Fischer prepares DNA samples for PCR

Bemidji scientists, with the aid of two interns from Bemidji State University, started research projects related to bullet trajectory analysis and validation of a new method of methamphetamine quantitation. Firearms Examiner Nat Pearlson and intern Katrina Kehoe studied the effects of difference surfaces and different bullet shapes when determining the angle of impact of a bullet by measuring the bullet hole. Drug Chemists Amy Granlund and Scott Tschaekofske worked with intern Brent Utech on a method of quantitating methamphetamine samples using a GC/MS/FID, a new instrument purchased in 2003.

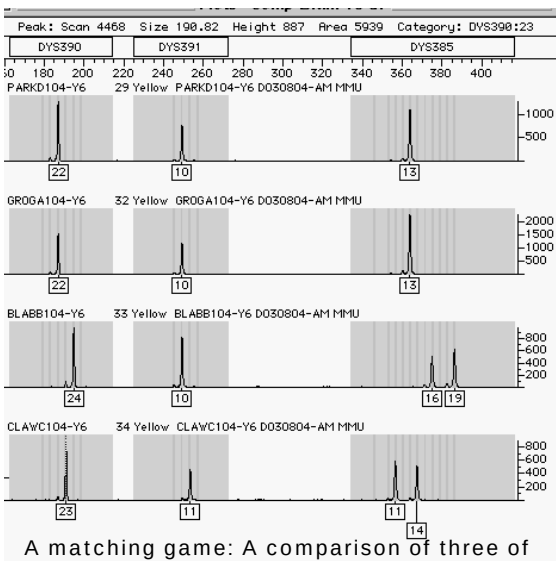
Intern Katrina Kehoe

Intern Brent Utech

Personal accomplishments of Bemidji scientists included AFTE (Association of Firearms and Toolmark Examiners) certification in the areas of firearms and toolmark comparison and proximity determination earned by Firearms Examiner Nat Pearlson. Patrick Warrick, a fingerprint examiner and crime scene team leader, successfully completed a course in bloodstain pattern analysis.

BIOLOGY/DNA

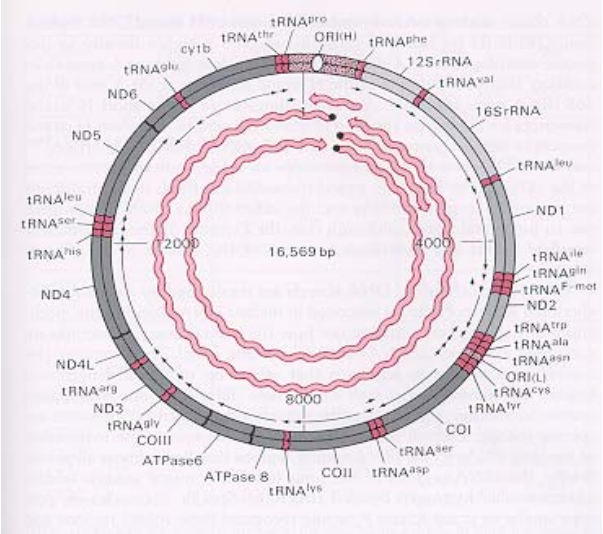
The start of this year brought exciting news to the world of DNA in the courts. In late February, the Minnesota Supreme Court ruled that PCR-STR DNA analysis was and is generally accepted in the scientific community. With that ruling, we saw an increase in the number of cases that went to trial and thus we kept busy testifying after a quiet year in 2002.



A matching game: A comparison of three of the loci that are analyzed in YSTR testing.

As that STR challenge is replaced with Y-STR challenges, we are refocusing our energies to provide information and proof that Y-STR DNA analysis is as reliable as autosomal STR testing and thus, being scientifically accepted in the scientific community, it should also be accepted into the courts. Y-STR testing analyzes areas on the Y, or male, chromosome, allowing us to obtain more information from DNA mixtures, specifically male: female mixtures, which are often encountered in cases of sexual assault. We look forward to our first Y-STR testimonies, which we anticipate will come in 2004 as we work towards training all casework scientists in Y-STR testing.

The summer of 2003 was busy with applications for the prestigious position of regional mitochondrial laboratory. In late September, along with Arizona, Connecticut and New Jersey, we were selected as one of four laboratories to become a regional mitochondrial DNA laboratory in collaboration with the FBI. That resulted in the Biology/DNA Group being split into two sections, a Nuclear DNA Section and a Mitochondrial DNA Section. A supervisor and at least two lead scientists head each section. Training and implementation of mitochondrial DNA testing will begin in early 2004 with the anticipation that casework could begin as soon as September 2005. Many dedicated people worked tirelessly to prove that our laboratory deserved this honor.



An example of the mtDNA that will be tested in the new biology section of the laboratory

The number of database samples continued to grow as we moved into the first full year of collecting samples from all convicted felons. With help from a National Institute of Justice grant, we continue to profile the backlog of convicted offenders that has occurred with the

increase in sample submissions. To date there are over 36,000 convicted offenders in our database. In 2003 alone there were 11 forensic database hits, 25 offender database hits, four national forensic database hits, and four national offender database hits!

We also are the recipients of an NIJ non-suspect grant, which will allow us to re-examine old cases as well as tackle new non-suspect cases, such as burglaries, in a timely fashion. With this grant we also have the resources to get out into the community and encourage the local law enforcement agencies to reexamine non-suspect "cold" cases. Hopefully with the help of the ever-growing DNA databases, we will be able to glean some information from DNA testing and can help agencies solve these cases.

And, not to be forgotten, we moved into our new building in St. Paul, thus tripling our space. We finally have enough space that we are not bumping into our coworkers' elbows as we search evidence. Mitochondrial DNA and nuclear DNA and database personnel share our space, and we continue to share new ideas between these groups within the larger Biology/DNA discipline in St. Paul and Bemidji.

As we look forward to 2004, we anxiously await the arrival of at least eight new scientists to fill current vacancies in both the nuclear and mitochondrial sections of the St. Paul Laboratory. The move to the new building in St. Paul ended 2003 on a high note that we hope to carry through into 2004.

BREATH TESTING

With the move to our fabulous new facility in November 2003, the Breath Testing section offers improved training of breath testing operators. The class capacity has increased from 32 to 40 students. The teaching laboratory is larger and students have their own individual Intoxilyzer 5000EN instruments. There is also on-site parking for students, and the basic Intoxilyzer 5000EN class has been reduced from five to four days while retaining the 36 POST credits.

Fig. 1. Forensic Breath Testing Specialist Harold Weatherson Repairs an Intoxilyzer 5000EN

In 2003, Intoxilyzer 5000EN instruments were responsible for 25,674 complete breath tests statewide. The average result obtained was 0.156, with values as high as 0.41. 91.79% of the completed breath tests had a reported value of 0.10 or more. In 2003 the Breath Testing Section received approximately 360 requests from attorneys for court testimony.

Education continued to be a major focus of the Breath Testing Section. In the past year 247 new Intoxilyzer operators were certified and 1617 experienced operators were recertified. We also instructed attorneys with the Minnesota County Attorneys Association and the Minnesota Institute of Legal Education, and trained newly appointed judges as part of the Minnesota Supreme Court's "New Judges Orientation" program.

Fig. 2. The Breath Testing Lecture Classroom

FIG. 3. The Breath Testing Teaching Laboratory

During 2003 two significant changes occurred in Minnesota Statutes governing chemical tests for intoxication. To comply with recommendations of the National Safety Council's Committee on Alcohol and Other Drugs, the two breath samples that constitute a breath test must be within 0.02 AC of each other. The second change was that the Department of Public Safety was granted the authority to adopt rules for approval of instruments using the expedited rulemaking process. Accordingly, rules to approve a new PBT or evidentiary breath test instrument can be adopted in 60 days rather than approximately 18 months.

The BCA Laboratory website (www.dps.state.mn.us/bca) was updated recently to include more information to assist the Criminal Justice system. Under the Breath Testing section webpage you can now access the list of Approved Preliminary Breath Testers (PBTs) and Evidentiary Breath Testing Instruments, the Intoxilyzer 5000EN class schedules, class descriptions and class registration form, as well as the locations of all the Intoxilyzer 5000EN instruments in Minnesota. Please let us know if there is any additional information you would like to see on the website.

CRIME SCENE

The St Paul Laboratory responded to forty requests for crime scene processing assistance in 2003. The forty scene investigations were comprised of seven homicides, three attempted homicides, one missing person, twenty-one death investigations, six officer-involved shootings, and two hit-and-runs.

In addition to responding to requests for assistance in processing crime scenes, a great deal of effort was spent in preparation for the 2004 accreditation inspections by the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB). While the St. Paul Laboratory has applied for reaccreditation for the second time, and the Bemidji Laboratory is striving for its initial accreditation, this will mark the first time that accreditation is available for the specialty area of crime scene processing. This preparation involved critical evaluation of all aspects of our Crime Scene Program to define our goals and objectives, update our standard operating procedures and methods of operation, ensure adequate training for our team members, and update our quality assurance and quality control system.

Training and continuing education are critical to the successful operation of the Crime Scene Program. In 2003, Crime Scene team members participated in training as well as competency testing and proficiency testing in numerous areas to verify and improve their abilities to identify, enhance, collect, package, and document forensic evidence encountered at crime scenes. Some highlights included classes and testing on shooting scene reconstruction, training in clandestine gravesite excavation, and competency testing in bloodstain pattern analysis.

In 2004 the Crime Scene Team will continue to strive to provide a high quality service to the law enforcement agencies throughout Minnesota. The team will also strive to maintain and enhance its abilities through rigorous training and testing.

DRUG CHEMISTRY

The Drug Chemistry section experienced many challenges during 2003. The first occurred in June, when one of our St. Paul scientists, Robert Lind, left for a nine- month peacekeeping operation in Bosnia with the Minnesota National Guard.

Picture 1. Cpt. Robert Lind in Ranger Body Armor During an Operation in Bosnia.

In addition to being down a scientist, many members of the section took on extra responsibilities to prepare for the lab's reaccreditation inspection in mid-2004. The biggest challenge, however, started in October and took us into 2004, as the section prepared for, and moved to, our new laboratory.

Picture 2. The New Instrument Room in the Saint Paul Drug Chemistry Laboratory.

With all of that said, the Saint Paul Drug Chemistry section received 2,778 cases containing 4,344 items and reported 2,476 cases in 2003. Methamphetamine led the submissions once again at 53%, a 12% increase from 2002, and a 21% increase since 2001. A significant factor in the increase of methamphetamine items could correspond to the boost in the number of Clandestine Laboratory cases submitted for analysis. Cocaine items dropped slightly from 19.5% in 2002 to 18.8% in 2003. Due to the laboratory's policy on limiting the acceptance of marijuana cases to those with a court date, marijuana item submissions have decreased in the last three years from 20% in 2001 to fewer than 5% in 2003.

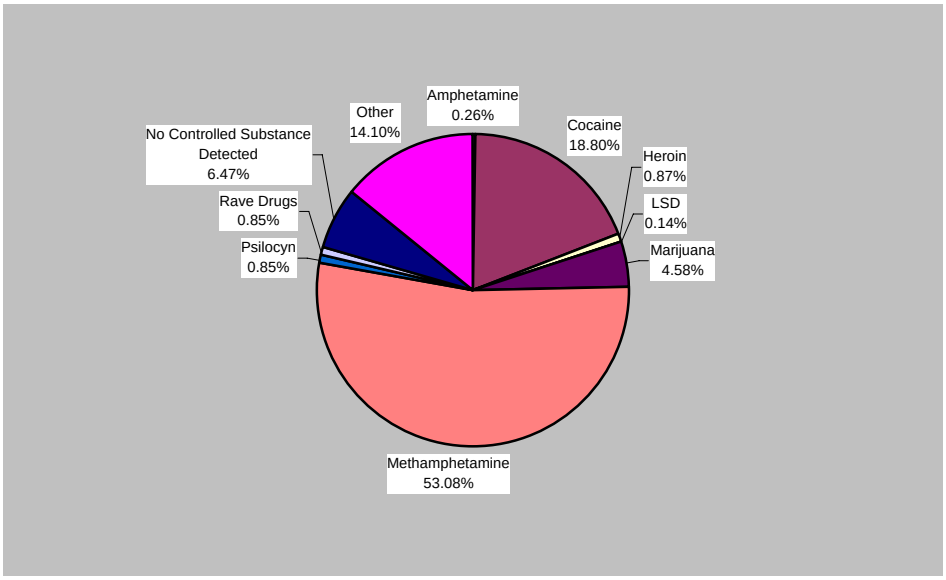


Figure 1. The contents of the 4,344 items submitted to the St. Paul Drug Chemistry Laboratory in 2003.

In 2003 we noticed a considerable increase in khat (pronounced COT) submissions. Although khat submissions were still small enough to be lumped into the 'other' category (see Figure 1), submissions increased from one case in 2002 to eight cases in 2003. The total weight of the case in 2002 was 21.9 grams, whereas the weight of the eight cases in 2003 totaled approximately 11.4 kilograms.

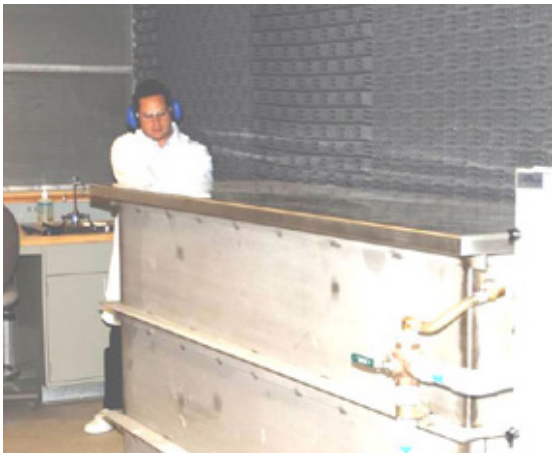
Khat (Catha edulis) is a 10 to 20 foot flowering evergreen shrub primarily grown in East Africa and the Arabian Peninsula. It contains a number of chemicals, two of which are controlled substances: Cathinone (Schedule I) and Cathine (Schedule IV). The use of khat is a social tradition in those regions. The fresh leaves, twigs, and shoots of the khat shrub are chewed, and then retained in the cheek and chewed intermittently to release the active drug. Dried plant material can be made into tea or a chewable paste, but dried khat is not as potent as the fresh plant product. In order to retain the moisture and freshness of khat, it is commonly packaged into bundles wrapped in banana leaves.

Picture 3: Bundles of khat wrapped in banana leaves to retain moisture and freshness.

In addition to continuing our preparation for the lab-wide accreditation inspection, a primary goal for 2004 is to reclaim the prompt turn-around time that we achieved prior to the move. The combination of returning scientists (one from military leave and one returning to the section) and the purchase of additional instrumentation should aid us in achieving this goal.

FIREARMS AND TOOLMARKS

There are four trained firearm examiners, three in St. Paul and a fourth in the Bemidji Laboratory, which services the northern region of the state.



Bemidji Firearms Laboratory – Collecting Test-Fired Ammunition in the Water Tank

The Firearm and Toolmark Section conducts tests on bullets, cartridge cases and firearms to identify firearms used in crimes, restores serial numbers on firearms and vehicles, and identifies tools used to make unknown toolmarks. A comparison microscope is used for many of the examinations in the section.

In 2003 the Firearm Sections of St Paul and Bemidji, continuing the trend from 2002, significantly decreased the turnaround time for submitted cases.

Most significant for 2003 was the move of the St. Paul Firearm Section into the new laboratory. The Firearm Section is unique from the other laboratory areas in that they require extensive collections of reference firearms, ammunition, books, and other literature. These collections are used constantly in their examinations. The firearms collection is used for law enforcement or training purposes, for serial number location and structure, to make inoperable guns functional to allow them to be test fired, and for disassembly and comparison to evidence guns. The ammunition collection is used to test fire firearms submitted and to assist in determining information (like brand or caliber) on evidence ammunition components.

Logistically, 4,500 reference firearms and approximately 71,000 rounds of laboratory ammunition had to be moved safely and securely to the new Laboratory. Three sealed moving trucks, traveling in a convoy under constant surveillance, moved the ammunition and firearms without a mishap. The ammunition and firearms were then uncrated and placed in their new storage locations.

The majority of cases submitted to the Firearm Sections in 2003 continued to be NIBIN cases. The NIBIN program (National Integrated Ballistic Information Network) is sponsored by the BATFE (Bureau of Alcohol, Tobacco, Firearms and Explosives). This is a computer database program that captures images of fired cartridge cases and bullets that were

recovered from crime scenes or were test fired from recovered firearms. When new entries are made into the database the program compares the images and shows the scientist possible matches. The scientist must then acquire the actual evidence and make comparisons to verify whether a match or "hit" exists.

In 2003 the BCA entered 668 bullet or cartridge case images into the Bemidji and St. Paul databases, with many resulting in "hits". Three-fourths of these linked cases were between cases from different law enforcement agencies.

Forensic scientists in the Firearm and Toolmark Sections participated in training and continuing education activities: armorer courses were attended for Heckler and Koch pistols, rifles, and submachine guns and M16/AR-15 rifles.

Scientists in the section taught a Firearm and Toolmark Evidence Collection course, coordinated by the BCA Police Training Section, for local law enforcement officers.

Looking ahead to 2004, the Firearm and Toolmark Section is looking forward to better serving the law enforcement community through a continued reduction in the turnaround time of cases. And, as always, the section hopes to find time to conduct research related to the firearm and toolmark field in order to assist other firearm examiners, law enforcement agencies, and the criminal justice community.

The New Firing Range in St. Paul

LATENT PRINTS

During 2003, the methods and science of fingerprint analysis continued to be challenged across the United States. Some challenges were argued in Daubert hearings and others were the result of aggressive questioning by defense attorneys. BCA scientists experienced such challenges in Minnesota, but in every case our scientists were able to thoroughly answer all questions. To keep the section abreast of the latest challenges, Scientist Glenn Langenburg attended three seminars on the topic.

The Latent Print Section has included more digital imaging as one of the tools used during casework. During this past year, two scientists utilized digital software to present their conclusions during court proceedings.

There were seven latent print examiners assigned to the section during the year; five at the St. Paul Laboratory and two at the Bemidji Regional Office. Scientist Gary Walton continued to devote a large portion of his time to his duties as the St. Paul Crime Scene Coordinator. All of the scientists are now members of the Crime Scene Team and four are Crime Scene Team Leaders. Responding to crime scenes gives scientists invaluable experience in conducting latent print work in the field. Scientists were also able to attend several quality training courses and seminars this past year, including classes on courtroom testimony and the comparison and identification of palm prints.

Two Basic Latent Print classes were offered in Wilmar and Lakeville and one Advanced Latent Print class was offered in St. Paul. These training classes continue to be beneficial to police agencies in Minnesota by increasing the skills of the law enforcement officers who submit evidence for examination. Having agencies process more of the evidence prior to submission to the BCA is important to preserve the latent prints, and allow the scientists to spend more time comparing latent prints on evidence and latent print lifts.

Scientist Josh Bergeron examining a latent print in one of the new workbench areas of the St. Paul Laboratory

Expanded work areas and better lighting have created much needed improvements to the work environment in St. Paul

Holly Hofstad, a University of Minnesota student, was assigned to the St. Paul Latent Print Section as an intern. She worked with Scientist Josh Bergeron on developing a fluorescent dye stain for cyanoacrylate ester processed evidence. Although numerous experiments with a variety of substances were conducted, no definitive solution was discovered. This will be an ongoing project in the Latent Print Section and may be taken up by another intern in the future.

Management of the MAFIN (Midwest Automated Fingerprint Identification Network) database continues to demand the daily attention of the section. Over 64,000 fingerprint cards, resulting in approximately 640,000 fingerprints, were compared against latent print images in the Unsolved Latent File. This resulted in 31 hits on previously unsolved cases, including the identification of an unknown homicide victim. In addition, latent print searches entered during 2003 resulted in over 70 hits, including the identification of a homicide suspect.

Scientists at the Bemidji Regional Office developed several latent prints on a plastic bag that had been discarded by an unknown male suspected of being the shooter in a homicide investigation. The male had been filmed on a convenience store surveillance camera throwing the garbage away. Working with the Illinois State Police, the male was identified using AFIS (Automated Fingerprint Identification System) and ultimately arrested in Chicago.

PHOTOGRAPHY

In 2003 the Photography Section entered the digital age and became the "Photo/Imaging Laboratory" with a new film processor and a Noritsu 2901 printer/processor. The new printer can make different size prints and enlargements, index prints (like contact sheets), and store the information onto CD's (which have a small index print sized to fit in the case) or output to a variety of other electronic media. It can print directly from 35 mm, 120, and APS color or black and white negatives, slides (in strips of two or more, not individually mounted), CD's, floppy discs, Memory Sticks, Smart Media, Compact Flash, PC Cards, Zip discs, and other electronic media. It also has an attached high quality scanner for making images from prints (other scanners are available if needed to scan single or oversized negatives and single slides).

Unlike the previous equipment, which required manual adjustments to change size and accommodate different film types, the 2901 can easily switch between different size prints and adjust the color balance for different types of film. The monitor has eliminated the need for test prints because each image is viewed and the effect of changing density, color balance, or other factors can be immediately seen and adjusted. Images can be enlarged (up to 400%) or reduced, and can be rotated. There are also adjustments available for contrast, chroma, sharpness, grain suppression, moiré pattern suppression, red eye reduction, and making black and white or sepia tone prints from color images.

Photographer Rosella Stow with the Noritsu 2901

For crime scene photographs, agencies now receive index prints which show all the images for each roll on an 8'x10" sheet, and a CD in jpeg format which contains all of the images from all of the film shot at each scene. Regular size prints are available, if needed, by contacting the Criminalistics Section supervisor. Enlargements for court are routinely made 12"x18," and smaller sizes are available as needed. The new equipment allows enlargements to be made much more quickly than in the past, but agencies should provide as much lead time as possible, especially if the prints must be mounted by the agents' Special Operations Division.

PROGRAM SERVICES

The Program Services Section provides laboratory support for the St. Paul and Bemidji laboratories in the essential areas of Safety, Training, the Laboratory Information Management System (LIMS), and Quality Assurance.

Laboratory Information Management System (LIMS). LIMS Coordinator Tony Petracca worked in 2003 to refine the LIMS to add features that enhanced laboratory case management and reporting, as well as provided improved services to our law enforcement clients. Progress in these areas occurred despite the challenges presented by the network and server issues related to our move to the new St. Paul facility in November. The major LIMS accomplishments in the past year included:

- Implementation of additional capabilities of the inventory programs portion of the LIMS. The Firearms Reference Collection has been logged into the LIMS. The program is also capable of tracking chemicals and reagents ordered and received, and those that are no longer in use in the laboratory. Finally, the LIMS system has also been configured to work as our means of maintaining an inventory of our equipment and analytical instruments.
- Improvement of programming modules used by the Toxicology Group.
- General implementation of a web-based Convicted Offender DNA Pre-Log system. CODNAWEB allows corrections officials to log convicted offender information into the LIMS for samples being sent to the BCA.
- Continued expansion of the LIMS electronic reporting capability. Secure, encrypted evidence receipts and analytical reports can be sent to agencies that supply the Laboratory with a valid e-mail address. Access to a secure BCALAB web site can also be provided to agencies.

Safety & Training. Safety & Training Coordinator Mark Nielsen was kept very busy in 2003 dealing with issues related to the move to the new building. One of his biggest challenges was ensuring that all of the chemical waste and unused chemicals obtained "over the years" were disposed of prior to the move. Other services provided to Laboratory staff included:

- Creation of computer links to provide scientists with Internet access to Material Safety Data Sheets (MSDS). This allows scientists to easily retrieve the most up-to-date safety information on the chemicals they use.
- Development of a respirator safety program for members of the BCA Crime Scene teams. Respirators are now available to assist team members in processing scenes when noxious chemicals or odors are present.
- Safety audits to ensure that our staff works safely and that the Laboratory continues to be compliant with OSHA requirements.

Quality Assurance. The Laboratory Quality Assurance program continued to evaluate and develop the Laboratory Quality System, which serves to support the validity of Laboratory analyses, results, and reports. Some of the activities conducted in 2003 by QA Coordinator LaRae McPartlin and Program Services Supervisor/Quality Manager Pat Wojtowicz were designed to help the Laboratory prepare for accreditation inspections that will occur in 2004:

- A series of quality assurance presentations were made to staff at monthly all-lab meetings. Programs Services utilized the expertise of Laboratory directors and supervisors in some of these presentations. Topics included such things as a Laboratory Policy Refresher and An Overview of the BCA Laboratory Quality System.
- A new generation of document control was launched to take advantage of electronic means of document distribution and review. Laboratory staff now reviews new and revised methods and procedures in electronic format. In addition, all manuals are available via the Laboratory server to Laboratory employees.
- The second yearly cycle of Laboratory internal quality audits was conducted prior to the move to the new St. Paul BCA facility.

In addition to these specific program areas, Program Services staff also stands ready to assist with informational inquiries from law enforcement and the general public.

TOXICOLOGY

Fig. 1. The Toxicology Instrument Room

Like the other areas of the BCA Laboratory, the Toxicology section is truly excited to be our magnificent new facility. We have ample room for all our equipment and work needs, and there is plenty of room for growth. The move to the new facility went smoothly, and within a week we were back up and running, performing alcohol analyses on blood and urine samples.

Fig. 2. The Toxicology Sample Preparation Room

In 2003, 6254 blood and urine samples were analyzed for ethyl alcohol and 1904 were analyzed for drugs. Marijuana continues to be the most common drug found, followed by methamphetamine, benzodiazepines, cocaine, opiates, and other drugs. The most unusual Toxicology case submitted in 2003 involved a blood sample collected from a subject who had been arrested for DWI. The test subject blew a PBT of 0.297 and was arrested and taken into custody. While in custody the subject complained of blurred vision and had a seizure, and was transported to the hospital. Analysis of the blood sample revealed a methanol concentration of 0.33 g/dL. The subject succumbed to methanol poisoning and was pronounced dead two days after the DWI arrest.

Fig. 3. Capillary Zone Electrophoresis

During 2003 we acquired a Capillary Zone Electrophoresis (CZE) instrument that has the capability of screening for 500 compounds in a blood or urine sample in 20 minutes. The CZE will go on-line in early 2004, and it will screen for 10 times the number of drugs without sacrificing turn-around time.

The BCA Laboratory website (www.dps.state.mn.us/bca) has been updated recently to include more information to assist the Criminal Justice system. Under the Toxicology section webpage you can now access the list of Approved Laboratories for the Forensic Analysis of Ethyl Alcohol, the Blood and Urine Sample Collection Instructions and the Medical Personnel Certificate, and a list of Drug Analyses Currently Performed, which also includes the Drug Scheduling information. If there is any additional information you would like to see on the website, please let us know.

TRACE EVIDENCE-CHEMICAL TESTING

The Bureau of Criminal Apprehension Forensic Science Service-St. Paul Laboratory has completed its move into their new building at 1430 Maryland Avenue East in St. Paul. The Trace Evidence-Chemical Testing section is settled and handling cases as they come into the Lab. We spent a lot of time preparing for the move, but we are back online and ready to serve. The turnaround time remains around 30 days for fire debris analysis. The section is currently operating with one full-time examiner and one-half-time examiner. The half-time examiner is split between Trace-Microscopy and Trace-Chemical Testing.

Our caseload for 2003 was down a bit from 2002. We had 166 cases in 2003, a decrease of 6.2% from 2002. The section examined 568 items in 2003, a decrease of 13.9% from 2002. The number of items averaged about 3.4 per case, which was a decrease of 15%.

With the current budgetary challenges, we do not expect any new equipment or positions. We will be handling casework and training with what we have and utilizing instrumentation to its fullest extent. To that end, we will be developing areas of analysis to better serve our customers. We will be exploring the use of the ChromatoProbe for solids analysis and its capabilities for a more rapid screening of samples before a complete analysis is done. In addition, the use of Solid Phase Micro-Extraction (SPME) will be examined to see if this technique is viable for use in routine fire debris analysis. The use of MS^n (multiple ionization mass spectroscopy) will be studied as a technique to further classify compounds from fire debris.

In the coming year we expect to reactivate the analysis of explosive devices (exploded only) and explosive residues. To accomplish this, staff training needs to be completed, and methods and procedures need to be developed and written. The goal of accepting cases by the end of the year should be attainable.

Chevy Monza with 25 Pounds of Am-Fo

While we are content in our nice new environment, we want to assure everyone that we are willing to assist in any capacity that we can. Please feel free to call, write, e-mail, or drop in with any questions or concerns that you may have. We will be happy to come and discuss fire debris analysis, sample preservation and packaging, or related topics at your meeting.

TRACE EVIDENCE-MICROSCOPY

The Trace Evidence-Microscopy section had a tremendous year in 2003 by reporting 178 cases! Trace-Microscopy received 141 cases, which was a 7 % increase in cases compared to 2002. The section made remarkable headway with their backlog, lowering the backlog from 86 cases down to 49. This was due in part due to the assistance of two former Trace Evidence scientists. One returned from retirement for 6 months, while another former Trace Evidence scientist who had transferred to another section was brought in to help with casework for 3 months.

Currently the Trace Evidence-Microscopy staff consists of 2 ½ scientists, with only one scientist trained in all areas of trace analysis. The variety of analyses performed in the section dictates a very lengthy training process. The second scientist has recently completed training in the areas of shoeprints, tire tracks, tape, fabric impressions, physical matches, and vehicle filaments, and can now complete examinations in these areas along with fibers, paint, and glass. The remainder of the training should be completed in 2004. The newest scientist is half time Trace-Microscopy and half time Trace-Chemical Testing. He is currently training in glass analysis and is expected to be analyzing glass cases in Spring 2004.

All three Trace-Microscopy scientists attended a 3-day glass workshop offered by the Midwest Forensics Resource Center in Iowa. One scientist attended a three-day class on Basic Mass Spectral Interpretation while the other scientist attended a three-day class on the operation of the Paint Data Query (PDQ) database. Additional one-day workshops on airbag

analysis, wood analysis, and physical match theory were also attended by one of the scientists while at the Midwestern Association of Forensic Scientists annual meeting in October 2003.

The Trace-Microscopy laboratory in the new BCA building is very spacious. Specialized work areas that are currently vacant will allow the potential for the addition of Trace Evidence-Microscopy scientists in the future. The laboratory also has separate instrument rooms with adequate ventilation and space, two separate search rooms with large search tables, and a microscope room.

Figure 1: The new Scanning Electron Microscope

Some new equipment and accessories were received in Trace-Microscopy this past year. A second column and detector for the Pyrolysis Gas Chromatograph (PGC) were added and a Diamond Anvil Cell Accessory was added to the Fourier Transform Infrared Spectrometer (FT-IR). Both of these additional pieces will allow further characterization of a variety of samples including paint, fibers, and plastic.

The largest new piece of equipment obtained was the Leo EVO Scanning Electron Microscope (SEM). **Figure 1** is a picture of the new SEM. This replaces an outdated SEM that the BCA previously owned. Servicing, supplies, and parts were very difficult to find for the outdated instrument. The new SEM is the latest technology, with a larger sample compartment, magnification capabilities up to 900,000x, and additional elemental composition potential that the old instrument could not provide.

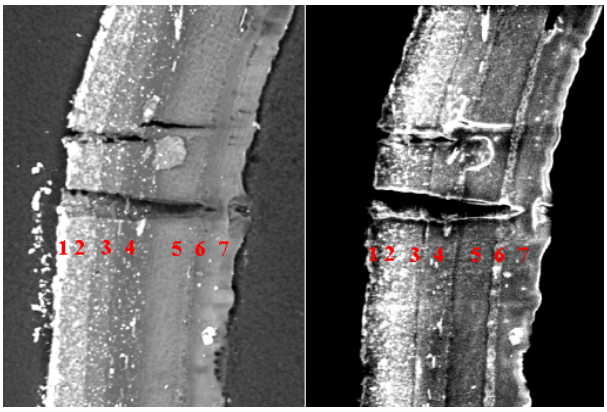


Figure 2 is an image from the SEM illustrating the new split screen capability. The image is a cross-sectioned paint chip viewed simultaneously with two different detectors. This enables the scientist to visualize all 7 layers at the same time.

Figure 2: SEM Image Visualizing All 7 Layers of a Paint Chip

An interesting case from 2003 was a fabric impression left on the face of a bullet that hit an officer. The fabric impression on the bullet corresponded to the fabric on the outer shell of the officer's bulletproof vest. **Figure 3** is a photograph of the face of the bullet. **Figures 4 and 5,** respectively, are microphotographs of the fabric impression on the bullet and the corresponding clothing of the officer.

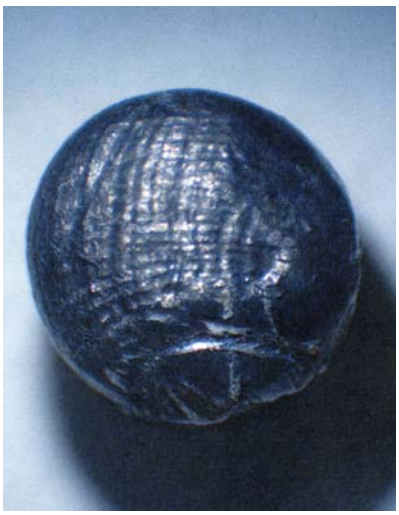


Figure 3: Face of the bullet

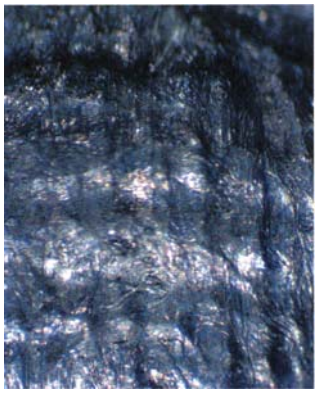


Figure 4: Fabric impression on the Face of the Bullet

Figure 5: Corresponding Fabric from Shell of Officer's Bulletproof Vest

The biggest goal for 2004 is to complete training so that more time can be concentrated on casework, keeping the backlog down and lowering the turn around time.