Forensic Science Service

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St. Paul Forensic Science Laboratory
Bemidji Forensic Science Laboratory

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2004 Annual Report

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MINNESOTA BCA FORENSIC SCIENCE SERVICE
2004 ANNUAL REPORT

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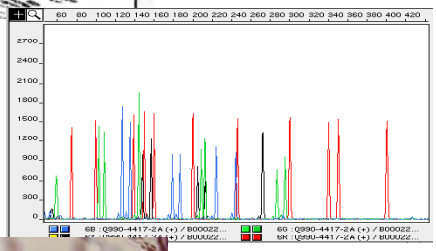
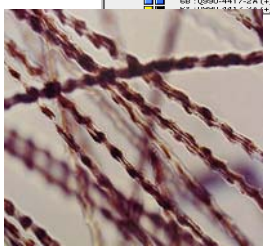




DIRECTOR HIGHLIGHTS

■ BCA Grand Opening February 4, 2004

The BCA had the grand opening of the new facility at 1430 Maryland Ave. E. in St. Paul on February 4, 2004. The building includes state-of-the-art forensic laboratories. At the ribbon cutting were, left to right: Commissioner Stanik, Governor Pawlenty, Superintendent Campion and Mayor Kelly.

Director Dolejsi describes the new BCA facility to Governor Tim Pawlenty and St. Paul Mayor Randy Kelley. "It's better than sliced bread" he says.

■ Forensic Science Service * *Commitment to Service*

With Forensic Science Laboratories in Saint Paul and Bemidji we provide world-class forensic science services to our criminal justice clients in Minnesota.

■ Accreditation * *Commitment to Quality*

Both laboratories are accredited by ASCLD/LAB and maintain rigorous quality assurance programs.

■ Communications

There are currently over 280 departments set up to receive laboratory reports as e-mail attachments (about 90% of all reports). You can also receive e-mail receipts for any evidence mailed to the lab. Through a secure web site departments can access their encrypted reports at any time after they are issued by the laboratory.

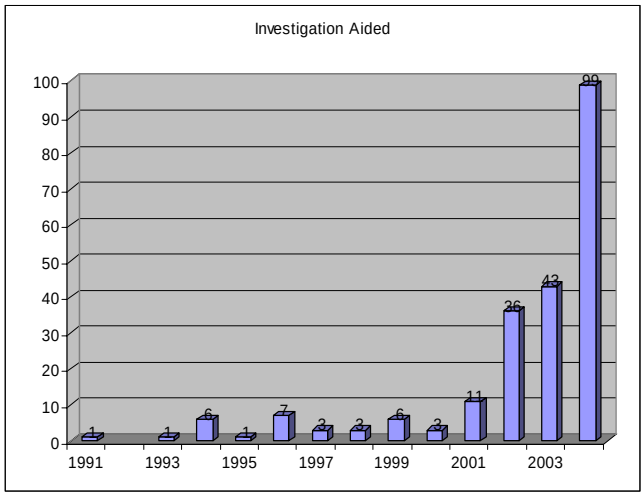
■ **ASCLD & ASCLD/LAB**

I was elected to the board of directors of ASCLD/LAB. Our involvement in this and other national organizations espouses our desire to improve our lab and forensic science in general.

■ **NIJ DNA Grants**

The BCA was awarded $1Million in federal grants to improve our DNA capacity through robotics and new technologies and to address our DNA casework backlog.

■ **DNA Convicted Felon Database**



With over 30,000 individuals in CODIS (Combined DNA Index System) 99 cases were solved in 2004. When the law was passed in 2002 requiring DNA from all convicted felons the BCA was funded to collect the samples but not to analyze them. Over 14,000 samples were outsourced to private labs through another NIJ grant. **For every 1,000 samples entered into the database 7 to 10 cases are solved!** The Governor's budget includes funds for this activity.

Frank C. 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 within various scientific disciplines 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	1998	1999	2000	2001	2002	2003	2004
Homicide & Attempted Homicide	105	122	97	95	103	71	107
Death Investigation	261	207	172	156	188	180	182
Controlled Substance	2,615	2,639	3,124	3,441	3,326	3,432	3,905
Criminal Sexual Conduct	510	514	506	551	689	718	695
Burglary/Robbery	526	441	479	337	455	612	570
Fire Investigation	140	185	166	132	178	159	164
Fraud/Forgery	130	152	124	78	87	94	84
DWI	8,147	7,702	7,466	5,633	5,200	5,168	5,029
All Other Criminal	956	1,073	1,314	1,365	1,553	1,565	1,747
Proficiency Testing	84	78	69	80	77	80	81
TOTALS	13,474	13,113	13,517	11,866	11,856	12,079	12,564

Specific scientific expertise is provided in the Laboratory sections. The following describes the types of examinations that can be made by each section and the laboratory sites where the services/offices are located:

- BIOLOGY/DNA (St. Paul and Bemidji)

  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 (St. Paul)

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

- CRIME SCENE RESPONSE (St. Paul and Bemidji)

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

- DRUG CHEMISTRY (St. Paul and Bemidji)

  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 (St. Paul and Bemidji)

  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.

- FORENSIC DOCUMENTS (St. Paul)

  The Forensic 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.

- LATENT PRINTS (St. Paul and Bemidji)

  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.

- PHOTO/IMAGING (St. Paul)

  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 (St. Paul)

  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).

- TOXICOLOGY (St. Paul)

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

- TRACE EVIDENCE (St. Paul)

  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.

BIOLOGY/DNA

2004 was a very successful and busy year for the Biology/DNA section of the BCA Laboratory. It was the St. Paul staff's first full year in the new building and we have nothing but great things to say about the space. The large St. Paul laboratory space has allowed us to add instruments and continue doing research with help from interns without impacting casework. The section as a whole reported over 1650 cases and had nearly 100 database hits. The end of 2003 brought change that carried into 2004. The section grew in numbers as we shifted to two subsections of Nuclear DNA and Mitochondrial DNA (mito, mtDNA). 2004 was our third full year of offering DNA services out of our satellite laboratory in Bemidji to Northern Minnesota within easy accessibility to courts and police departments. We continue to hear high praise of their work and are looking forward to the hiring of a new DNA scientist to join that laboratory in early 2005.

In June of 2004, four new forensic scientists joined the mito section and are working diligently to get the mtDNA analysis on line. Many hours of validation work have been done and more are forthcoming. The group remains on track for a September 2005 target to accept cases. These cases will be primarily assigned through acceptance from the FBI, but a portion of the cases can be Minnesota cases that are selected by the mtDNA unit. Most of the mito scientists have completed their training at the FBI and are excited about completing the validation work so that they can turn their attention to casework.

Image 1: Scientist prepares samples

Image 2: Typical clothing submission

<u>Image 3:</u> Packaging evidence

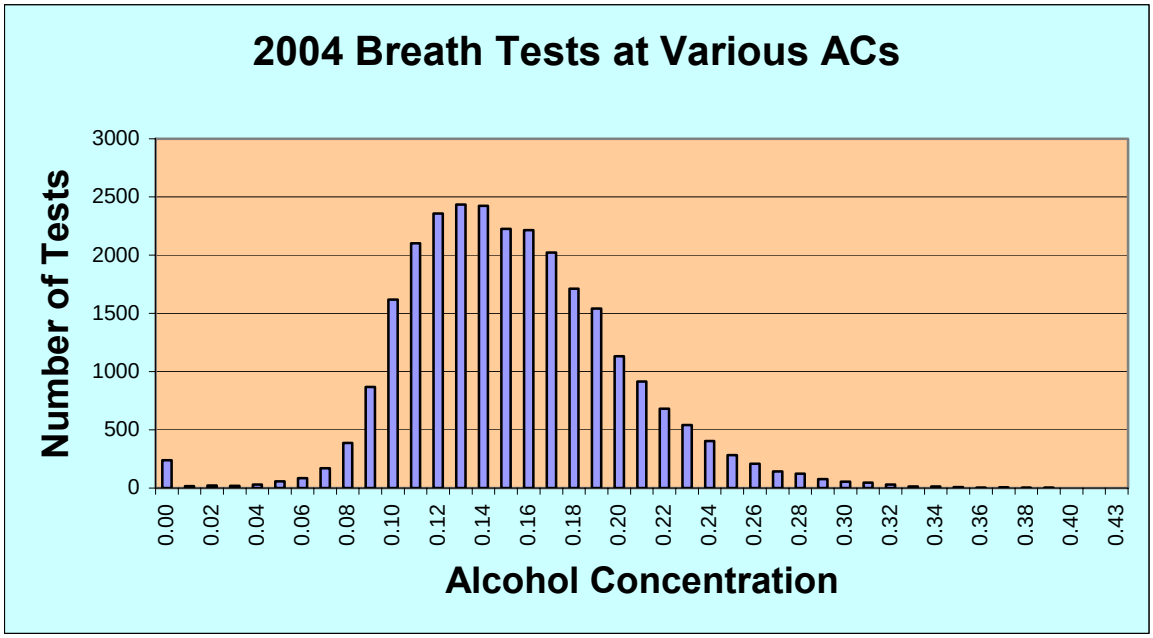
In late July and early August, four new forensic scientists joined the St. Paul portion of the nuclear section to fill positions left by those scientists moving to the mito group. These four scientists have quickly blended into the nuclear section and their addition has helped the nuclear section work on our current case backlog. It is our goal to have that backlog gone in the next year and decrease our turn around time to less than two months, a period of time that we were able to achieve a few years ago. With the addition of these new faces, and one more coming soon to Bemidji, we are well on our way!

The section applied for and was awarded two NIJ grants that will help with implementing technologies in 2005 and in reducing DNA case backlogs. The end of 2004 saw the switch in the nuclear section from amplifications of short tandem repeat DNA (STRs) using the ProfilerPlus™ and COfiler™ kits, to the Identifiler™ amplification kits. This kit combines the two previous kits into one reaction, typically producing more results with less total DNA. 2005 brings even more change to the amplification process and the analysis techniques which the scientists are embracing with open arms. These technologies continue to allow us to do better work and obtain more information from smaller and smaller samples. Autumn 2004 also saw a change in technology for YSTR analysis. A new, larger, amplification kit (YFiler™, produced by ABI) was made commercially available and is being validated to replace YPlex 5™ and YPlex 6™ - much in the same way that Identifiler™ replaced ProfilerPlus™ and COfiler™.

2005 looks to be a promising year. We have great plans for the grant awards we received. We will be absorbing the analysis of convicted offender DNA sample processing, a task that has previously been handled by private companies with funding from a different NIJ grant. We have hired additional personnel to begin this effort and look forward to this with excitement and optimism that the coming year brings even more help for this ever-increasing responsibility. We also continue to work with others in the forensic community to evaluate and validate new technologies that come on the market.

BREATH TESTING

In 2004, Intoxilyzer 5000EN instruments were responsible for 27,565 complete breath tests statewide. Of those, 93.0% of the completed breath tests had a reported alcohol concentration value of 0.10 or more and 97.6% had a value of 0.08 or more. The average result obtained was 0.157, with a high value of 0.43.



In 2004 the Breath Testing Section received 463 requests from attorneys for court testimony. Last year's most interesting case concerned a subject who had a progressively enlarging vascular growth on the inside of a cheek. It was alleged that this growth affected the breath test because it protruded so far into the mouth that it changed the airflow pattern, and it was frequently subjected to biting so it bled excessively, which caused the breath samples obtained to be contaminated with blood. The dimensions of this tissue mass also allegedly created a pocket into which food particles and alcohol were trapped. It was also alleged that the vascular nature of this growth caused an increase in the blood flow to the oral cavity, which in turn raised the mouth temperature. All these factors supposedly elevated the breath alcohol concentration, and rendered the test inaccurate. As it turned out, the judge was not persuaded by these arguments, but the case did provide a fascinating examination of some of the key factors involved in breath testing.

We continue to add more Intoxilyzer 5000EN locations; there are now 200 units available at police departments and sheriff's offices throughout Minnesota. If you would like to request an Intoxilyzer placement please send us a letter with the request.

Education continued to be a major focus of the Breath Testing Section. In the past year 302 new Intoxilyzer operators were certified and 1032 experienced operators were recertified. The Minnesota Supreme Court invited us to provide training on "Alcohol and the Intoxilyzer" to newly appointed judges as part of the week-long New Judges Orientation program, as well as for experienced judges as part of the Judicial College. We have also invested in our own continuing education by sending a staff member to the Robert F. Borkenstein Symposium on Blood and Breath Alcohol Program Administration at Indiana University.

Breath Test Operator Training Course

The BCA Laboratory website (www.dps.state.mn.us/bca) now includes access to the list of Approved Preliminary Breath Testers (PBTs) and Evidentiary Breath Testing Instruments, the Intoxilyzer 5000EN class schedules, class descriptions, class registration form, locations of all the Intoxilyzer 5000EN instruments in Minnesota, and where to find a replacement unit. Please let us know if there is any additional information you would like to see on the website.

CRIME SCENE

The BCA Forensic Science Laboratory Crime Scene Team responded to seventy-five requests for crime scene assistance in the year 2004. The St. Paul Laboratory responded to forty- five crime scene requests and the Bemidji Regional Laboratory responded to thirty crime scene requests. Of these, there were thirteen homicides; nine attempted homicides; one kidnapping; forty-two death investigations; three officer-involved shootings; three hit and runs; three assaults; and one clandestine gravesite. Thirty-two vehicles were processed for forensic evidence.

In addition to responding to requests for assistance in processing crime scenes, there was continuing preparation for accreditation by the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB). This preparation involved critical evaluation of all aspects of our Crime Scene Program to redefine our goals and objectives and update our standard operating procedures and methods of operation. Accreditation in the area of crime scene has not previously been available. Attaining accreditation in this area will reinforce the commitment the laboratory has to quality work in this area.

Training and continuing education were, as always, critical to the successful operation of the Crime Scene Program. In 2004, Crime Scene team members participated in training and testing in numerous areas to improve and verify their abilities to identify, enhance, collect, package, and document forensic evidence encountered at crime scenes.

Some highlights included classes and testing on the use of the electronic distance measuring device, metal detector and alternate light source, sulfur casting of impressions left in snow, and arson training.

The following synopsis of a death investigation is just one of the crime scene success stories from our laboratory. In this incident the deceased was at a party, drinking and doing drugs, when he passed out in his pickup truck. He had a violent history, including a tendency to brandish weapons at people and threatening to kill them. Some of the people at the party, including his girlfriend, decided to take advantage of his vulnerable condition and kill him. After taking the unconscious victim's weapon, the girlfriend and stepbrother drove from the scene with the victim. The stepbrother then placed a large plastic zip-tie around the victim's neck. The victim awoke and a struggle ensued inside the truck. The stepbrother and the victim fell out of the pickup and onto the street. Tightening of the zip-tie around the victim's neck eventually resulted in his death. The Crime Scene team collected latent fingerprints from the truck. These prints were later identified to the girlfriend and stepbrother, thus placing them in the truck. The team also collected DNA from a second vehicle, used to escape from the crime scene. This DNA was later matched to the victim. The forensic evidence identified and collected by the Crime Scene team played a major role in the eventual conviction of both the girlfriend and the stepbrother for first-degree murder. They received life sentences for the crime.

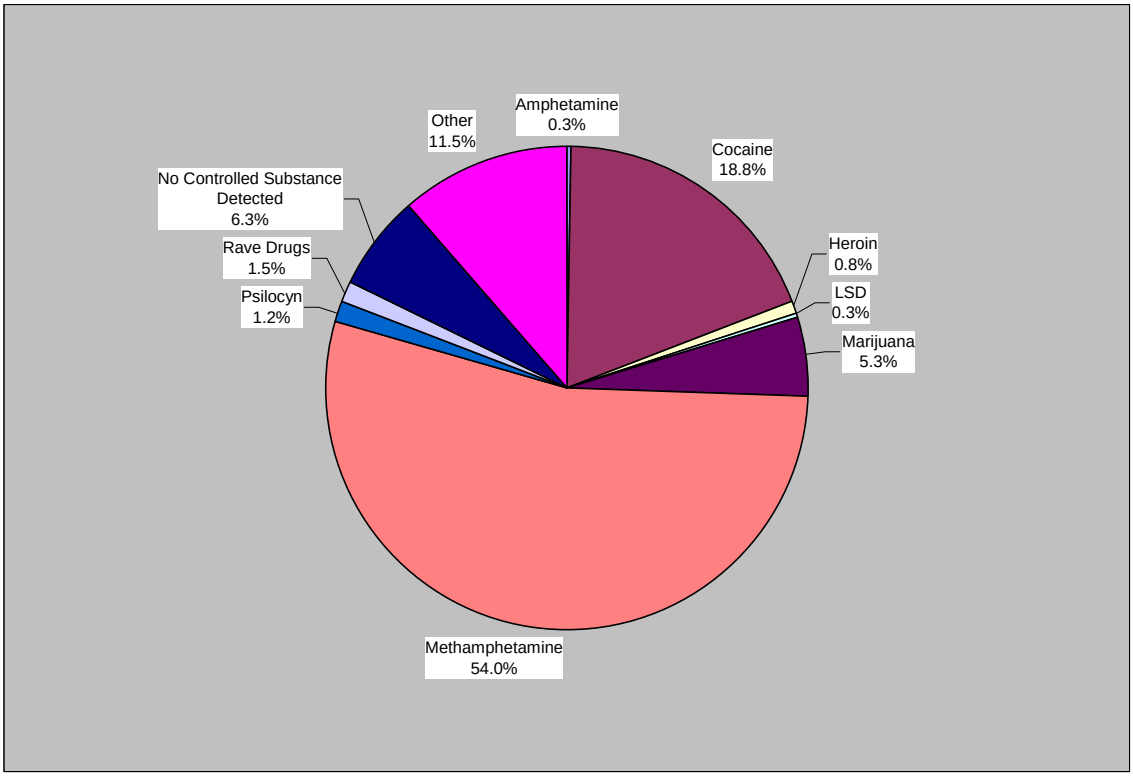
In 2005 the Crime Scene Team will continue to maintain and enhance its abilities through rigorous training and testing. The team will maintain its goals of providing high quality services to the law enforcement agencies throughout Minnesota.

DRUG CHEMISTRY

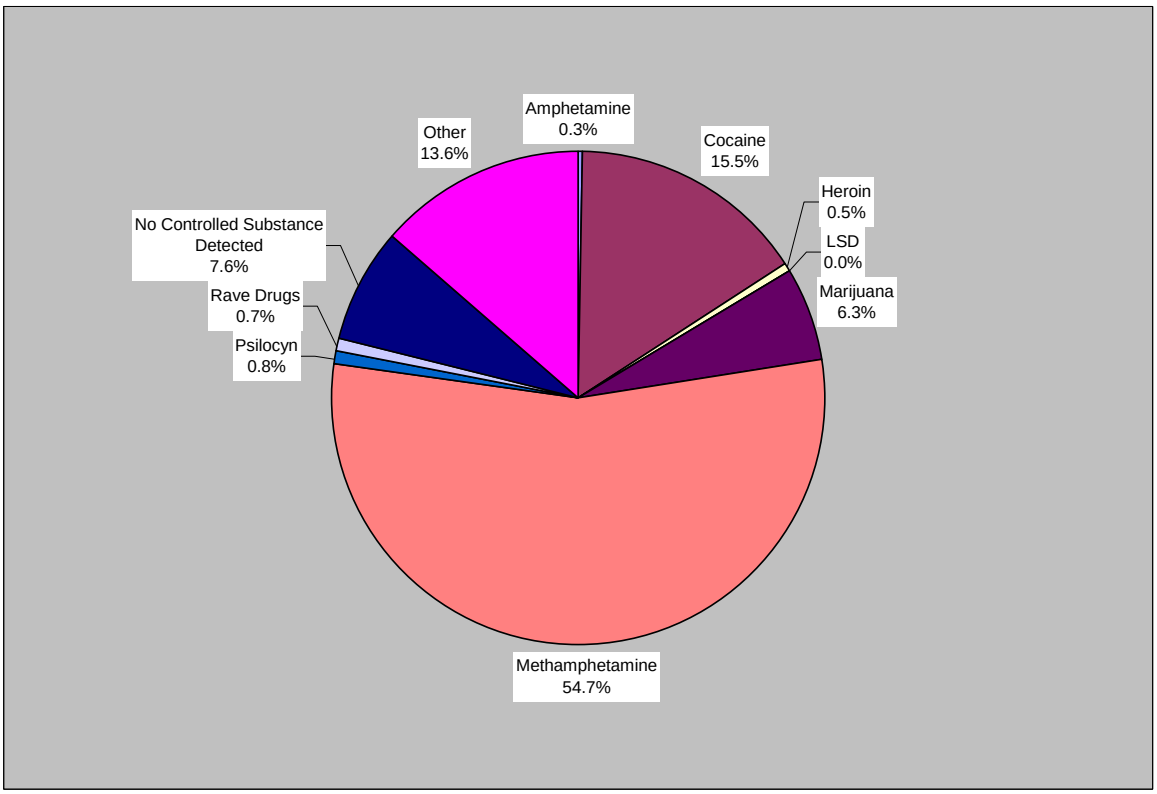
The Drug Chemistry section is composed of eleven scientists; nine located in Saint Paul and two in Bemidji. The primary responsibility of the Drug Chemistry section is to analyze items of evidence for the presence of controlled substances. The items of evidence are usually submitted as powders, rock-like material, drug paraphernalia, plant material, tablets and/or capsules (clandestinely or legitimately manufactured), and liquids.

The Saint Paul Drug Chemistry section received 3,115 cases containing 4,398 items, and reported 2,722 cases in 2004. This was a noticeable increase from the 2,778 cases received in 2003. The section managed to report 246 more cases then the previous year.

The Bemidji Drug Chemistry section received 1,003 cases containing 1,413 items, and reported 838 cases in 2004. This was a slight increase from the 932 cases received in 2003.



<u>Figure 1</u>: The contents of the 4,398 items reported by the St. Paul Drug Chemistry section in 2004.



<u>Figure 2</u>: The contents of the 1,413 items reported by the Bemidji Drug Chemistry section in 2004.

Methamphetamine continued to be the most prominent controlled substance reported by the Drug Chemistry section at both locations. Of the 4,398 items submitted for analysis in Saint Paul, 2,389 items were reported as containing methamphetamine. Of the 1,413 items submitted for analysis in Bemidji, 771 items were reported as containing methamphetamine. Cocaine continued to be the second most prominent controlled substance reported by the Saint Paul and Bemidji Drug Chemistry laboratories. Marijuana items remained low due to the section's policy on only analyzing suspected marijuana with a scheduled trial date.

Image 1: A methamphetamine submission.

Image 2: Another methamphetamine submission.

Drug Chemistry's primary goal for 2005 will be to alleviate the case backlog. The section understands how important prompt turnaround time is for the investigation and prosecution of controlled substances. By reducing the case backlog, we hope to enhance the prosecution of controlled substance cases. We are very fortunate in Saint Paul to have additional temporary help for the first six months of 2005. One scientist is from another section of the laboratory, one is a retired BCA scientist, and the third is a current scientist from the Wisconsin State Laboratory system. Bemidji will be training in a new hire during the first part of the year and will hope to have their third scientist online by mid-year. With this additional help to our team of scientists, we hope to diminish the case backlog and have shorter turnaround times.

Image 3: Eric Grunwald performing color tests.

Image 4: Paula Reber performing instrument maintenance.

Image 5: Allison Hursh loading a sample onto the GC/MS

FIREARMS AND TOOLMARKS

There are three trained firearm examiners in St. Paul. A fourth examiner and a technician are assigned to the Bemidji Laboratory, which services the northern region of the state.

The Firearm and Toolmark Section conducts tests on bullets, cartridge cases, and firearms; 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. The Firearm Section of St. Paul significantly decreased the backlog and turn around time of submitted cases in 2004 to less than 25 days.

The Firearm Section is unique from the other laboratory areas in that they require extensive collections of reference firearms, ammunition, books, and literature. These collections are used constantly in their examinations. The firearm collection is used in part for law enforcement or training purposes, for serial number location and structure, making 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. The Firearm Sections of Bemidji and St. Paul have a combined total of over 5000 reference firearms and approximately 75,000 rounds of ammunition.

The majority of cases submitted to the Firearm Sections in 2004 continued to be cases where entry of the evidence into the NIBIN system was requested. 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 are recovered from crime scenes or are 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 2004, the BCA entered over 800 bullet or cartridge case images into the Bemidji or St. Paul databases, resulting in 44 "hits". This indicates that roughly 5% of the evidence entered into the database is linked to another shooting or to a firearm. Many of the linked crimes or guns were between items submitted by different law enforcement agencies.

Forensic scientists in the Firearm and Toolmark Section participated in training and continuing education activities: two scientists were able to attend the annual AFTE Training Seminar.

Scientists in the section taught a Firearm and Toolmark Evidence Collection course and Serial Number Restoration course for Minnesota law enforcement personnel. Funding available through a grant to train law enforcement officers how to process vehicles in auto theft cases was used to provide serial number restoration kits to participants in the Serial Number Restoration course. The BCA Police Training Section coordinated both courses. One scientist assisted in training firearms examiners for the BATFE National Firearms Examiner Academy. In addition, the scientist assigned to the Bemidji Laboratory is training a firearm examiner for the state of South Dakota.

Looking ahead to 2005, 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 by providing training. 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.

FORENSIC DOCUMENTS

August and September brought changes and further education to the section. In August, one of the scientists began the board certification process through the American Society of Questioned Document Examiners. This certification process involves a written exam, five practical cases, and an oral review by the acting board members, all within a two year span.

In addition, the Midwest Association of Forensic Scientists (MAFS) had their annual meeting with four other national associations in Orlando, Florida. The section was instrumental in planning the three Forensic Document workshops that were offered at this conference. "Large Case Documentation" using Microsoft Access was a two and a half day workshop that coincides well with the numerous items of evidence a Forensic Document examiner has to deal with, whether it is check fraud or an identity theft case.

The section continues to offer examination services in such areas as signatures, handwriting and hand printing, typewriters, indented writing, ink, paper, mechanical impressions, photocopiers, alterations and obliterations, counterfeit documents, and the reconstruction of documents that have been burned or damaged.

The majority of Forensic Document cases involve the examination of handwriting. The evidence examined may be from a homicide case, bomb threat case, money-laundering case, or a variety of other cases. However, most of the evidence examined by the Forensic Document Section is involved with some type of forgery case.

Identity theft type cases are becoming more common. These cases are more involved because of the multiple examinations that need to be done before the case is finished. It is possible that a handwriting examination, ink comparison, document authenticity examination, and printing process verification will be performed in order to complete an identity theft case. The task of the Forensic Document examiner is to identify the fraudulent documents that are produced using high tech forgery processes and to help the investigator find the beginning of the paper trail, if possible.

Figure 1: The Imaging Laboratory

Figure 2: The Electro Static Detection Apparatus

The cases submitted to the Forensic Document Section continue to represent a wide spectrum of case types that include everything from vandalism to homicide investigations. We would like to remind our clients, that in order for us to conduct a complete examination, we need the following materials:

1. If the original of the questioned and known documents exist, they are the preferred material to examine. If the originals are not available, we can work with photocopies provided they are of good quality.

2. If the case involves the forging of another person's writing and signatures, it is important to provide the victim's writing and signatures for elimination purposes. This helps us to make a determination whether the questioned material really is genuine writing or not and whether any attempt has been made to simulate or copy the victim's writing.

3. The writing from the suspect writer must be comparable to the questioned material. This means that we must have hand printing from the suspect writer if the questioned material is hand printed, and handwriting if the questioned material is handwritten. It also means that we need the same letter combinations in both the questioned and known material. It is not possible to compare a cursively written "Kate Jackson" to a hand printed entry of "John's TV Repair".

4. A general handwriting exemplar should be submitted from the suspect writer(s) if possible. It includes all the letter forms, both upper and lower case, as well as numbers. If you need handwriting exemplar forms, you may access them at the Bureau of Criminal Apprehension website: http://www.dps.state.mn.us/bca/lab/documents/Lab-Intro.html or give us a call at 651-793-2900 and we can provide them. The requested writing should also consist of the same phrases and names as appear in the questioned material, besides what is requested in the exemplar. This material should be dictated to the suspect writer and repeated several times. The suspect writer should never be shown the questioned material and asked to copy it.

   In addition to the requested material, it is very important to include non-requested writing from the suspect writer. This consists of material which was written when the suspect writer had no idea that it would be used for examination purposes. This can help us determine whether the requested material on the exemplar is natural and fluent writing normally produced by the suspect writer. Suggestions for places to collect non- request writing are also at our web site listed above, or give us a call and we will send you a copy.

Many investigators, when working with forged checks, focus their efforts on determining whether their suspect writer wrote the payers' signatures and therefore only collect signature samples. Unfortunately, many forgers make an attempt to disguise the payer's signatures and this makes identification of the forger difficult. However, many times the forger makes little effort to disguise the writing in the date, memo, payee, and amount

areas. If comparable known writing is received, it is often possible to identify this material as having been produced by the suspect writer.

The Forensic Document Section continues to remain on the cutting edge of technology as the science of forensic document examination progresses into 2005 and beyond. This is achieved by continued studies, conducting research, and attending the newest and most advanced training opportunities available.

LATENT PRINTS

The year 2004 brought some changes to the Latent Print Section. Two new examiners were hired, due in part to a grant received to decrease the turn around time for processing auto theft cases. Heather Holden and Justin Bundy (left) started their training program. Both will be assigned to the Bemidji Regional Office under lead worker Pat Warrick; however, Heather started her training in the St. Paul lab. They are both natives of northern Minnesota. This will bring the latent print staff up to nine examiners, three in Bemidji and six in St. Paul. As a part of the grant, classes were started that are specifically tailored for law enforcement officers on how to efficiently process a recovered stolen auto for latent prints. The designated funding was used for training expenses and to procure sufficient supplies to furnish each trained officer with their own latent print processing kit. St. Paul examiners Marty Koolen and Scott Ford are managing this Auto Theft Grant program.

Three Basic Latent Print classes were taught in Marshall, Grand Rapids, and Rochester, and two Advanced Latent Print classes were taught in Bemidji and St. Paul. These popular classes have translated into better submissions of preprocessed latent print evidence and/or better quality latent print lifts and photographs.

The MAFIN/AFIS system aided in the identification of 49 suspects on cases with previously unknown suspects, including five robberies. Two unknown homicide victims were also identified. Approximately 256,000 fingerprint images were compared against latent print images in the Unsolved Latent File, resulting in the identification of 25 suspects in previously unsolved cases. The cases ranged in age from six months to three years old. This latter activity consumed over 500 hours of the section's time.

Heather Holden at the AFIS terminal

Two interns worked with Glenn Langenburg on a research project analyzing latent prints deposited in a blood matrix. Allison Pream, a junior at the University of Minnesota, Duluth, was followed by Courtney Wandersee, who is completing her graduate studies in forensic science at Nebraska Wesleyan University. Glenn's project continues.

On a more personal note, Josh Bergeron successfully completed all the necessary requirements for latent print examiner certification by the International Association for Identification (IAI). There are now four IAI-certified examiners in the Latent Print Section. In September, Josh was recognized by the Minnesota Division of the IAI for his research into, and use of, titanium dioxide to develop bloody latent prints on dark surfaces. Kudos to Josh! Pat Warrick presented his case study of the 2003 triple homicide in Pillager, Minnesota, to audiences at the IAI Minnesota Division conference as well at the annual IAI conference. David Peterson was promoted to the position of lead technical worker for the St. Paul Latent Print Section.

In August, the IAI held its annual conference in St. Louis, Missouri, celebrating the 100th year of United States law enforcement use of fingerprints as the primary means of identification. Gary Walton, Glenn Langenburg, Pat Warrick, and Scott Ford were able to participate in this milestone event. Pat presented the Pillager case to the IAI, which was well received. Although significant advancements have been made in the past 100 years, ranging from developing processes to digital capture, nothing has replaced the individual expertise of the latent print examiner.

PHOTO/IMAGING

In 2004, the Photo/Imaging section explored techniques to optimize the use of the new photo processing equipment and provide the most usable materials to our users. The Photo/Imaging Lab now makes 8"x10" index prints and CD's with their 5"x5" index print "labels" from digital images. Clients have the option to "process" their images and submit a CD or they can submit digital media from the camera and the density will be adjusted on our equipment, which can save a great deal of time on larger cases. Traditional film is still processed and CD's and/or prints can be made. We have begun computerized recording/logging to track all photo work and we are preparing to develop film submitted by the State Patrol.

PROGRAM SERVICES

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

Quality Assurance. The most exciting Quality Assurance activity for the past year was to coordinate the American Society of Crime Laboratory Directors/ Laboratory Accreditation Board (ASCLD/LAB) accreditation inspections of the St. Paul and Bemidji laboratories. Accreditation through ASCLD/LAB is a voluntary program that the BCA Forensic Science Service Laboratories (BCA FSS) participate in to demonstrate that

management, operations, personnel, procedures, equipment, physical plant, security, and health and safety programs meet established forensic laboratory standards. Accreditation is part of our quality assurance program to ensure the best forensic laboratory service to the criminal justice system. Accreditation under the current ASCLD/LAB Legacy program is granted for a period of five years, and to achieve and maintain the accreditation, an accredited laboratory must undergo a rigorous on-site inspection conducted by ASCLD/LAB trained inspectors who are drawn from other ASCLD/LAB accredited laboratories. The St Paul laboratory has been accredited since 1994, and the Bemidji laboratory recently attained its initial accreditation.

The ASCLD/LAB accreditation inspections at each laboratory included interviews with scientific staff and BCA FSS laboratory management, evaluation of laboratory methods and instrumentation, and overall evaluation of the BCA FSS laboratory quality system.

2005 will bring a new challenge as the BCA St Paul and Bemidji laboratories evaluate the ASCLD/LAB International accreditation program. ASCLD/LAB International accredits to the international ISO/IEC 17025 standards and additional program standards specific to forensic science. While becoming accredited to the international standard in the future will not substantially change the way the BCA FSS laboratory does its work, it will place some new demands on the quality system.

Safety and Training. The Safety and Training Coordinator Mark Nielsen continued to be involved in 2004 with chemical safety, respiratory protection, safety audits, and various training areas such as courtroom testimony, crime scene, right-to-know, evidence handling, and general BCA lab operations. Other new programs of involvement and coordination included:

- Citizen's Academy – This academy educates business leaders in the community and shares the capabilities of the BCA to enhance community confidence.

- Forensic Partnership Program – This program links Regional Coroner's offices with the BCA in an effort to educate death investigators throughout Minnesota. Death Investigators receive training from all aspects including crime scene, forensic analysis, and pathology.
- Internship Coordination – The BCA laboratory has an extensive internship program available for qualified undergraduate and graduate students. The coordination of this program involves overseeing the application process, submitting qualified list to supervisors, notifying applicants, and arranging for interviews.

Laboratory Information Management System (LIMS). In 2004 more departments signed up to receive Laboratory reports and evidence receipts by email. Over 280 departments now receive receipts and reports in this way, representing about 90% of all Laboratory cases. These departments also have access to the Laboratory's web site (https:\\bcalab.dps.state.mn.us\bcalab), where they can look up cases and retrieve past reports.

By May of 2005, this web site will be re-designed to include access to past evidence receipts and a link that will enable departments to pre-log their evidence. More information on this will be emailed to departments with access to the web site.

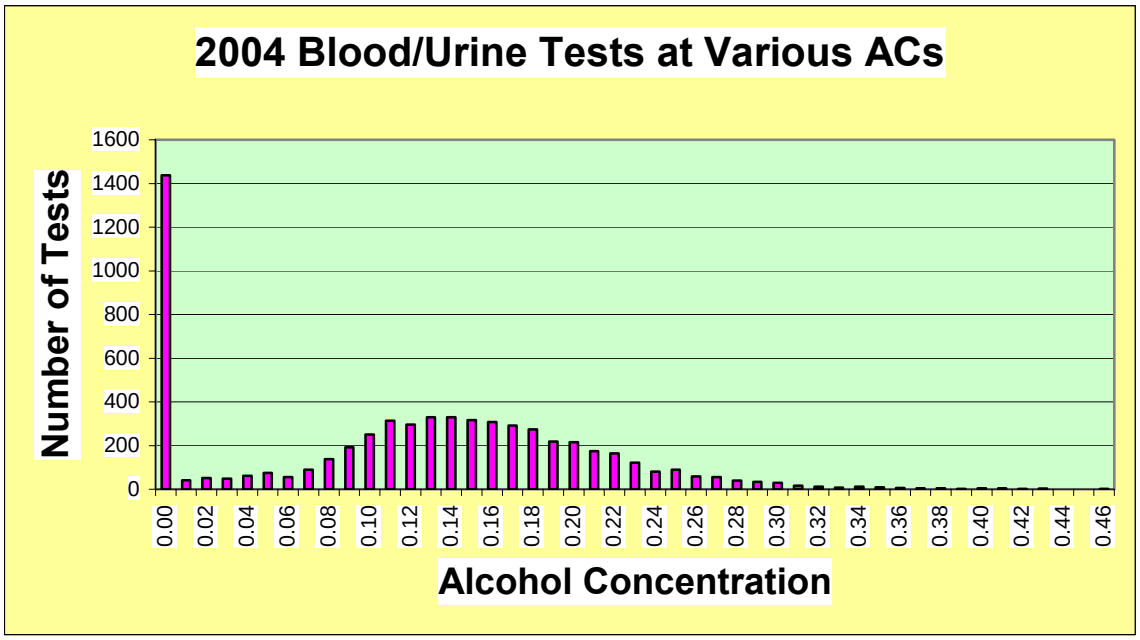
If your department is not currently set up to receive receipts and reports by email and would like to use this service you can contact the Lab at tony.petracca@state.mn.us.

In 2004 the Laboratory continued to add to the functionality of its LIMS, installed in the summer of 2001. This system is now used to track not only evidence but also equipment, chemicals, and the firearms reference collection. The LIMS also now allows the crime scene teams to record case and item information from a scene on a laptop, print receipts in the field, and import all the case and custody information into the main LIMS system when they return to the Lab.

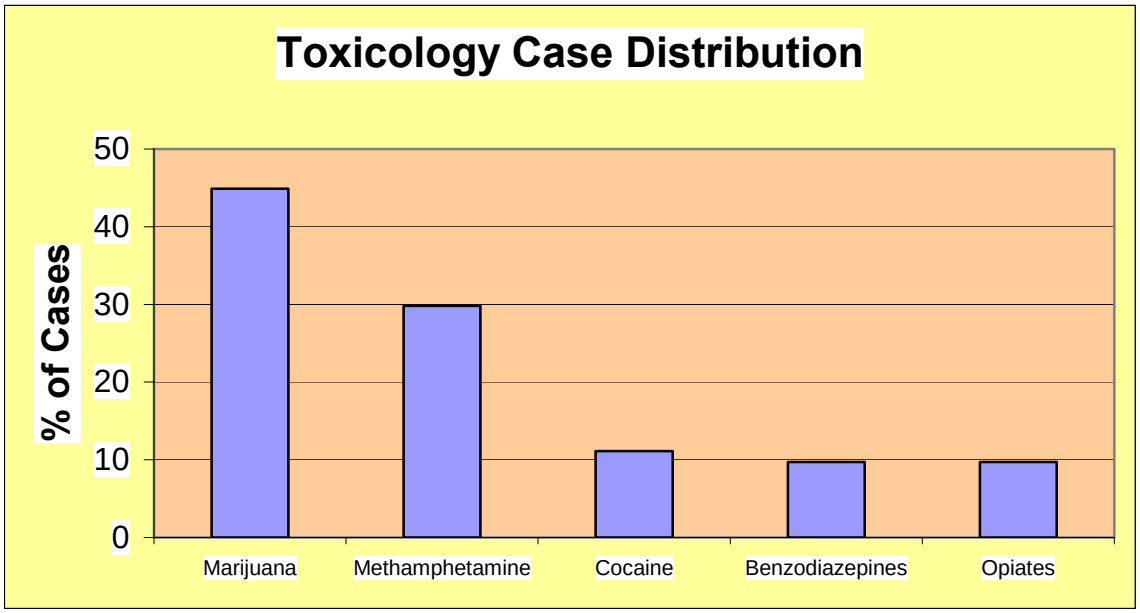
Another LIMS feature is the ability to receive new cases by scanning PDF bar code labels. There are currently three Minnesota agencies using a property room inventory system compatible with the BCA LIMS (Crow Wing Co. SO, Northfield PD, and Winona PD). Their systems produce a label that the Lab's evidence intake section can scan. This can speed up the process of submitting evidence to the Lab.

TOXICOLOGY

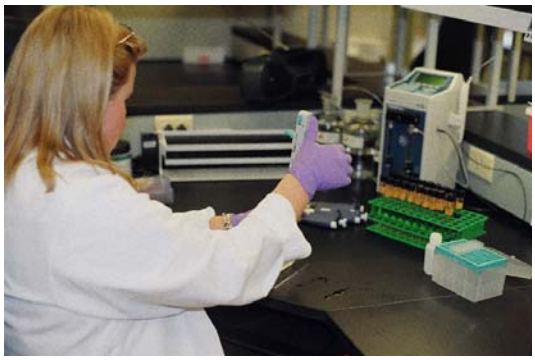
In 2004, 6239 blood and urine samples were analyzed for alcohol, of which 4629 were from arrests for Driving While Impaired (DWI). The average alcohol concentration result from the DWI samples was 0.136 and the highest value was 0.46.



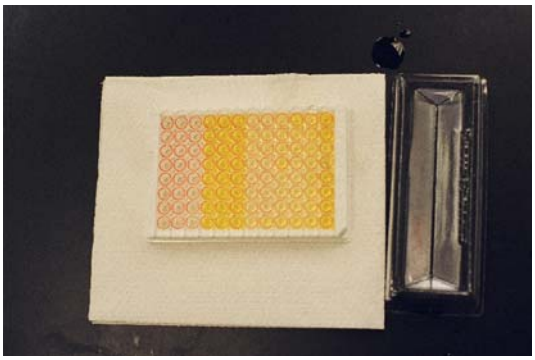
Last year, 2242 blood and urine samples were analyzed for drugs, a 17% increase over 2003. Of these 1007 were positive for cannabinoids (marijuana), 249 for cocaine, 217 for opiates (morphine, heroin, oxycodone, etc.), 668 for methamphetamine, 218 for benzodiazepines (Valium, Xanax, Clonipin, etc.). During 2004 the average turn-around-time for alcohol cases was 8.3 days and for drug cases was 39.3 days.



During 2004, the Toxicology section lost two staff members due to resignations. In response, we have made changes to our case sample analysis scheme. We now report positive screening results for urine cannabinoid (marijuana) cases rather than waiting for the more time-intensive confirmation analysis before reporting. This positions us to be able to provide faster service and to begin to expand the number of drugs we can perform analyses for. If you would like a case to be confirmed for urine cannabinoids please contact us.

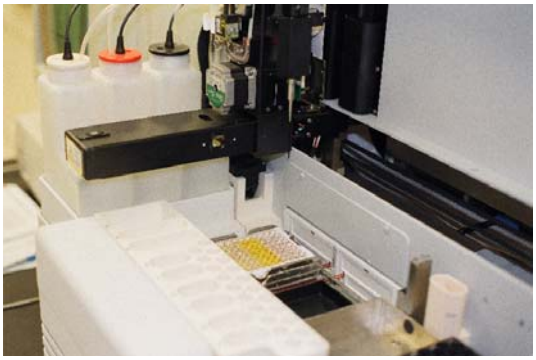


Preparing a drug screen sample plate



A drug screen sample plate

Programming the drug screen analyzer



The drug screen analyzer in action

We continue to invest in training and continuing education. During 2004, Toxicology staff attended workshops and scientific sessions at the Joint FBI/Society of Forensic Toxicologists/International Association of Forensic Toxicologists meeting and at the annual meeting of the American Academy of Forensic Sciences.

Toxicology staff was invited by the Minnesota Supreme Court to provide training on "Alcohol and the Intoxilyzer" to newly appointed judges as part of the weeklong New Judges Orientation program as well as for experienced judges as part of the Judicial College. We provided instruction at the Drug Recognition Expert (DRE) officer's recertification course. Also we have given lectures to various area universities and colleges.

One of our interesting cases last year involved a homicide in which it was alleged that the test subject had taken a larger-than-normal dose of oxycodone immediately before going to bed, and therefore was not aroused from sleep by a shotgun blast that occurred at approximately 4:00 AM one floor above the sleeper. The State contended that the test subject—the defendant—was the person who pulled the trigger. Our testimony concerned the effects that a large dose of oxycodone would have on a subject's sleep, in light of additional information that the subject used the drug routinely as indicated by a prescription due to a pre-existing chronic pain condition. As it turned out the defendant was found guilty of murder due to other evidence that did not pertain to the drug use.

TRACE EVIDENCE-CHEMICAL TESTING

We have been in our new digs for over a year now and it is starting to feel comfortable and broken in. In 2004 we reported 147 cases. The number of items is holding steady at approximately 3.4 items per case. There were a total of 506 items analyzed. The turn around time still averages approximately 30 days for all cases. Generally speaking, cases that involve special testing take a bit longer than routine casework. Our goal is to improve the general turn around time to less than 25 days.

While roughly 90% of a scientist's time is spent on casework, we are involved in other activities as well. Court testimony comprises a large part of the time that is spent away from the laboratory. We have also been asked to teach in various capacities during the last year. These are usually short presentations about arson and what we do to detect ignitable liquids. Requests for presentations have been on the increase since the appearance of the CSI shows on network and cable television.

Currently, we are completing an internship project in the Trace Evidence-Chemical Testing section. The intern has been with us since September working on a project dealing with Solid Phase Micro-Extraction (SPME). This is a solvent less extraction technique. Preliminary results indicate that eventually this could be used in casework. This would limit or curtail the use of chemicals in arson analysis that are highly toxic and extremely flammable. The intern has put a lot of work into developing a method, building a library, and running test samples. Soon we should have an alternative method available for the analysis of fire debris and other volatile chemicals. A sidelight of his project involved some work done for other disciplines of the laboratory involving SPME applications in those areas. Individual samples were examined to answer specific questions. More work will need to be done if these ideas are to be put into normal analytical schemes.

The BCA does not offer explosive residue analyses. If you have concerns about explosives and residues, please contact the Bureau of Alcohol, Tobacco and Firearms (BATF) in St. Paul for investigative and analytical support.

In conjunction with the Toxicology Section of the Laboratory, we have upgraded our old Ion Chromatograph to a new modular system. This gives us greater flexibility in analytical techniques for quality control of reagents, but also in the identification and

quantitation of some preservatives, acids, bases, and metal ions. This system also permits expansion to other capabilities, such as, mass spectrometry and liquid chromatography.

We are looking forward to 2005 to continue to serve, but to also grow and improve our service to all throughout the year.

TRACE EVIDENCE-MICROSCOPY

Staffing: The Trace section added two hair examiners to the section as part of the Mitochondrial DNA regional lab grant. One of the scientists has completed training with the FBI Laboratory in Quantico, Virginia for human-to-human hair comparisons. The other hair examiner is currently in the midst of a four to six month training program.

Case Statistics: The Trace Section processed ninety-one cases in 2004 with the breakdown as follows:

21	Death Investigation / Homicide
16	Burglary
11	Drug related charges / DWI
6	Assault/Kidnapping / Criminal Sexual Conduct
5	Fire Investigation
4	Hit & Run / Criminal Vehicular Operation
28	Other

The current case log consists primarily of shoe prints (31%), glass (23%), and paint (19%). Tape, fibers, and physical matches account for another 20% of the cases. Less than 10% of cases involve examinations of wood, soil, filaments, building materials, and hair.

Instrumentation: The Leo Scanning Electron Microscope with Noran Energy Dispersive X-ray Spectrometer was installed and validated in 2004. It is used for a variety of trace evidence examinations including the analysis of paint, glass, and metal samples. The instrument is also used to identify phosphorous and iodine in methamphetamine manufacturing cases.

Presentations: One scientist attended the Midwest Association of Forensic Scientists (MAFS) meeting in September. She presented a paper on the forensic examination of glitter and its relevance to a sexual assault case. She also served on the MAFS board as a Member-at-Large for the first half of 2004 and was elected as Newsletter Editor for 2004-2007.
Scientists from the trace-microscopy section taught crime scene team members techniques to create known tire prints. They also taught a module on tire track collection and the use of software to search for vehicles based on tire track information. Training was also provided on the proper techniques for sulfur casting of impressions in snow.

One scientist presented "Proper Collection and Packaging of Trace Evidence" to members of the International Association for Identification (IAI) at a conference in September and to the Partnership in Forensics in October. The presentation was followed by a workshop in which participants collected paint samples and fabric impressions, and made casts of shoe prints.

Training: Two scientists attended courses provided by LEO on the operation of the scanning election microscope and by Noran on the operation of the energy dispersive spectroscopy (EDS) system.

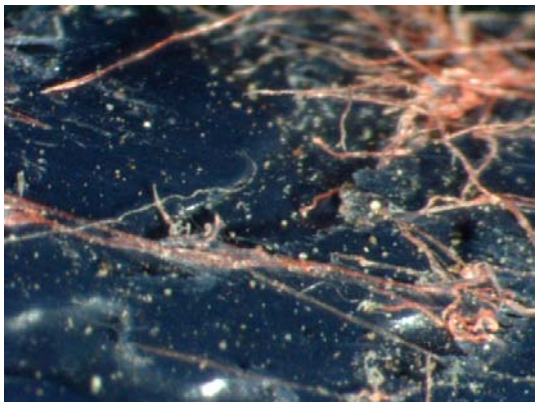
A two-week Hair and Fiber course was conducted by the FBI in March and attended by one scientist. That scientist also completed training in the following areas in 2004: filaments, animal hair vs. human hair and building materials.

The "½ time scientist" completed glass training and has been working glass cases when in the Trace-Microscopy lab. This scientist splits his time between Trace-Chemical Testing and Trace-Microscopy.

Three scientists attended the Forensic Microscopy course at the McCrone Institute in Chicago. This course is a required part of the Trace-Microscopy training and teaches techniques for analyzing fibers, hairs, and minerals with a polarizing light microscope.

Cases of Note:

Case #1: Red cotton fibers imbedded in the seatbelt of a car helped determine which person was in the driver seat at the time of a fatal collision.



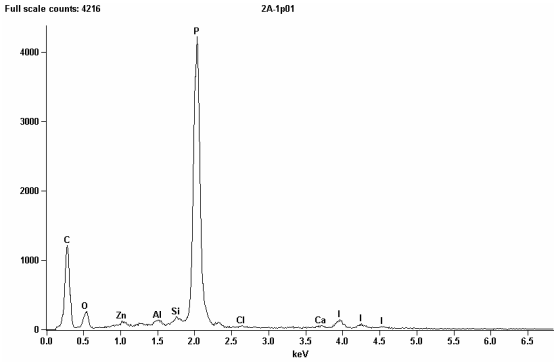
Left: Seatbelt.

Right: Seatbelt viewed under a microscope showing imbedded red cotton fibers.

Case #2: A physical match of automobile parts linked a suspect's vehicle to the scene of a fatal hit and run. The part with the ring was a hard plastic component found at the scene. The other component was removed from the suspect's vehicle.

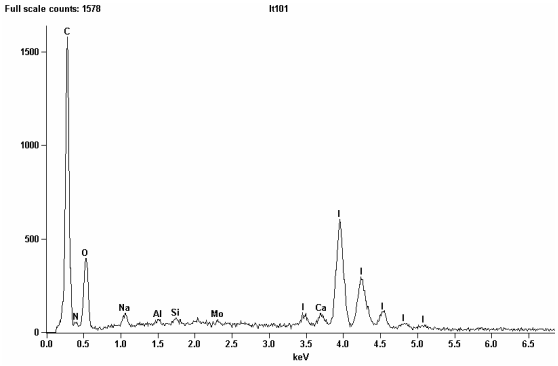
Left: Top view.
Right: Side view.

A number of cases were submitted to Trace in which items were thought to contain phosphorus and iodine used in methamphetamine manufacturing. The cases were analyzed by the SEM/EDS, which quickly identified the presence of phosphorus and iodine as well as other elements.



Left: EDS spectrum showing a large phosphorus peak.

Below:
EDS spectrum showing the characteristic iodine pattern.



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