

REGIONAL FORENSIC SCIENCE CENTER SEDGWICK COUNTY, KANSAS



Timothy P. Rohrig, Ph.D. — Director
Jaime L. Oeberst, M.D. — District Coroner-Chief Medical Examiner
Shari L. Beck — Forensic Administrator/Chief Medical Investigator

FORENSIC SCIENCE LABORATORIES 2010 ANNUAL REPORT

HISTORY

The Regional Forensic Science Center officially opened on December 21st, 1995. The Center houses the Office of the District Coroner and the Forensic Science Laboratories [FSL]. The Forensic Science Laboratories are composed of three major sections: Criminalistics, Forensic Biology/DNA and Forensic Toxicology. The staff currently consists of 33 scientific and support personnel.

The FSL is staffed with highly-trained and experienced forensic scientists, many who have advanced scientific degrees [MS, MSFS, Ph.D.]. The technical staff has well over a 150 years worth of combined professional experience.

In April of 1996, the Forensic Science Laboratories began accepting cases for firearms examinations. Three months later, the Biology Section provided forensic examinations for the identification of biological fluids. After mandatory accreditation by the State of Kansas, the Toxicology Laboratory began producing comprehensive examinations in post-mortem toxicology in support of the District Coroner in September of 1996. This was followed by the FSL providing forensic drug identification for local and regional law enforcement agencies. In November of 1996, arson/fire debris analysis was added to the Criminalistics Section. In January of 1997, The Center opened the first STR DNA Laboratory in the State of Kansas. The Trace Evidence Unit was expanded in 1998 to provide forensic analysis of paint and fibers.

The Forensic Science Laboratories are accredited by the American Society of Crime Laboratory Directors/Laboratory Accreditation Board [ASCLD/LAB].

The FSL of the Center continues to grow, providing timely and comprehensive forensic science services to local and regional law enforcement.

LABORATORY LEADERSHIP

The laboratory management staff are all case-working scientists.

Director and Chief Toxicologist
Timothy P. Rohrig, Ph.D., DABFT

Chief of Criminalistics
Gary L. Miller

Toxicology Lab Manager
Lillian Ngong

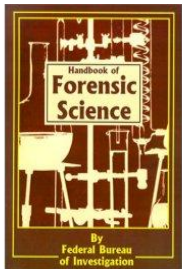
Forensic Biology/DNA Manager
Shelly A. Steadman, Ph.D.

Quality Assurance Manager
Robert Hansen, M.S.F.S.



SIGNIFICANT ACHIEVEMENTS

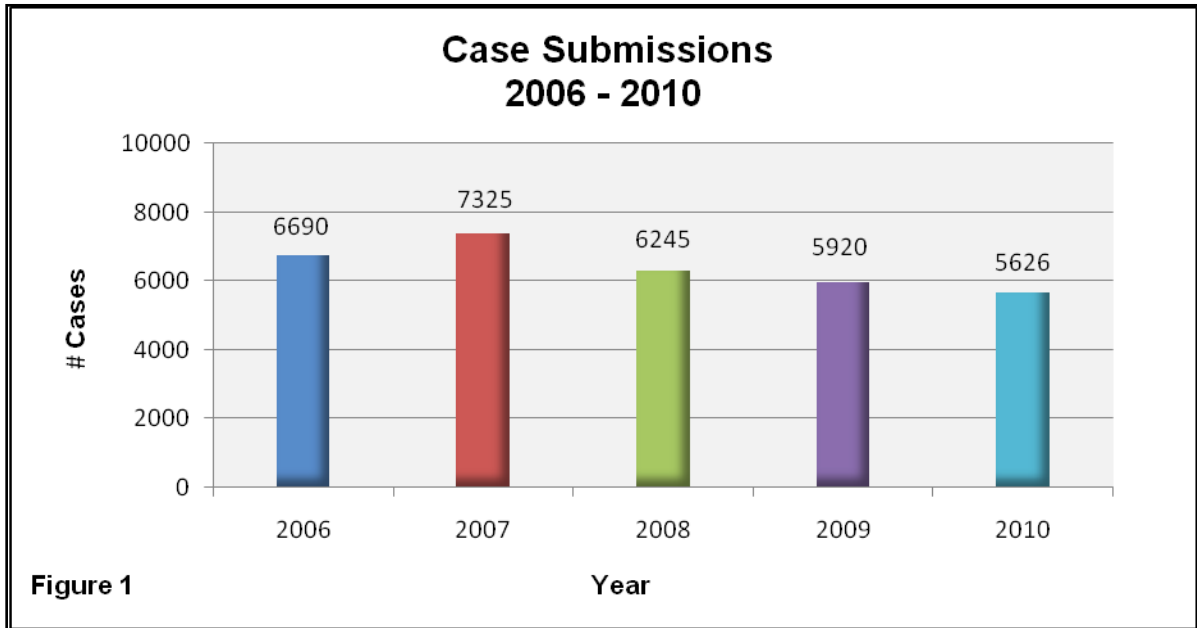
- The laboratory presented 2 papers at various professional meetings:
 - S. Steadman*, S. Hooper, S. Geering, and S. King “Recovery of DNA from latent fingerprint lifts.”, Presented at The MidAmerica 2010 Forensic DNA Conference, April 2010, Columbia, Missouri.
 - T.P. Rohrig, “Drug Facilitated Sexual Assault (DFSA) Applications and Interpretations: OTC Antihistamines”, Presented at the workshop entitled “Drug Facilitated Sexual Assault”, at the Society of Forensic Toxicologist Annual Meeting; October 2010, Richmond, Virginia.
- Conferences/Symposiums:
 - T.P. Rohrig, Invited Instructor for the Ames Lab/Midwest Forensic Resource Center sponsored workshop [4.5 days] on “General Principles of Drug Pharmacokinetics [ADME]”, March 2010, Wichita , Kansas.
 - T.P. Rohrig, Invited Instructor for the Ames Lab/Midwest Forensic Resource Center sponsored workshop [4.5 days] on “Advanced Pharmacokinetics for Toxicologists: P-450 Isozymes and Drug-Drug/Food Interactions”, July 2010, Ames, Iowa.
 - T.P. Rohrig, Invited Instructor for the Ames Lab/Midwest Forensic Resource Center sponsored workshop [4.5 days] on “Postmortem Toxicology: Interpretive Challenges and Considerations”, October 2010, Ames, Iowa.
- Book Chapters:
 - T.P. Rohrig, M. Gamble, and K. Cox: Identification and Quantitation of Ketamine in Biological Matrices Using Gas Chromatography-Mass spectrometry (GC-MS). In *Clinical Applications of Mass Spectrometry; Methods and Protocols*, Ed U Garg and CA Hammett-Stabler, Humana Press, 2010.
 - T.P. Rohrig, L.A. Harryman, and MC Norton: Identification and Quantitation of Zolpidem in Biological Matrices Using Gas Chromatography-Mass spectrometry (GC-MS). In *Clinical Applications of Mass Spectrometry; Methods and Protocols*, Ed U Garg and CA Hammett-Stabler, Humana Press, 2010.
 - T.P. Rohrig, M.C. Norton, and L.A. Harryman: Identification and Quantitation of Zopiclone in Biological Matrices Using Gas Chromatography-Mass spectrometry (GC-MS). In *Clinical Applications of Mass Spectrometry; Methods and Protocols*, Ed U Garg and CA Hammett-Stabler, Humana Press, 2010.
- Peer-reviewed Scientific Publications:
 - T. Stockham and T.P. Rohrig, “The Use of “Z-drugs” to Facilitate Sexual Assault”. *Forensic Science Reviews* 22(1): 61-73 (2010).
- 2010 Grant Funding:
 - Justice Assistance Grant
 - National Forensic Science Improvement Grant
 - NIJ DNA Capacity Enhancement Grant



FORENSIC SCIENCE LABORATORIES SERVICE OVERVIEW

Case Submissions

The Forensic Science Laboratory continues to experience a significant demand for its expert services. This year the Laboratory Division worked several high-profile cases, each case involving hundreds of exhibits requiring forensic analysis. While the total number of case submissions slightly decreased compared to last year, the number of items of evidence examined increased dramatically. Compared to 2006, case submissions decreased approximately 16%. **Figure 1** illustrates the number of forensic laboratory cases submitted for examination for the past 5 years.



2010 Case Submissions

Figure 2 illustrates the breakdown of case submissions by Laboratory section. The Criminalistics section continues to receive the majority of evidence submitted.

2010 Case Submissions

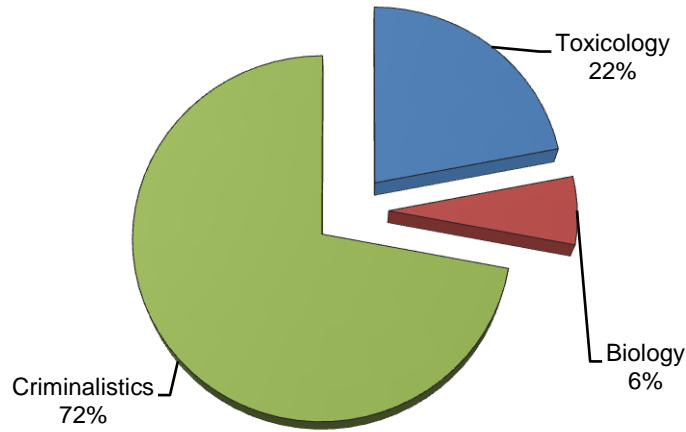


Figure 2

Although Biology accounts for a small percentage of the overall caseload – a significant portion of the casework required analysis of “hundreds” of exhibits. Also, the increasing number of CODIS entries, associated hits generated, and oversight of this database, entails a large amount of analyst time. Samples compared as a function of database management are not reflected in the percent breakdown of cases.

Requests For Expert Testimony

The professional staff is frequently called upon to present expert testimony in the courts [Figure 3]. In Y2010, the FSL received 4,009 subpoenas for court appearances, an approximate 9% decrease over the last year.

Request for Expert Testimony 2006 - 2010

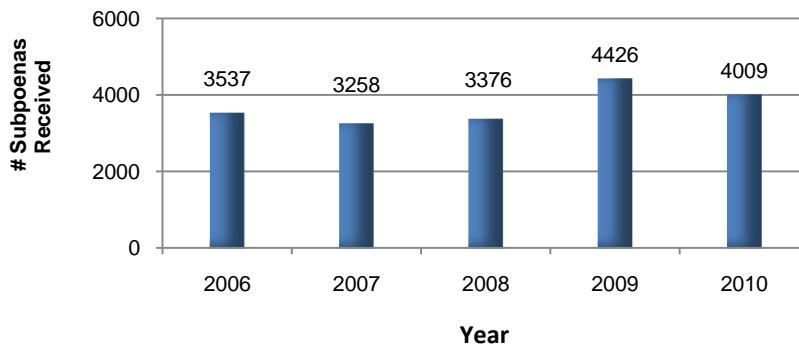


Figure 3

AGENCIES SERVED

The Forensic Science Laboratories provides expert testing services and consultation for a variety of law enforcement agencies within and outside of Sedgwick County. In 2010, the FSL provided expert testing services and consultations to 58 Law Enforcement Agencies, Fire Departments, and District Coroners. **Figure 4** indicates [yellow highlight] the counties within the state in which forensic laboratory services were provided.

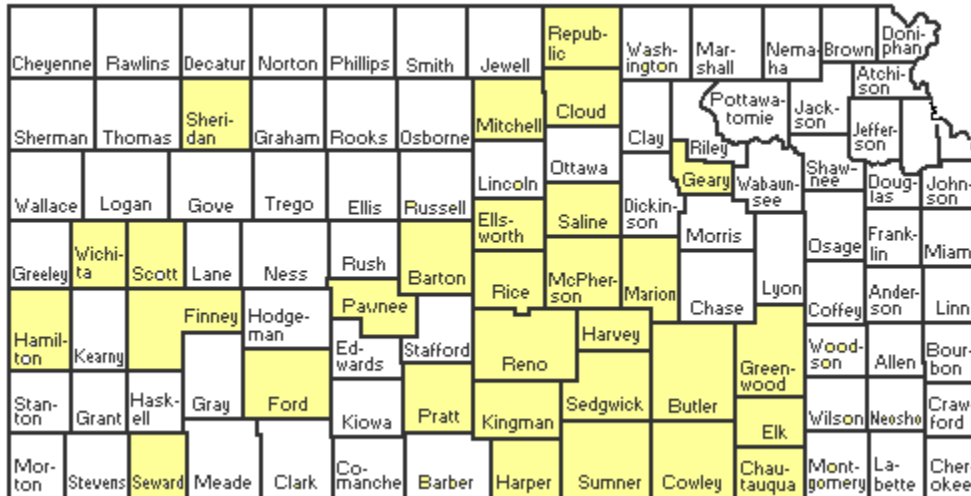


Figure 4

Sedgwick County vs. Out-of-County Cases

The Sedgwick County Regional Forensic Science Center serves as the principle Forensic [Crime] Laboratory for all of Sedgwick County Law Enforcement Agencies and provides forensic services to many other counties and municipalities within the state of Kansas. However, the vast majority of forensic laboratory services were provided for Sedgwick County Law Enforcement agencies. **Figure 5** illustrates the relative percentages of In-County [Sedgwick] and Out-of-County cases submitted to the Forensic Science Laboratories. A significant portion of the out-of-county cases was in support of the Sedgwick County Coroner’s out-of-county autopsies.

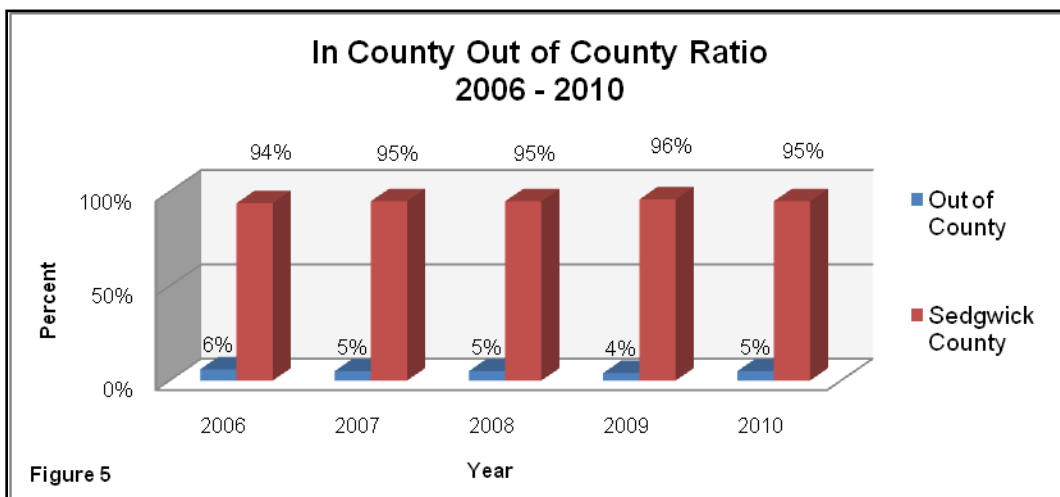


Figure 5

Table 1 is a list of Law Enforcement Agencies and Fire Departments that forensic laboratory services were provided for in Y2010.

Table 1: Agencies Served

ATF Task Force		
Barton Co. Coroner	Junction City PD	Valley Center PD
Bel Aire PD	Kansas Dept. of Corrections	Wichita Co. Coroner
Butler Co. Coroner	Kansas Highway Patrol	Wichita FD
Chautauqua Co. Coroner	Kingman Co. Coroner	Wichita PD
Cheney PD	Maize PD	Wichita State University PD
Cloud Co. Coroner	Marion Co. Coroner	
Cowley Co. Coroner	McPherson Co. Coroner	
Derby PD	Mitchell Co. Coroner	
Eastborough Police	Mulvane PD	
Eldorado Correction Facility	Newton FD	
Elk Co. Coroner	Park City PD	
Ellsworth Co. Coroner	Pawnee Co. Coroner	
FBI	Pratt Co. Coroner	
Finney Co. Coroner	Reno Co. Coroner	
Ford Co. Coroner	Republic Co. Coroner	
Ford Co. Sheriff	Rice Co. Coroner	
Garden Plain PD	Salina PD	
Goddard PD	Saline Co. Coroner	
Greenwood Co. Coroner	Scott Co. Coroner	
Hamilton Co. Coroner	Sedgwick Co. Coroner	
Harper Co. Coroner	Sedgwick Co. FD	
Harvey Co. Coroner	Sedgwick Co. Sheriff	
Haysville PD	Seward Co. Coroner	
Hutchinson Correctional Facility	Sheridan Co. Coroner	
Hutchinson FD	Sumner Co. Coroner	
Hutchinson PD	USD 266 Police (Maize)	



CRIMINALISTICS SECTION

The Criminalistics Section accounts for the majority of the cases submitted to the Forensic Laboratories. **Figure 6** illustrates the trend in forensic case volume submitted to the Criminalistics Section.

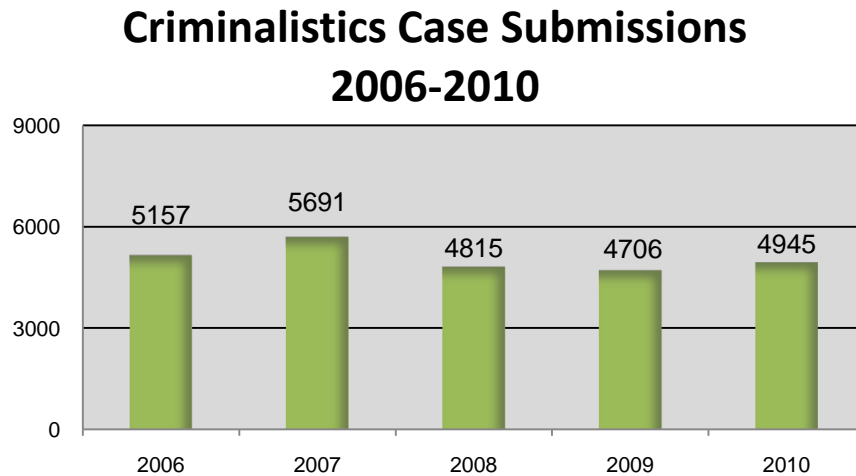


Figure 6

The Criminalistics Section provides forensic examinations in the following disciplines; Drug Identification, Open Container [Beverage Alcohol] Analysis, Firearms & Toolmarks, Serial Number [Firearms] Restoration and Trace Evidence – including sub-disciplines of Ignitable Liquids [Arson], and Chemical/Material Analysis.

2010 Criminalistics Case Types

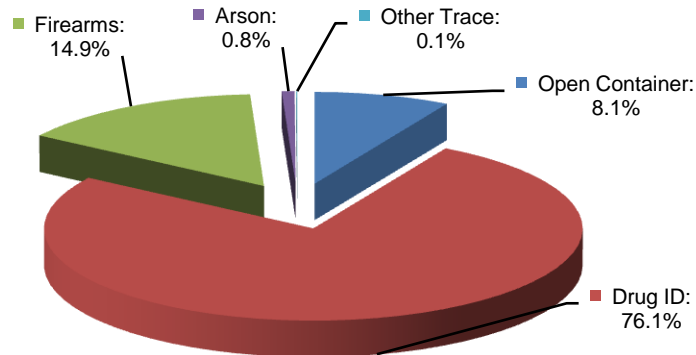


Figure 7

The majority of cases submitted to the Criminalistics Section [**Figure 7**] are for illicit drug identification. This accounts for a little more than three-fourths of the cases received. Firearms are the second most abundant case type, accounting for approximately 15% of the cases submitted for analysis to the section.

Drug ID Unit

The agency that submits the greatest volume of drug evidence is the Wichita Police Department [WPD]. This is apparent in **Figure 8** as nearly 90% of cases received are from the Wichita Police Department. Agencies other than the Wichita Police Department and the Sedgwick County Sheriff's Office comprise less than 5% of the total cases submitted.

2010 Drug Identification Case Percentage by Agency

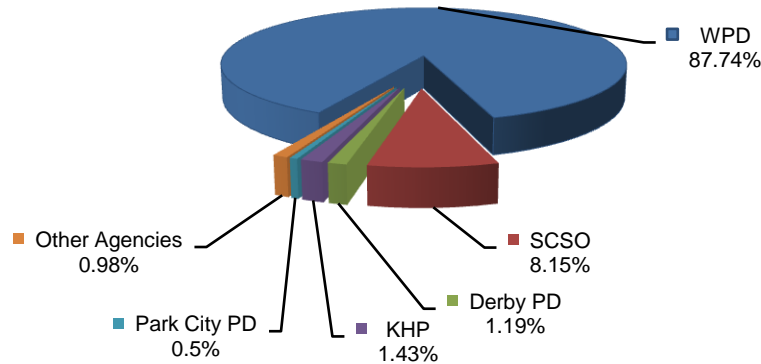


Figure 8

In 2010, the Drug Identification Unit examined over 9,636 exhibits for the presence of controlled substances. The majority of drug exhibits were Marijuana (54.41%). Cocaine and Methamphetamine account for 26.87% of the total exhibits examined. The number of other controlled substances represents 7.25% of the exhibits examined. **Figure 9** illustrates the number of exhibits in which various types of drugs were positively identified.

2010 Drug Exhibits

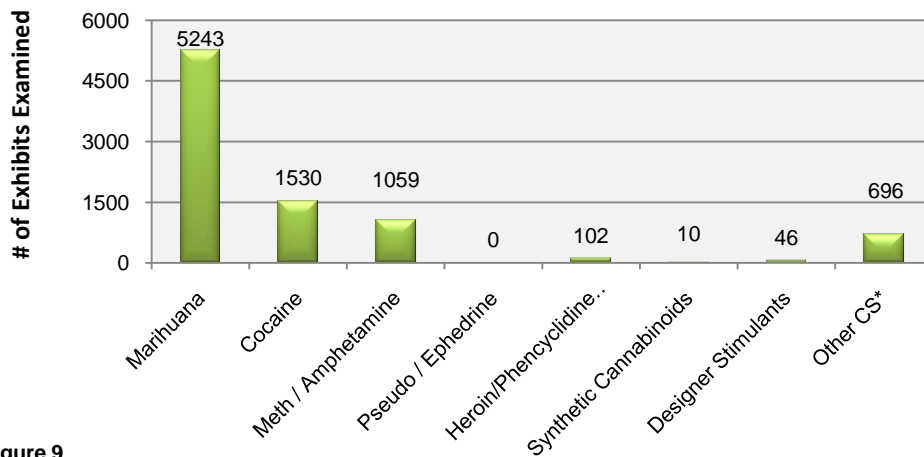


Figure 9

*CS: Controlled Substances

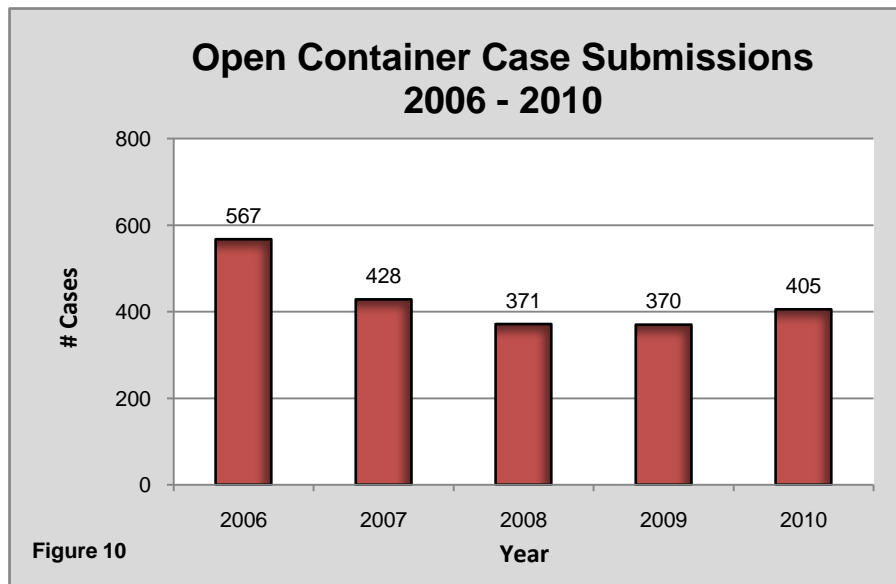
In 2010 the Forensic Science Center began to see a number of cases containing “potpourri” (Synthetic Cannabinoids) and “Bath Salts” (Synthetic Stimulants) and other derivatives of Amphetamine-like stimulants.





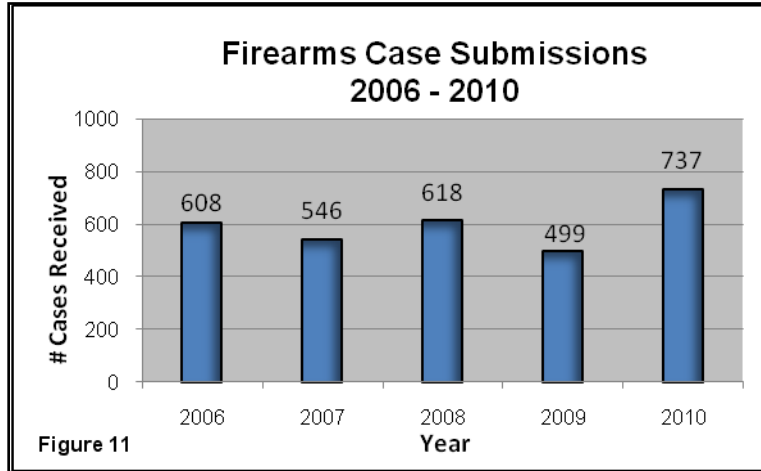
Open Container [Alcohol] Unit

Open Container/Beverage Alcohol Analysis is conducted in support of the state and local DUI laws and prohibition of minors to possess alcohol. As shown in **Figure 10** the number of cases submitted remained somewhat constant.

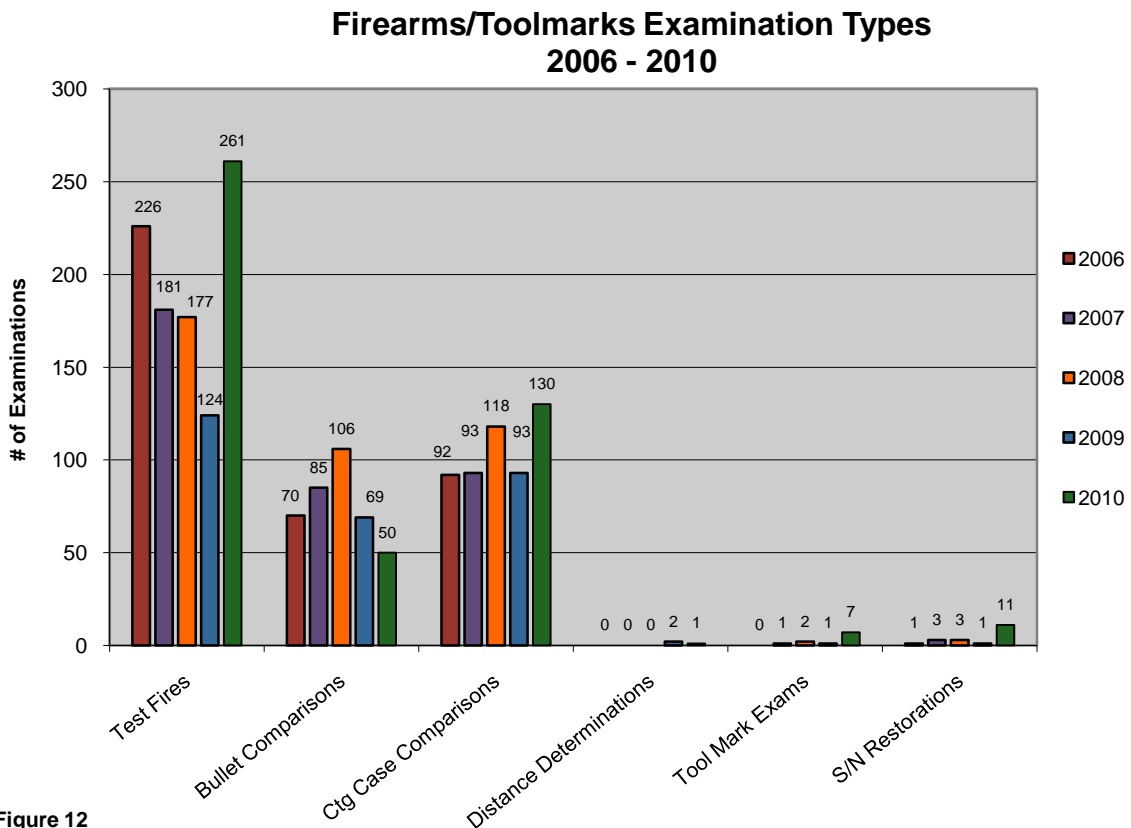


Firearms/Toolmarks Unit

The Firearms/Toolmarks Unit conducts many types of forensic examinations. The majority of examinations involve operability (function) tests on the submitted firearms. As shown in **Figure 11**, the unit experienced approximately a 47.7% increase in function test requests from Y2009 to Y2010.



In 2010, bullet comparison examinations decreased 27.5% while cartridge case comparisons increased 40% from the previous year. **Figure 12** illustrates the case types submitted to the unit; classified as test fires, bullet comparisons, cartridge case comparisons, distance determinations, tool mark exams, and serial number restorations.

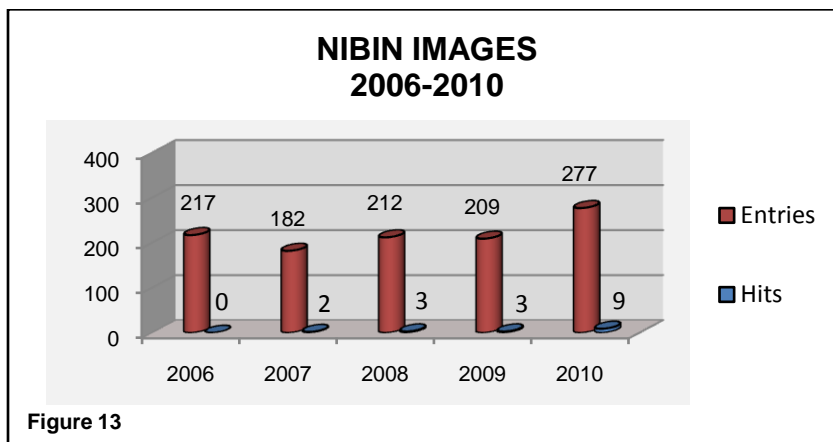


National Integrated Ballistic Information Network [NIBIN]

NIBIN is a national program, in partnership with the Bureau of Alcohol, Tobacco, Firearms, and Explosives [ATF] that provides a database of fired bullets and cartridge casings. Images of test-fired bullets and test-fired cartridge casings from submitted firearms, as well as images of bullets and cartridge cases from crime scenes where no firearms were recovered, are inputted into NIBIN. Searches are then conducted attempting to link serial-type crimes where the same firearm is used. This may result in linking crimes that may have occurred at an earlier date, locally and/or nationally. This system was used successfully in the Washington D.C. Sniper serial killings and linked the various crimes from multiple jurisdictions to one firearm.

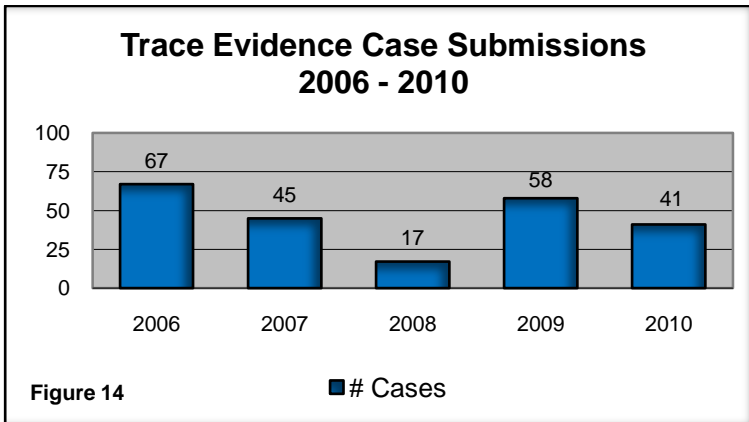


Since the acquisition of the NIBIN system in late 2002, the laboratory has made 1,673 NIBIN entries [Figure 13]. In Y2005 there were two hits in NIBIN, resulting in one investigation aided. In Y2006, there were no hits in NIBIN. In Y2007 there were 2 hits in NIBIN, resulting in 2 investigations aided. In Y2008 there were 3 hits in NIBIN, resulting in three investigations aided. In Y2009 there were 3 hits in NIBIN, resulting in 12 investigations aided. In Y2010 there were 9 hits in NIBIN, resulting in 18 investigations aided. The total number of hits and investigations aided since the inception of the program are 17 and 35 respectively.



Trace Evidence Unit

Trace Analysis is the forensic identification of unknown compounds and fire debris evidence in casework ranging from product tampering to assault and homicide. **Figure 14**, illustrates the number of cases worked by the Arson/Trace Evidence Unit each year from 2006 through 2010. The majority of casework in the Arson/Trace Evidence Unit is the investigation of suspicious fires. The unit will continue to see a high demand for this forensic service.



In addition to assisting arson investigations, the Arson/Trace Evidence Unit provides microscopic/physical/chemical analyses for a variety of evidence submissions associated with criminal investigations. The trace analysis case-type category also includes fracture analysis. Table 2 lists the different types of trace evidence [non-arson] examination requests.

Table 2: Non-Arson Trace Evidence Examinations

Identification of Unknown Liquids & Solids
Fracture Analysis (non-firearms)
Bank-Dye Analysis
Tear Gas/Pepper Spray Analysis
Adulterated Drinks (non-drug)



FORENSIC BIOLOGY/DNA SECTION

In Y2010, the Biology/DNA section received 328 cases for forensic DNA examination. Of those cases, 57 were submissions for additional analysis to be conducted on cases submitted in previous years and 46 were subsequent 2010 case submission. The remaining 225 cases were new cases generated at the Center for year 2010 (**Figure 15**). This calculates to 17% of the casework being conducted on cases continuing from previous years. For cases generated in 2010, 20% of the casework was from multiple submissions.

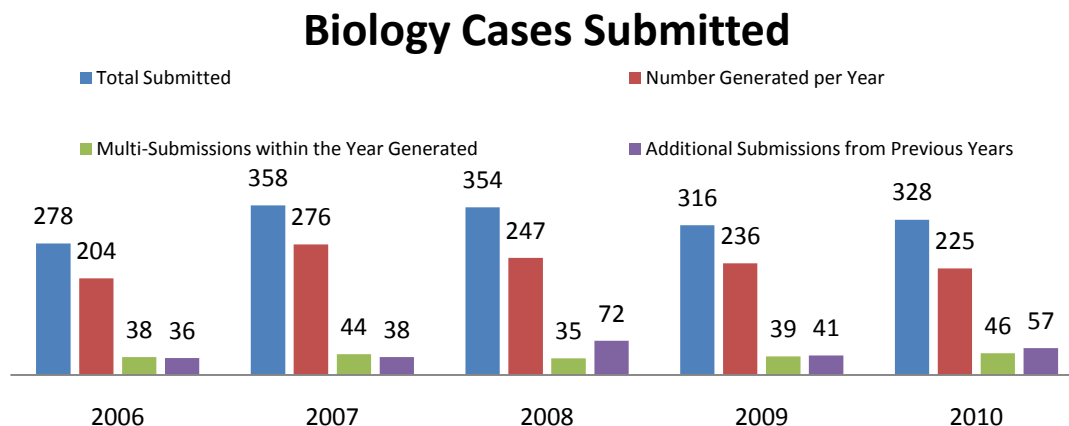


Figure 15 Demonstrates that on an average 15% of the Forensic DNA casework performed each year is a continuation from cases previously submitted to the Center. In addition, on average 17% of the cases submitted each year have additional submissions that same year.

The Forensic Biology Section provides forensic examination in the identification of body fluids and STR DNA [profile] analysis. As depicted in **Figure 16**, nearly half (48%) the cases submitted for biological examination are person on person type cases. The section continues to work a variety of case types, including sex crimes, homicides, property crimes, assaults, and forensic identifications [unidentified human remains].

As was the case in previous years, property crimes constitute the majority of the cases worked [**Figure 16**] and are generally single exhibit cases that are processed only if the evidence submitted has a high likelihood of resulting in a profile suitable for CODIS entry. Given that these crimes have a high recidivism rate, they have an exceptional solvability factor when crime scene profiles are searched against the database. This is exemplified by the fact that property crimes constitute 82% of the total 2010 investigations aided by CODIS hits. Because these cases have high solvability, as these cases populate the database and hits occur that warrant Offender Hit Notifications or LDIS Hit Notifications, the number of reports issued by the section will increase.

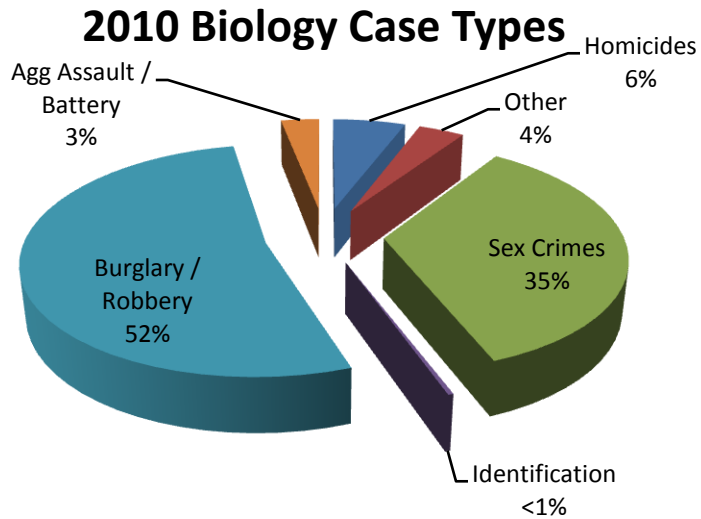


Figure 16 Four percent of the case types are categorized as other. This category may include cases involving felony possession of a firearm, arson, vandalism, auto theft, attempted murder, vehicular homicide, narcotics, stalking, etc. The section identified one human remain through Forensic DNA analysis.

The Biology / DNA section issued 503 reports in 2010. Of those, 140 were Offender Hit Notifications, which is when a forensic unknown sample hits to a convicted offender sample at the state or national level, and 16 were Local DNA Index System (LDIS) match reports, which is when a local forensically unknown sample hits to another sample previously entered into the local database.

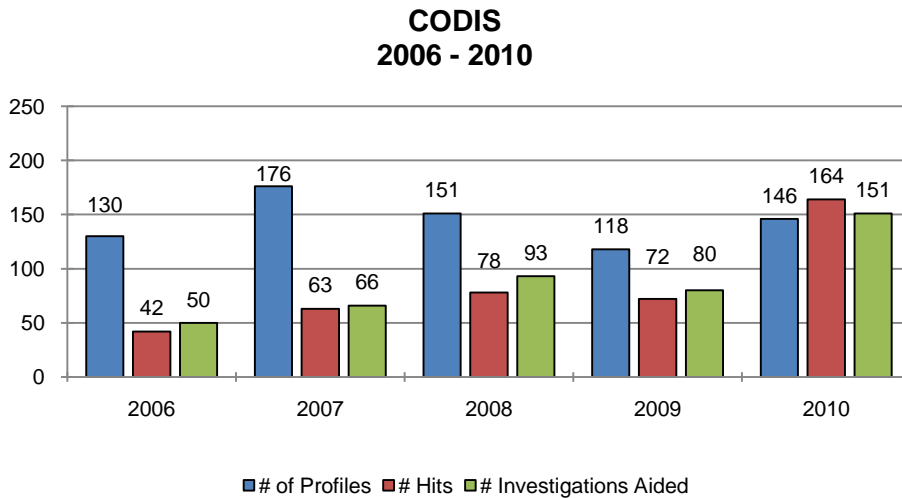


Figure 17 2010 indicates an increase in the number of reports issued by the Biology / DNA section due to new accreditation requirements. As the CODIS database increases in the number of profiles the number of reports is expected to increase.

Each report and associated case record goes through a review process. While the process has always included a technical review when a record contains technical data and an administrative review on all case records, new accreditation requirements mandate that with each hit a formal notification be provided to the investigating agency. This new requirement has increased the time spent reviewing case records substantially.

FORENSIC TOXICOLOGY SECTION

The Forensic Toxicology Section has experienced a steady increase in casework over the last few years. According to **Figure 18**, the number of cases submitted in Y2010 has increased over years Y2008 and Y2009. The section continues to expand the number of drugs and poisons it can detect and quantitate. The Forensic Toxicology Section provides comprehensive examinations of post-mortem [autopsy] samples to assist in the determination of cause and manner of death. Specimens collected during the investigation of driving-under-the-influence-of-drugs/alcohol cases and drug-facilitated sexual assault cases are also examined by this section. The Toxicology Laboratory also provides drug testing on children removed from clandestine methamphetamine laboratories.

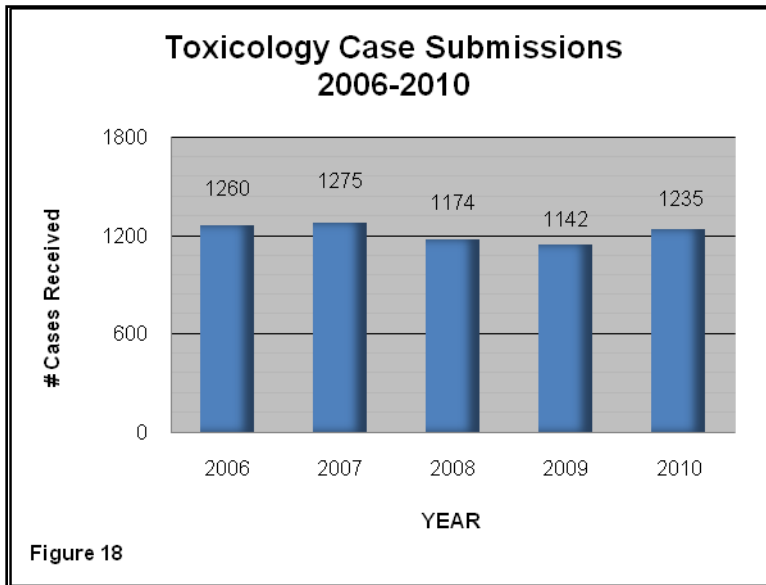
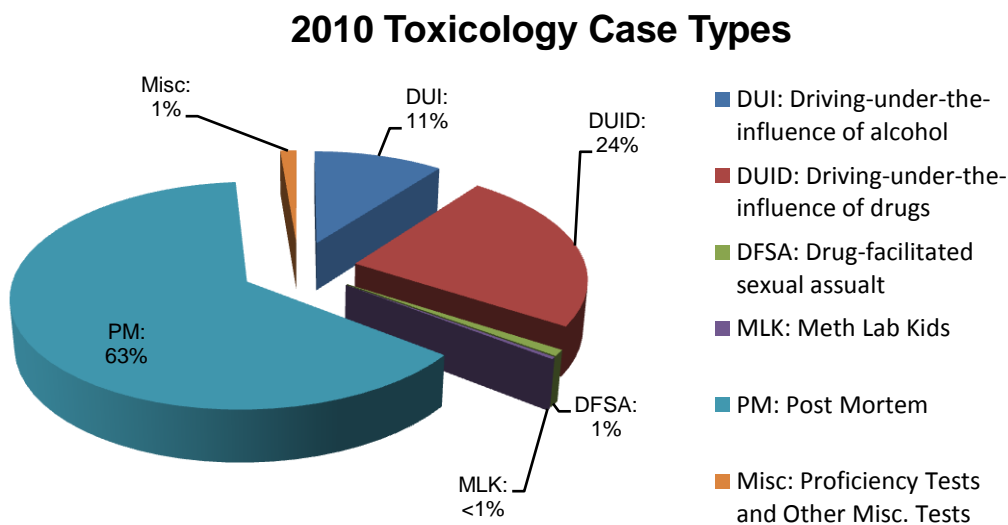


Figure 19 depicts the percentage of toxicology cases submitted by case type. Toxicological examinations in support of the District Coroner accounts for approximately two-thirds of the forensic case work performed by the section.



Children Removed from METH LABS

The RFSC is a partner in the Sedgwick County “Meth Kids Initiative Task Force” and the Kansas Alliance for Drug Endangered Children [DEC]. The DEC program is a multidisciplinary approach to protecting children found in clandestine methamphetamine laboratories. Children in these laboratories are at a great risk for physical, emotional, and developmental harm.



As shown in **Figure 20**, the Toxicology Laboratory evaluated 4 children [4 cases] removed from clandestine methamphetamine laboratories for exposure to methamphetamine in Y2010.

Overall, 39.4% of all children tested had detectable amounts of methamphetamine in their systems from 2004 through 2010.

2006-2010 Clandestine Meth Lab Kids

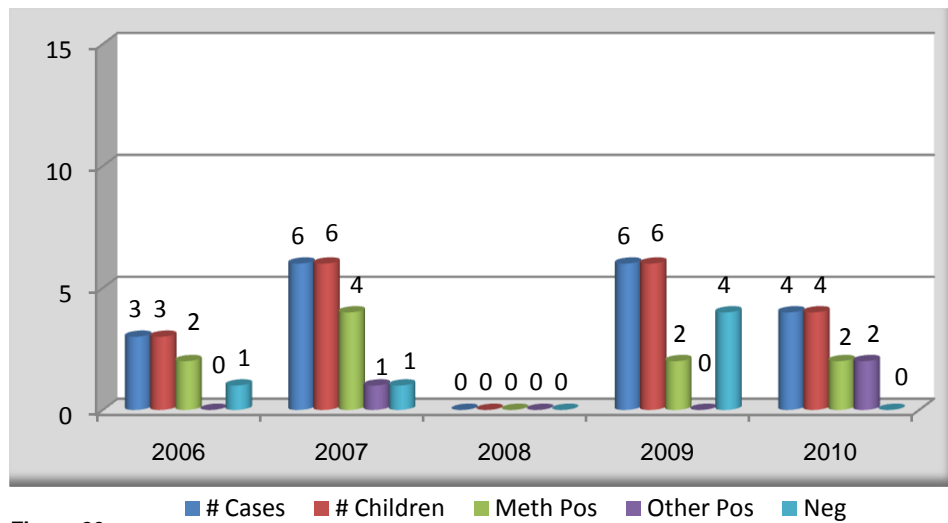
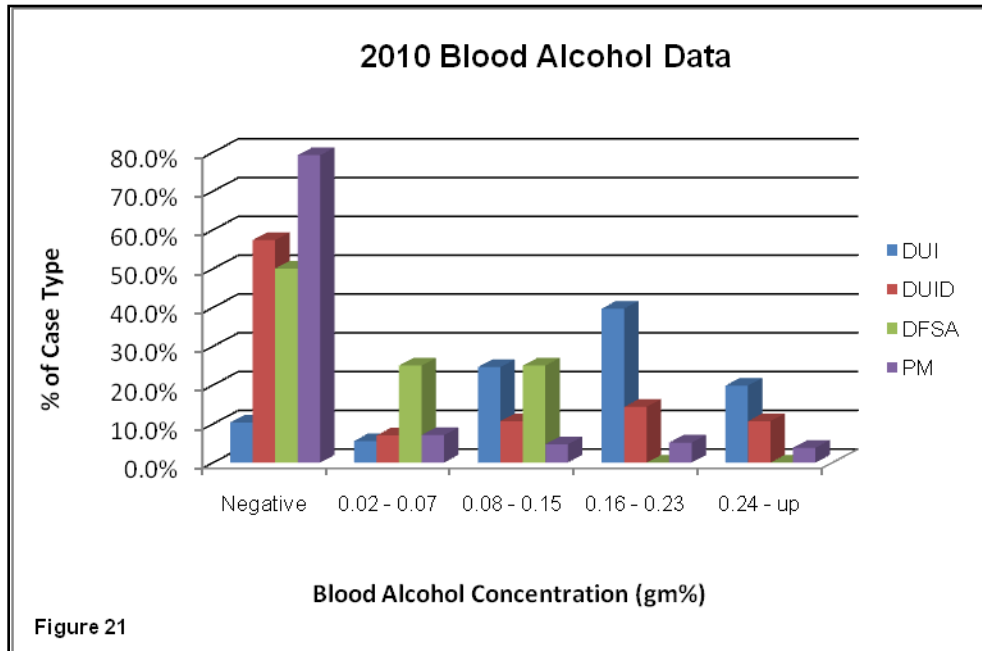


Figure 20

Alcohol and Drugs

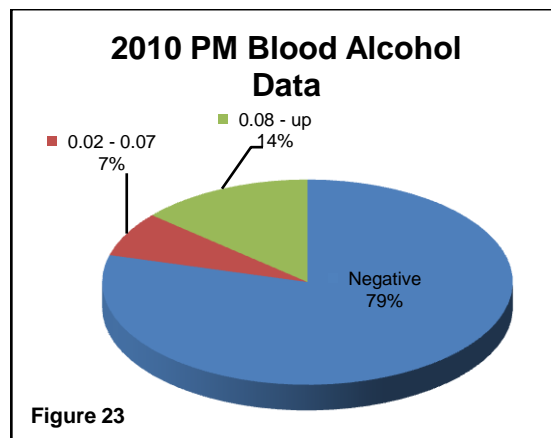
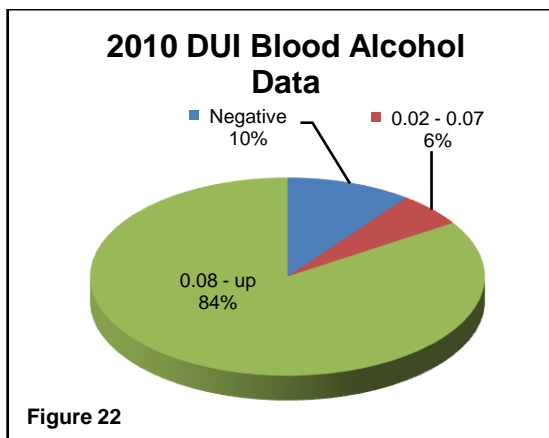
Alcohol continues to play a significant role in all of the FSL toxicology case types [Figure 21]. In more than 27.5% of the toxicology alcohol positive cases, the driver/decedent was greater than twice the legal limit (0.08 gm%).



DUI = Driving-under-the-influence (Alcohol exclusively tested)
 DUID = Driving-under-the-influence (Alcohol and/or drugs tested)
 DFSA = Drug-Facilitated Sexual Assault
 PM = Post-Mortem

The vast majority of samples submitted in Driving-Under-the-Influence [DUI] cases were found to have alcohol concentrations at or above the legal limit of 0.08 g% [Figure 22].

In approximately 21% of the postmortem (PM) case investigation there was a positive finding of alcohol [Figure 23].



Drug-Related Deaths

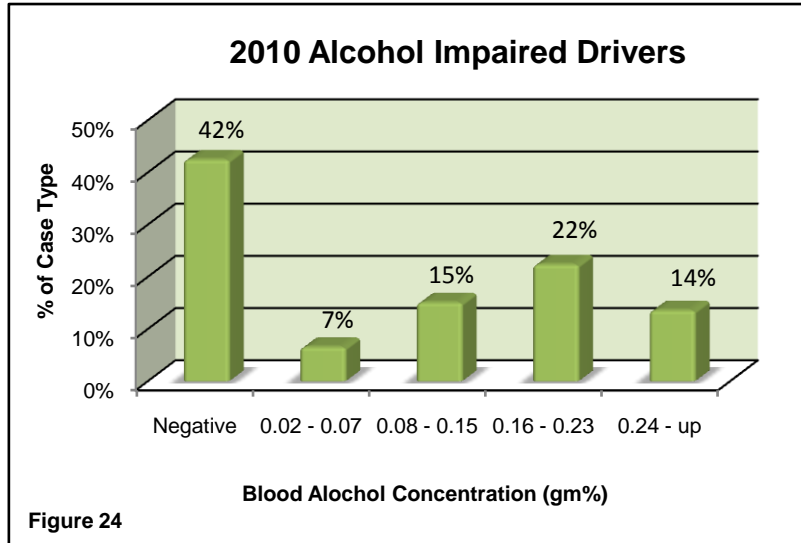
Aside from alcohol, cocaine is the most commonly found drug in post-mortem cases. Table 3 depicts the 50 most common drug findings in post-mortem Toxicology cases [excluding ethyl alcohol] for Y2010.

Table 3: 2010 Most Commonly-Found Drugs (Post-Mortem)

6-Monoacetylmorphine/6-Acetylcocaine (Heroin)	Levamisole
Acetaminophen	Lidocaine
Alprazolam/a-Hydroxyalprazolam	Lorazepam
Amitriptyline/Nortriptyline	Methadone/Normethadone/EDDP/EMDP
Amphetamine/Methamphetamine	Metoclopramide
Atropine	Mirtazapine
Benzotropine	Morphine
Bupropion/Metabolites	Nordiazepam
Carisoprodol/Meprobamate	Oxazepam
Chlorpromazine	Oxycodone
Citalopram/Desmethylcitalopram	Paroxetine
Clonazepam/7-Aminoclonazepam	b-Phenylethylamine
Cocaine/Benzoylcocaine/Cocaine	Phenobarbital
Codeine	Phenytoin
Cyclobenzaprine/Norcyclobenzaprine	Promethazine/Norpromethazine
Dextromethorphan	Propoxyphene/Norpropoxyphene
Diazepam	Quetiapine
Dihydrocodeine	Salicylate
Diphenhydramine/Nordiphenhydramine	Sertraline/Norsertaline
Diltiazem	Temazepam
Doxylamine	Tetrahydrocannabinol/Carboxytetrahydrocannabinol
Fentanyl	Tramadol/n-Desmethyltramadol/o-Desmethyltramadol
Fluoxetine/Norfluoxetine	Trazodone/m-Chlorophenylpiperazine
Hydrocodone/Hydromorphone/Dihydrocodeine	Venlafaxine/o-Desmethylvenlafaxine
Hydroxyzine	Zolpidem

Alcohol Positive Drivers

Alcohol plays a significant role in driving under the influence cases. In 2010, more than half of the drivers [DUI and DUID] tested had some detectable alcohol in their blood, the largest group being over twice the legal limit [Figure 24]. Approximately fifty one percent of alcohol positive drivers were at or above “per se” limit of 0.08 gm%.



Alcohol Positive Drivers – Under the Age of 21

The legal age for possession of alcohol is 21 years old. In 2010, a significant portion [8%] of all motor vehicle drivers testing positive for alcohol were under the age of 21 [Figure 25].

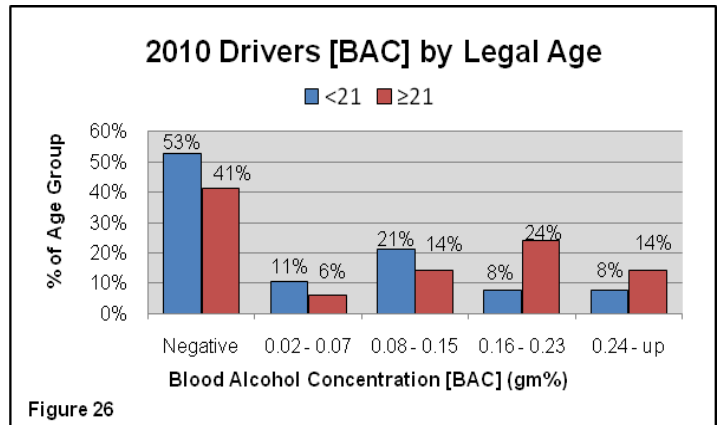
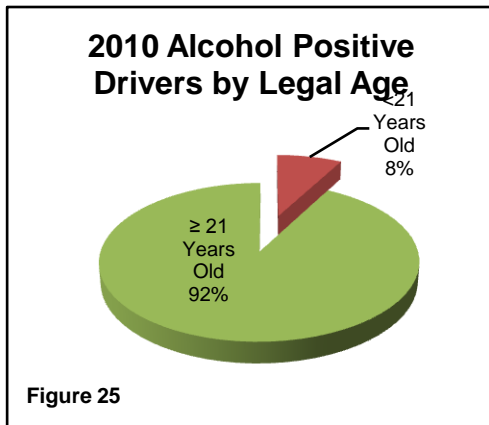


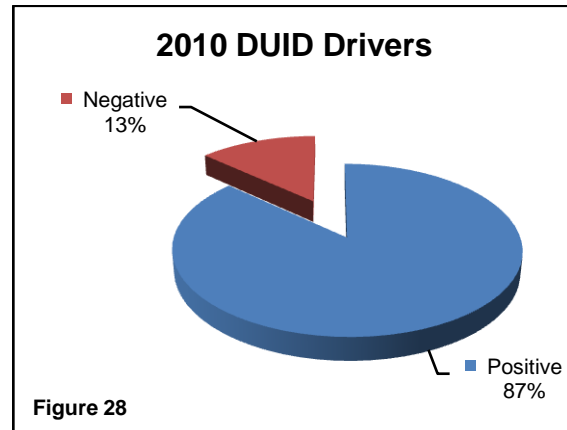
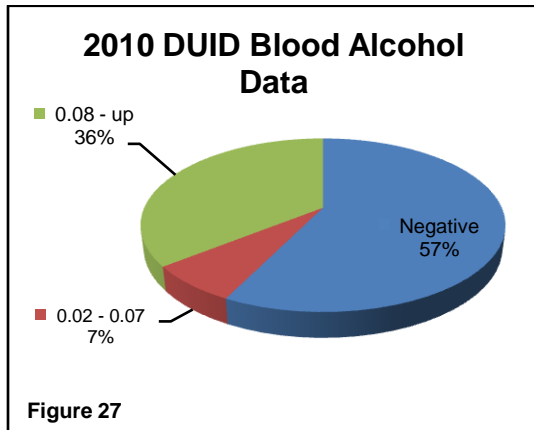
Figure 26 illustrates the percentages of suspected alcohol impaired drivers by age. For drivers tested that were under 21, 37% had alcohol concentrations $\geq 0.08\%$.

Drugs and Driving

Drugs play a significant role in driving under the influence cases. While 57% of cases were found to be negative for alcohol upon pre-screening, 7% were cases involving blood alcohol levels at or below the legal limit and 36% of the cases were severe impairment (over 0.08% and up) [Figure 27].



[Figure 28] illustrates that 87% of individuals suspected of driving under the influence of drugs tested positive.



Drivers Drug Usage: Licit and Illicit Drugs

In those cases where drugs were detected, more than half were illicit drugs or a mixture of illicit and licit [Figure 29].

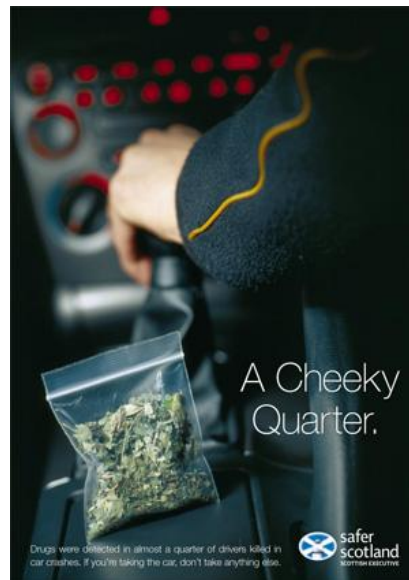
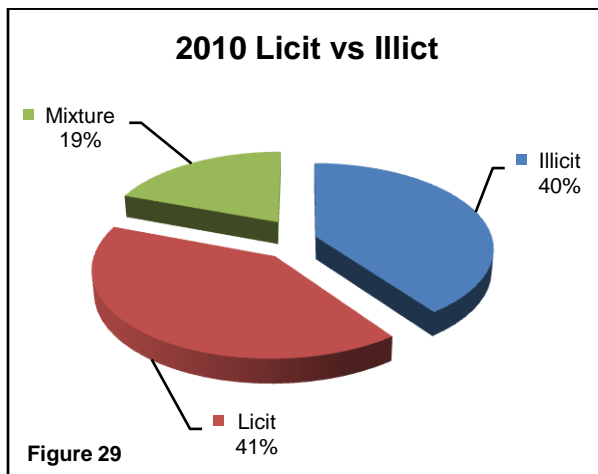


Table 4 depicts the 42 most common drug findings in Driving-Under-the-Influence-of-Drugs [DUID] toxicology cases [excluding ethyl alcohol] for Y2010.

Table 4: 2010 Most Commonly-Found Drugs (DUID)

Tetrahydrocannabinol/Carboxytetrahydrocannabinol	Morphine
Alprazolam/a-Hydroxyalprazolam	Oxazepam
Hydrocodone/Hydromorphone/Dihydrocodeine	Zopiclone
Amphetamine/Methamphetamine	Lorazepam
Cocaine/Benzoyllecgonine/Cocaethylene	Oxymorphone
Carisoprodol/Meprobamate	Trazodone/m-Chlorophenylpiperazine
Methadone/Normethadone/EDDP/EMDP	Amitriptyline/Nortriptyline
Citalopram/Desmethylcitalopram	Fentanyl
Clonazepam/7-Aminoclonazepam	Fluoxetine/Norfluoxetine
Nordiazepam	Butalbital
Oxycodone	Dextromethorpan
Zolpidem	Methylecgonine
Diazepam	Phentermine
Diphenhydramine/Nordiphenhydramine	Codeine
Phencyclidine	Lidocaine
Venlafaxine/o-Desmethylvenlafaxine	Propoxyphene/Norpropoxyphene
Tramadol/n-Desmethyltramadol/o-Desmethyltramadol	Lamotrigine
Sertraline/Norsertaline/Desmethysertraline	Hydroxyzine
Temazepam	Doxylamine
Cyclobenzaprine/Norcyclobenzaprine	
Quetiapine	
Mirtazapine	

