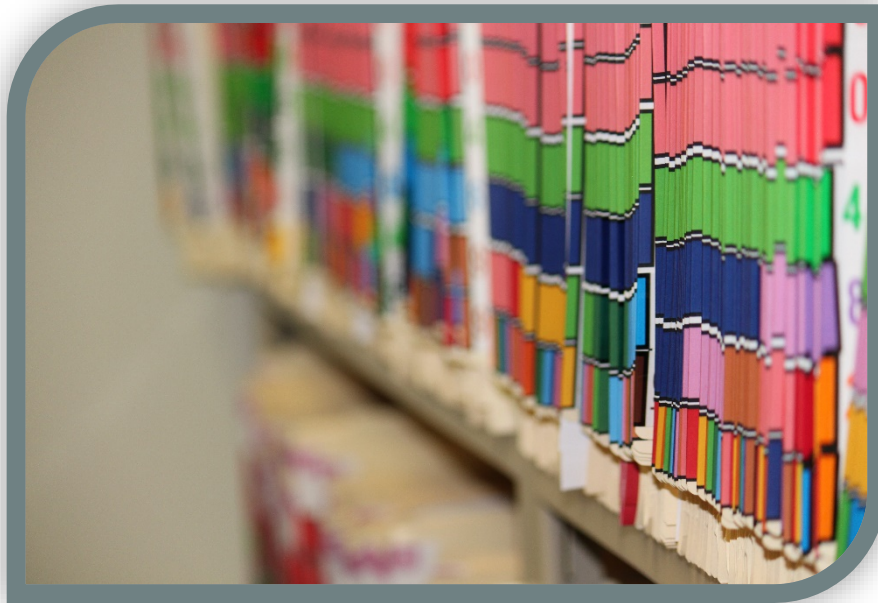




Montana Department of Justice
Forensic Science Division
Annual Report - 2018



Contents

The Forensic Science Division	1-5
State Medical Examiner’s Office	6
Toxicology Section	7-19
Chemical Analysis Section	20-22
Latent Prints Section	23
DNA/Serology Section	24-28
Firearms/Tool Marks Section	29
Quality Assurance and Evidence Section...	30

“If the law has made you a witness, remain a man of science. You have no victim to avenge, no guilty or innocent person to convict or save – you must bear testimony within the limits of science.”

**Dr. P.C.H. Brouardel
French Pathologist
1837-1906**

Executive Summary

The Forensic Science Division spent a great amount of time and energy this past year strengthening our ability to deliver on our mission. Multiple sections were provided with additional resources which allowed them to improve their production and efficiency. This report will provide a high-level overview of the entire Division as well as detailed information regarding each of the scientific sections of the laboratory. I believe they provide a great service to the criminal justice system and the citizens of Montana.

Scott Larson, Administrator



Montana Attorney General
Tim Fox and Forensic
Science Division
Administrator Scott Larson

Forensic Science Division

The Forensic Science Division (FSD), better known as the State Crime Lab, is one of eight Divisions within the Department of Justice. It was established in Montana Code in 1977.

Our Mission is to provide **accurate, objective and timely forensic analysis** in support of the Montana criminal justice community.

The Division has facilities in both Missoula and Billings. The Missoula facility houses the Medical Examiners, DNA/Serology, Toxicology, Chemical Analysis, Latent Prints, Firearms/Toolmarks, Quality Assurance, and Evidence sections. The Billings facility contains Medical Examiner, Chemical Analysis, and Evidence sections.

Billings Laboratory

On January 14, 2019 the Division opened a new laboratory in Billings with the focus of improving services to eastern Montana. The Medical Examiner and Chemistry disciplines work out of this facility.

Staff

The lab continues to recruit a variety of scientists and staff with a broad range of skill sets to contribute to our mission. The lab is staffed with 33 scientists, 3 pathologists, and 9 administrative/support staff. This small Division boasts 41 staff with bachelor's degrees (several with multiple degrees), 13 with master's degrees (several with multiple degrees), three medical degrees, and 11 nationally certified scientists. The division is made up of 28 females and 16 males, 19 Montana natives and 25 employees who were lucky enough to be able to move to this beautiful state.

Special thanks to Annalisa Martin and Dana Clark for all their financial and administrative expertise. They keep the Division functioning.

Laboratory Accreditation

Accreditation is the process by which forensic laboratories throughout the world demonstrate that the laboratory operates to a set of quality assurance standards. Quality Assurance Manager Emily Wemlinger is charged with making sure the laboratory continues to meet or exceed national accreditation standards. The Crime Lab was originally accredited under ASCLD/LAB's Legacy program in 2005. In 2010, the laboratory attained a higher level of accreditation to ISO/IEC 17025:2005 standards for testing laboratories (which are the standards for forensic labs) as well as ASCLD/LAB-*International* Supplemental Requirements. In 2017, the Breath Alcohol section was accredited to ISO/IEC 17025:2005 standards for calibration laboratories. Our accreditation is transitioning to ANSI National Accreditation Board (ANAB) in 2019. ANAB has provided accreditation of forensic testing agencies since 1982 and moved to ISO/IEC 17025 in 1999.

Outreach

Members of the laboratory continue to expand our interactions with a broad cross-section of legislators, citizens, citizen groups as well as criminal justice agencies and organizations across Montana. In 2018, lab representatives attended conferences or met with boards for the Montana Sheriffs and Peace Officers Association, the Montana Association of Chiefs of Police, the Montana County Attorneys Association, the Montana Coroners Association, and the Attorney General's Law Enforcement Advisory Committee. The laboratory holds open house events for legislators and the public and provides regular tours for the public. Overall, laboratory personnel spend over 300 hours per year training law enforcement, prosecutors, defense attorneys, judges, and the public in matters tied to the forensic sciences.



National Matters

The Organization of Scientific Area Committees (OSAC) for Forensic Science works to strengthen the nation's use of forensic science by facilitating the development of technically sound forensic science standards and by promoting the adoption of those standards by the forensic science community. These standards are written documents that define minimum requirements, best practices, standard protocols, and other guidance to help ensure that the results of forensic analysis are reliable and reproducible.

The laboratory is proud that multiple laboratory personnel have served on national committees which are critical to the advancement of technological standardization of forensic sciences.

Forensic Science Laboratory Advisory Board

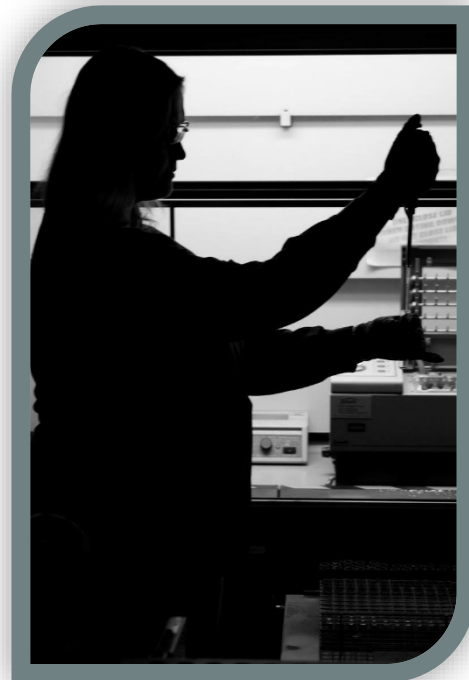
The board was established in 1996 by Attorney General Joe Mazurek and has met nearly every year since. The board serves as an advisory council and as an independent body to investigate complaints of serious negligence or misconduct. It also serves as a communication link between the lab and its stakeholders. The board met in March of 2018 for an update on the laboratory and discussions on the general direction of the Division. The current members of the board include:

- Attorney General, Tim Fox
- District Judge, Greg Pinski
- Yellowstone County Attorney, Scott Twito
- Public Defender Division Administrator, Peter Ohman
- Division of Criminal Investigation Administrator, Bryan Lockerby
- Bureau of Indian Affairs Assistant Special Agent-in-Charge, William LeCompte
- Broadwater County Sheriff/Coroner, Wynn Meehan
- Cascade County Sheriff/Coroner, Bob Rosipol
- Yellowstone County Coroner, Cliff Mahoney
- Fergus County Coroner, Richard Brown
- Department of Corrections Quality Assurance Manager, Kurt Aughney

We are grateful for their time, dedication, and providing their unique viewpoints that directly help improve the Crime Lab.

Grant Funding

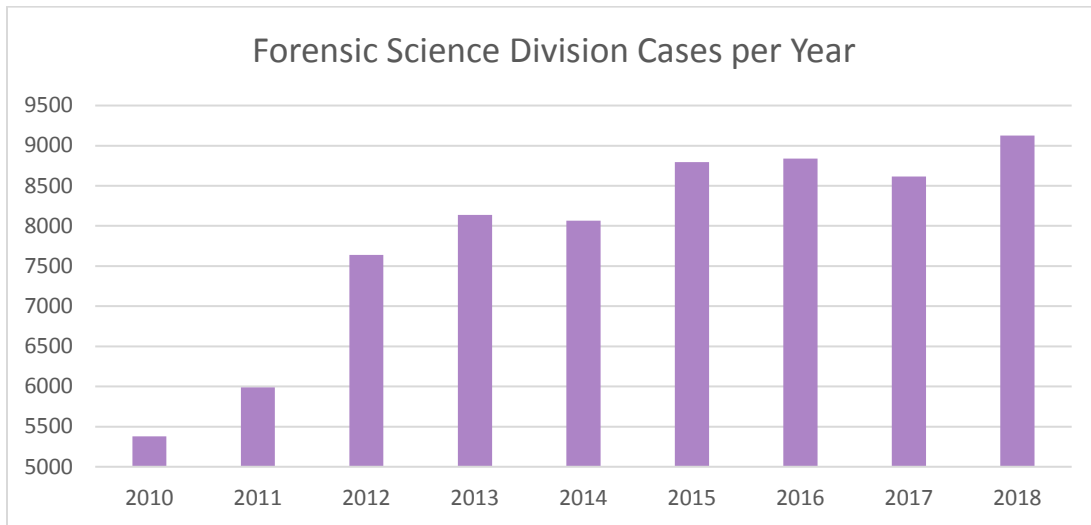
The laboratory takes advantage of federal grant funding whenever possible. The laboratory typically receives grants from the Paul Coverdell Appropriation, Debbie Smith Act that provides funding for DNA Capacity Enhancement and Backlog Reduction grant, and a National Institute of Justice "Strengthening the Quality and Consistency of the Medical Examiner/Coroner System" grant. These grants provide funding for personnel, remodeling of Missoula morgue, supplies,



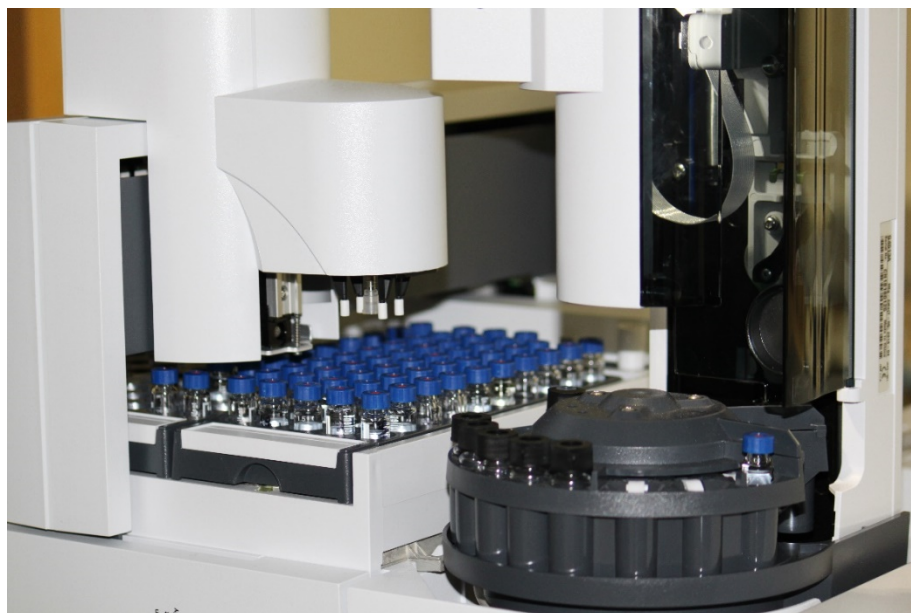
contracts, outsourcing of cases, instrumentation and the training for scientists. The Division also worked with Health and Human Services on a CDC grant that will fund a Coroner/Medical Examiner death investigation database which will allow multiple state agencies to work together improving this process. Overall the laboratory received over \$1.6 million in 2018 which is up from \$339,000 in 2017.

Caseloads

As with many crime labs nationwide, the Montana Forensic Science Division has seen a steady influx in cases over the last 10 years. Cases can be further divided into requests for testing in specific laboratory sections. One case may consist of multiple requests for services throughout the lab or within a section (a single handgun may have requests for testing for the presence of latent prints, for DNA and for firearms analyses). Cases can contain anywhere from one to more than one hundred items of evidence. Section specific workloads will be discussed below.



Cost disclosure: Only published on-line so \$0 for printing costs and \$0 for distribution.



The State Medical Examiner’s Office

In 2018 the Montana Medical Examiner’s Office employed three forensic pathologists and two autopsy assistants. In late-2018 a new morgue facility in Billings was built, and operations started in January 2019. This new facility will improve the efficiency and overall capabilities of the death investigation system. In addition, Dr. Andrea Orvik joined the Billings lab as the state’s fourth pathologist.



The Medical Examiner’s Office has focused on improving information and statistics regarding its casework in recent years. The Office releases an annual report, which summarizes the annual case results based on manner of death, age of the decedent, deaths involving firearms, deaths attributable to alcohol or drugs, natural deaths, and report turn-around time performance. **The full report can be found on the Montana Department of Justice website under the Forensic Science Division tab.**

In 2018, a total of 612 postmortem examinations were performed (Missoula 338, Billings 274). This was a 6.4% increase over 2017. Our pathologists responded to a limited number of scene investigations and recoveries. We provided court testimony and made educational presentations at the annual Montana Coroner Advanced and Basic Coroner trainings. Informational meetings took place with coroners, law enforcement, county attorneys, organ and tissue procurement agencies, and funeral directors.

Staff

Dr. Robert Kurtzman	Chief Medical Examiner, Billings
Dr. Andrea Orvik*	Deputy Chief Medical Examiner, Billings
Dr. Sunil Prashar	Deputy Chief Medical Examiner, Missoula
Dr. Aldo Fusaro	Deputy Chief Medical Examiner, Missoula
Heather Krell	Autopsy Assistant, Missoula
Heather Beeler	Autopsy Assistant, Billings

*Started in March 2019

Successes

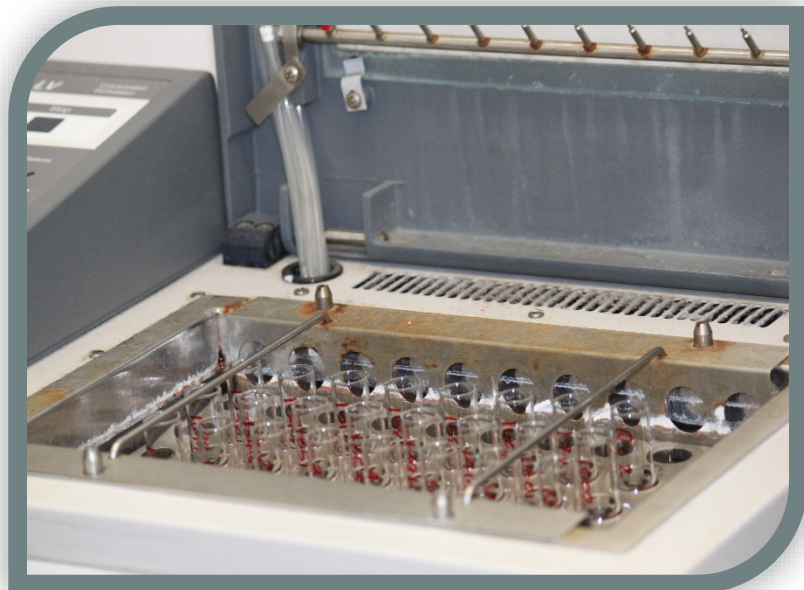
1. Completion of the Eastern Montana Regional Medical Examiner’s Office which is critical and essential to maintain medical examiner services in Eastern Montana.
2. Provided consistent ME coverage statewide with limited staff.
3. Worked in partnership with HHS for a grant that will provide a statewide death investigation database. This new system should begin in mid-2019.

Challenges

1. Working to finalize standard operating procedures which will be needed for eventual national accreditation.

The Toxicology Section

The Toxicology section provides the drug and alcohol testing in Driving Under the Influence cases (DUI or DUID), postmortem cases (assisting the medical examiner/coroner system in the determination of cause/manner of death), urinalysis testing (Department of Corrections probation/parole system and Drug Endangered Children cases), and sexual assault cases. The section also oversees the breath alcohol program. This includes maintaining and certifying the breath-testing instruments used to detect the presence of alcohol in DUI cases. We also provide over 300 hours of training per year to law enforcement, judges, prosecutors, and defense attorneys.



This report contains graphs and figures used to track our results by the many agencies we partner with throughout the state. This is not an exhaustive list of drugs detected and confirmed by this laboratory; simply the most frequently found drugs. The cases in this report are sorted into groups as they were submitted to us, not necessarily as the final cause/manner of death as concluded by the medical examiner or coroner. In addition, a drug found in a postmortem case does not necessarily mean it contributed to the cause/manner of death.

Staff

Beth Smalley, Toxicology Supervisor	April Mitchell, Forensic Toxicologist
Scott Schlueter, Forensic Toxicologist Diplomate-ABFT-FT	Gavin Lawson, Forensic Toxicologist
Michelle Duffus, Forensic Toxicologist	Ben Vetter, Breath Alcohol Manager
Eric Miller, Forensic Toxicologist Diplomate-ABFT-FT	Justin Lyndes, Breath Alcohol Toxicologist
Crystal Everett, Forensic Toxicologist	Elizabeth Holom, Toxicology Technician
Doug Lancon, Forensic Toxicologist	

Successes

1. Continue to develop and validate new analytical methods onto newly leased Liquid Chromatography/Mass Spectrometry/Mass Spectrometry (LC/MS/MS) instruments. This is a time consuming but vital process in updating the sections ability to detect and quantitate drugs in all types of cases.
2. Turn-around times are equivalent to national averages even with substantially fewer personnel resources.

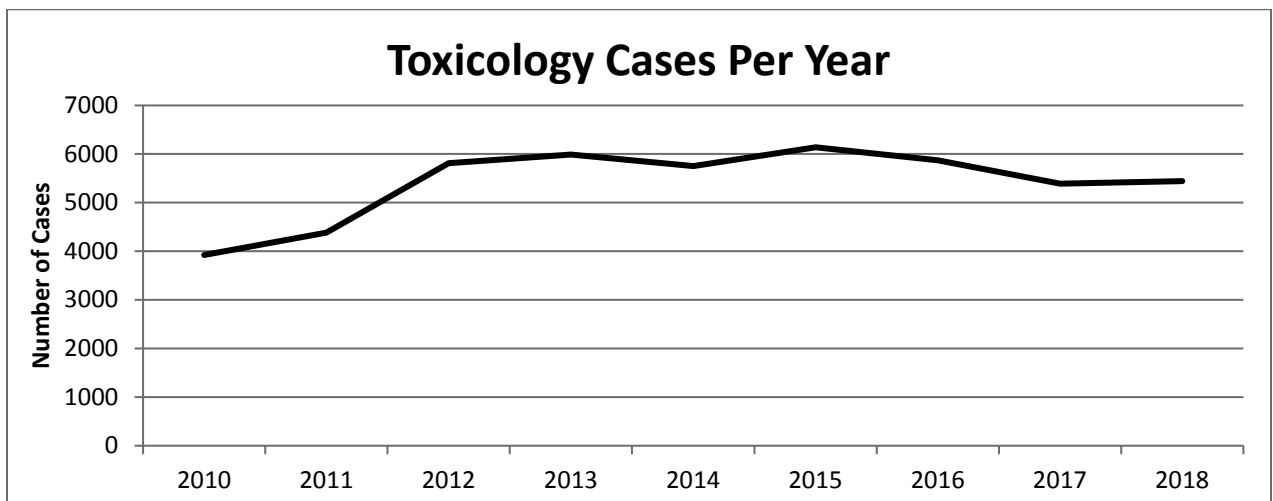
3. Two analysts completed their training programs in the last year bringing the number of trainees down to one.
4. Resources were obtained begin replacing the breath alcohol instruments that have been in use since 2007. The plan is that the new models will be deployed by the end of 2019.

Challenges

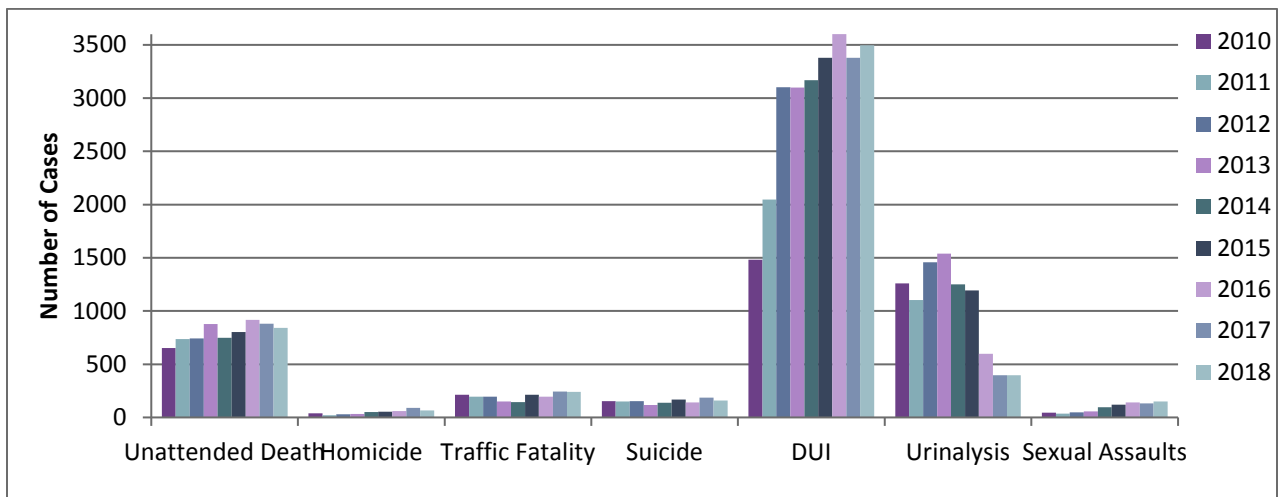
1. Cases continue to become more complex with more poly drug cases and the release of synthetic drugs, creating more time and resources spent per case.
2. Balancing the time needed to perform casework in a timely manner with the need to develop and validate new analytical methods.
3. Space for new instrumentation and staff.

Total Testing Per Year

2010-2018 Total Toxicology Cases



2010-2018 Toxicology Results per Case Type



2018 Performance Summary

The chart below contains the median turn-around time and average number of cases per toxicologist for both Montana and national averages.

Type of Case	Median 2016	Median 2017	Median 2018	*Median National Average	2018 Cases per Montana Toxicologist	*Cases per National Average Toxicologist
Postmortem	43	32	30	38	402	118
DUI Drugs	53	43	40	44	504	176
DUI Ethanol	22	15	15	14	1345	883
Urinalysis	47	30	27	---	790	---

*Numbers are based on “**Project FORESIGHT Annual Report, 2015-2016**”, from the Forensic Science Initiative, College of Business & Economics, West Virginia University

Another standard metric within forensics is determining the percentage of cases done within a given timeframe. The current goal at this laboratory is to complete 95% of the postmortem cases within 75 days, DUI drug cases within 75 days, DUI ethanol-only cases within 30 days, and urinalysis cases within 60 days. This demonstrates that most of the cases are completed within a timeframe that fulfills the Division’s mission.

Type of Case	95% of cases completed in this timeframe		
	2016	2017	2018
Postmortem	77 Days	68 Days	68 Days
DUI Drugs	75 Days	90 Days	75 Days
DUI Ethanol	35 Days	25 Days	27 Days
Urinalysis	119 Days	59 Days	57 Days

Drugs of Interest

Methamphetamine: A central nervous system stimulant that has been very prevalent in Montana over the last few years. In 2018, Methamphetamine intoxication was listed by the medical examiner as the cause of death in nine cases and 15 mixed drug intoxications. It was also found in 9% of all drug driving under the influence cases.

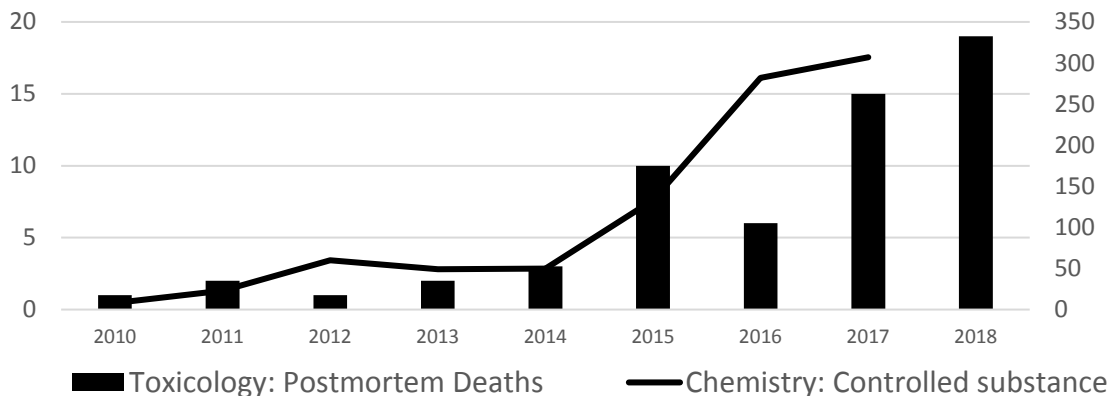
Case Type	2018 Cases	2017 Cases	2016 Cases	2015 Cases
Postmortem Deaths (Blood results only)	93 cases Mean: 1.5 mg/L Range: 0.2-54 mg/L	77 cases Mean: 0.9 mg/L Range: 0.2-12 mg/L	78 cases Mean: 1.0 mg/L Range: 0.2-11 mg/L	89 cases Mean: 2.1 mg/L Range: 0.2-38 mg/L

DUID	319 cases Mean: 0.35 mg/L Range: 0.2-3.3 mg/L	310 cases Mean: 0.33 mg/L Range: 0.2-2.2 mg/L	301 cases Mean: 0.34 mg/L Range: 0.02-1.8 mg/L	294 cases Mean: 0.36 mg/L Range: 0.02-2.6 mg/L
Probation/Parole Urinalysis	232 cases (51% of all positive cases)	239 cases (60% of all positive cases)	307 cases (51% of all positive cases)	566 cases (47% of all positive cases)

Heroin: Nationally heroin use has skyrocketed since 2010. Montana did not see this increase until 2015. The table below tracks the toxicology results over the last few years.

Case Type	2018	2017	2016	2015	2014	2013
Postmortem Deaths	19	15	6	10	3	2
Probation/Parole Urinalysis	5	8	3	4	2	3

The following graph compares heroin overdose deaths in Montana (left axis and bar graph) versus the number of cases that the Chemistry section identified it in seized drug cases (right axis and line graph). This shows that increased availability of heroin directly leads to increased overdose deaths.



Fentanyl: Considered a synthetic opiate narcotic analgesic. Historically this has been prescribed to cancer patients or others in extreme pain. Nationally there has been a large increase in overdose deaths since 2016. This is a combination of it being substituted for heroin and that it is 40-50 times more potent.

2016- 29 and 2017-15

Case Type	2018 Cases	2017 Cases	2016 Cases
Postmortem Deaths (Blood results only)	11 Mean 13 ng/mL Range: 0.83-29 ng/mL	10 Mean 6.2 ng/mL Range: 0.6-16 ng/mL	19 Mean 14 ng/mL Range: 2-39 ng/mL
DUID	1	2	2
Probation/Parole Urinalysis	1	0	1

Designer Opiates: Nationally there has been a huge increase in synthetic opiate deaths since 2013. Montana had multiple carfentanil, furanyl-fentanyl, and U-47700 deaths in 2016 and 2017. In 2018, there were no confirmed deaths attributed to this subset.

Mitragynine (Kratom): This is an alkaloid herbal drug that is extracted from the leaves of plants commonly found in southeast Asia. It is marketed as a dietary supplement due to its stimulant effects (when used in low doses) but it can have significant sedative and euphoric effects (when used in higher doses). In 2016, the DEA decided against scheduling this compound while obtaining more data on its potential medical uses. It is currently legal and can be easily purchased in Montana.

Case Type	2018 Cases	2017 Cases	2016 Cases
Postmortem Deaths (Blood results only)	4 Mean 737 ng/mL Range: 490-960 ng/mL	7	4
DUID	6	2	2
Urinalysis	1	0	1

Buprenorphine: Synthetic opiate used for pain management and the treatment of opiate addiction. Was not listed as part of the cause of death in any autopsied case in 2018.

Case Type	2018 Cases	2017 Cases	2016 Cases
Postmortem Deaths (Blood results only)	4 Mean 4.5 ng/mL Range: 1-7.9 ng/mL	5 Mean 2.6 ng/mL Range: 1-5 ng/mL	5 Mean 4.5 ng/mL Range: 1-11 ng/mL
DUID	3	6	16
Probation/Parole Urinalysis	5	10	7

Designer Benzodiazepines: Designer benzodiazepines are central nervous system depressants that are not approved for use in the United States (can be purchased over the internet). In general, these compounds can produce euphoria, drowsiness, sedation, depression, and slurred speech when used at higher concentrations.

Case Type	2018 Cases	2017 Cases	2016 Cases
Postmortem Deaths (Blood results only)	Diclozepam 1 case	Etizolam 1 case	
DUID	Diclozepam 1 case Etizolam 2 cases	Etizolam 7 cases	Etizolam 2 cases

Cocaine: A central nervous stimulant which has historically not been used at high levels in Montana but is increasing in prevalence.

Case Type	2018 Cases	2017 Cases	2016 Cases	2015 Cases
Postmortem Deaths	6 (3 traffic fatality)	6 (1 traffic fatality)	6 (1 traffic fatality)	1 (0 traffic fatality)
DUID	9	19	14	3

Tetrahydrocannabinol/THC (Marijuana)- There was a dramatic increase in THC positive cases in 2018. This was based on a combination of a full year using a new method with a lower detection limit (1ng/mL as opposed to 3 ng/mL) and presumably an increase in marijuana availability/use. Overall there was a 59% increase in THC positive DUI cases compared to 2017. 13% of all DUI and traffic fatalities had active THC present in their system. There was also a 73% increase in marijuana found in postmortem cases.

Case Type	2018 Cases	2017 Cases	2016 Cases												
Postmortem Deaths (Blood results only)	85 cases Mean: 8.7 ng/mL Range: 1-170 ng/mL	49 cases Mean: 10 ng/mL Range: 1-97 ng/mL	36 cases Mean: 11 ng/mL Range: 3*-35 ng/mL												
DUID	454 cases Mean: 8.6 ng/mL Range: 1-160 ng/mL <table border="1"> <thead> <tr> <th>Concentration</th> <th>% of Cases</th> </tr> </thead> <tbody> <tr> <td>1-2.99 ng/mL</td> <td>29%</td> </tr> <tr> <td>3-4.99 ng/mL</td> <td>16%</td> </tr> <tr> <td>5-9.9 ng/mL</td> <td>27%</td> </tr> <tr> <td>10-19.9 ng/mL</td> <td>18%</td> </tr> <tr> <td>>20 ng/mL</td> <td>10%</td> </tr> </tbody> </table>	Concentration	% of Cases	1-2.99 ng/mL	29%	3-4.99 ng/mL	16%	5-9.9 ng/mL	27%	10-19.9 ng/mL	18%	>20 ng/mL	10%	284 cases Mean: 7.8 ng/mL Range: 1-47 ng/mL	297 cases Mean: 10 ng/mL Range: 3*-82 ng/mL *LOD on old method
Concentration	% of Cases														
1-2.99 ng/mL	29%														
3-4.99 ng/mL	16%														
5-9.9 ng/mL	27%														
10-19.9 ng/mL	18%														
>20 ng/mL	10%														
Probation/Parole Urinalysis	111 cases (25% of all positive cases)	112 cases (28% of all positive cases)	137 cases (23% of all positive cases)												

Synthetic Marijuana- There has been a decrease in the number of cases tested for these various compounds over the last 3 years. In 2018, nine cases were tested and three were positive for ADB-Fubinaca (Mean 8.2 ng/mL and range of 1.9-15 ng/mL).

Inhalants: 1,1-Diflouroethane is a compound found in "canned air" and regularly used for huffing.

Case Type	2018 Cases	2017 Cases	2016 Cases	2015 Cases
Postmortem Deaths	4 (2 traffic fatality)	10 (4 traffic fatality)	8 (0 traffic fatality)	2 (0 traffic fatality)
DUID	12	20	14	12

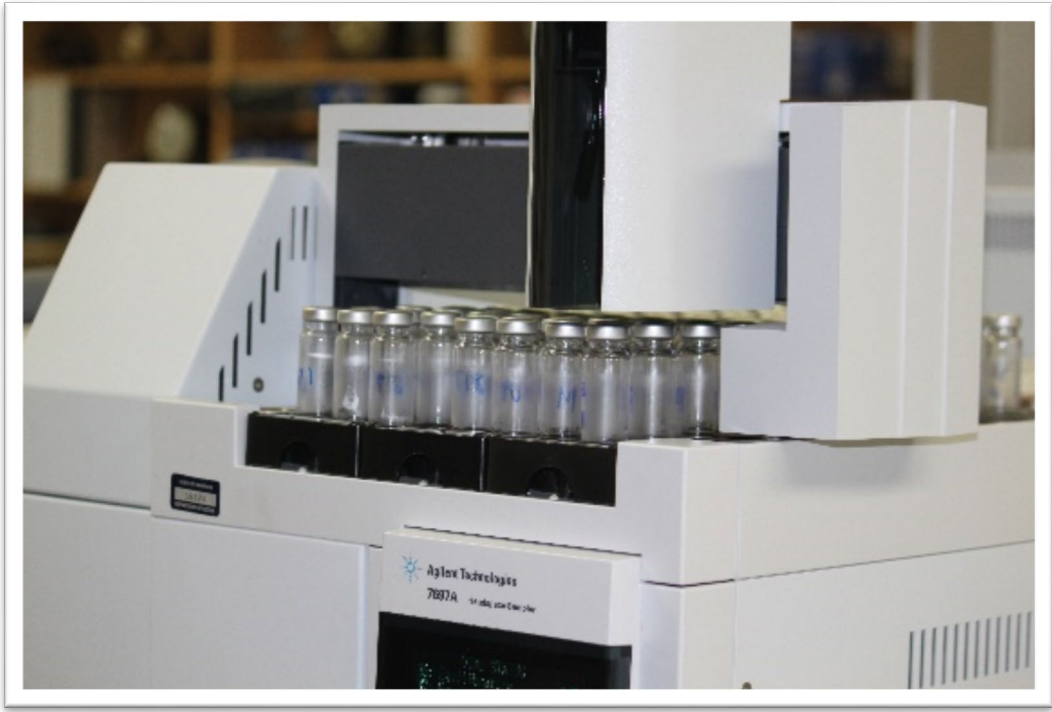
Gabapentin: Gabapentin has been prescribed as an alternative or in conjunction with opiates for a few years now. We have found it in an increasing number of postmortem deaths over the last few years. Many have been mixed drug intoxications combined with various opiates.

Case Type	2018 Cases	2017 Cases	2016 Cases	2015 Cases
Postmortem Deaths	38	42	17	16
DUID	3	3	2	1

Driving Under the Influence (Alcohol and/or Drugs) Summary

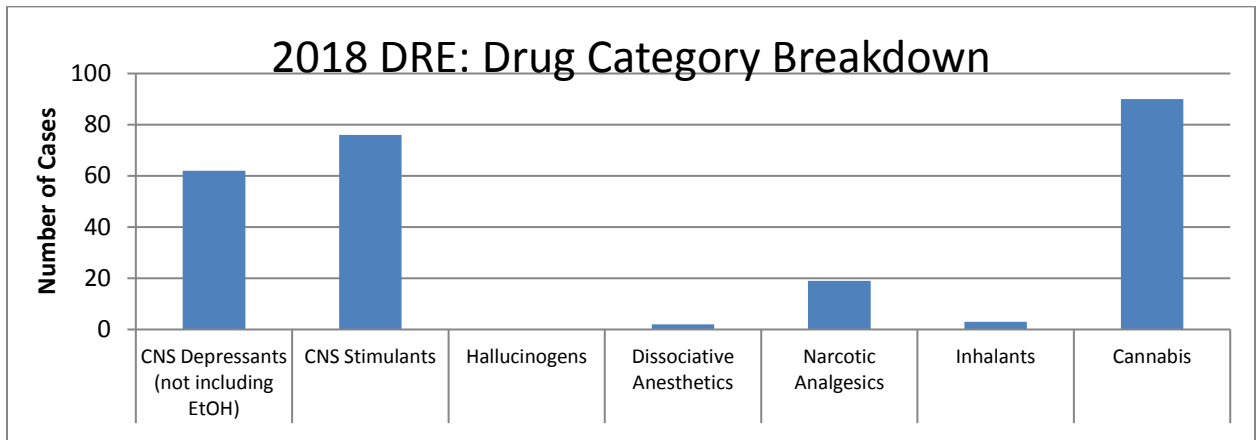
In 2013, a laboratory policy was instituted where drugs were only tested in DUI cases *if* requested and the blood alcohol was less than 0.1 g/100mL. Case reports are then released with a note stating that no drug testing was performed. Contact information is provided if a client requests drug testing to be performed on that case. This policy was necessary to manage the increased workloads and to reduce delays in the completion of reports for the majority of DUI cases. Any case involving a drug recognition expert (DRE) or a fatal crash is exempt from this policy.

Alcohol and Drug Prevalence in Driver Blood Samples (includes fatal crashes)	
Blood Samples Submitted	3701
Blood Samples Positive for Alcohol	75%
Blood Samples Positive for Drug(s) other than Alcohol	26%
Alcohol Detected Only	67%
Alcohol + Drug(s)*	8%
Drug(s) Detected Only*	18%
No Drug(s) or Alcohol Detected	6%
BAC Greater than 0.100%	67%
BAC 0.020% - 0.100%	9%
Average BAC	0.184, Range: 0.020 – 0.485
Most detected Drugs* 1. THC – 13% of all samples (Avg = 9.2 ng/mL, Range: 1.0–160ng/mL) 2. Methamphetamine – 9% of all samples (Avg = 0.366 mg/L, Range: 0.02-3.3mg/L) 3. Alprazolam (Xanax) – 1% of all samples (Avg = 0.074 mg/L, Range: 0.022-0.23 mg/L) 4. Diazepam (Valium) – 1% of all samples (Avg = 0.232 mg/L, Range: 0.022-0.72 mg/L) 5. Zolpidem (Ambien) – 1% of all samples (Avg = 0.331 mg/L, Range: 0.025-1.5 mg/L) 6. Morphine – 1% of all samples (Avg = 0.050 mg/L, Range: 0.02-0.1 mg/L) 7. Clonazepam (Klonopin) – 1% of all samples (Avg = 0.050 mg/L, Range: 0.021-0.15 mg/L) 8. Hydrocodone – 1% of all samples (Avg = 0.055 mg/L, Range: 0.02-0.19 mg/L) 9. Benzoylcegonine (Cocaine Metabolite) – 1% of all samples (Avg = 0.421mg/L, Range: 0.023-2.3mg/L) 10. Lorazepam (Ativan) – 1% of all samples (Avg = 40.9 ng/mL, Range: 4.0–119ng/mL)	



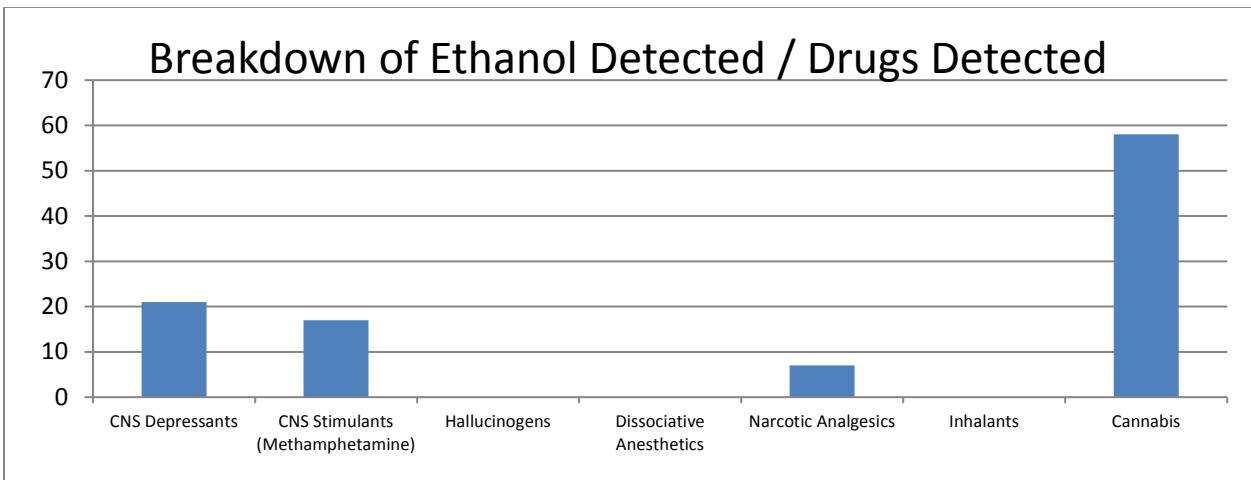
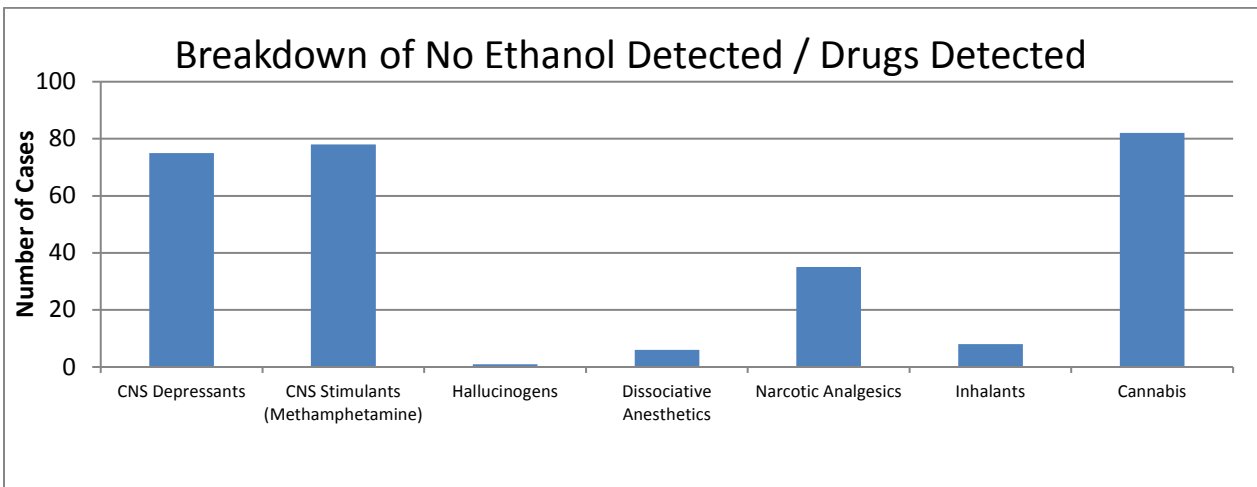
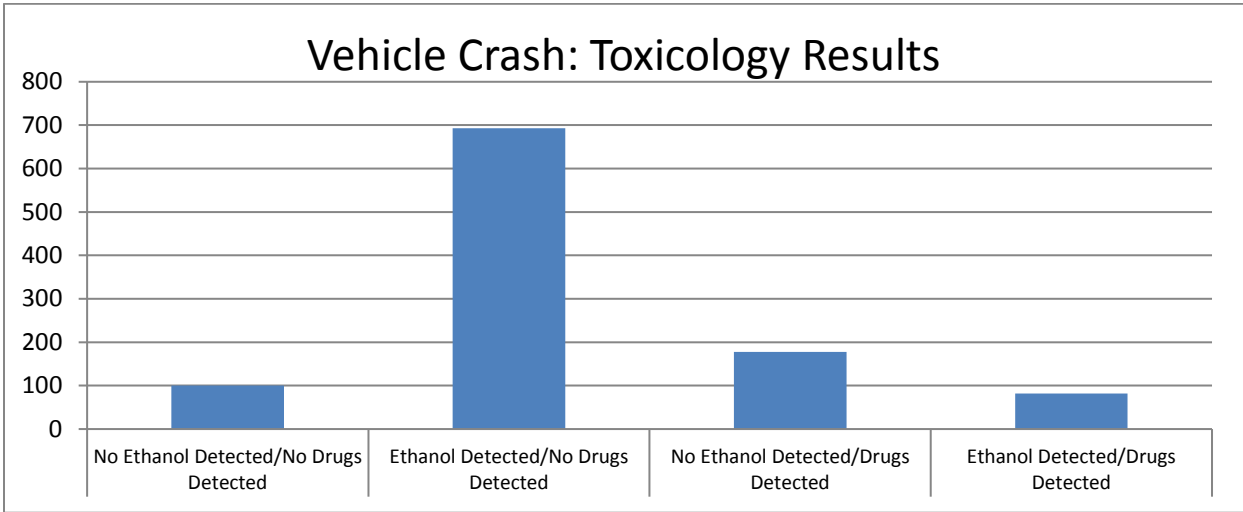
DRE (Drug Recognition Expert) Summary

Drug testing is performed on all DRE submitted cases. In 2018, there were 197 DRE cases submitted. Some cases may be positive for multiple drugs.



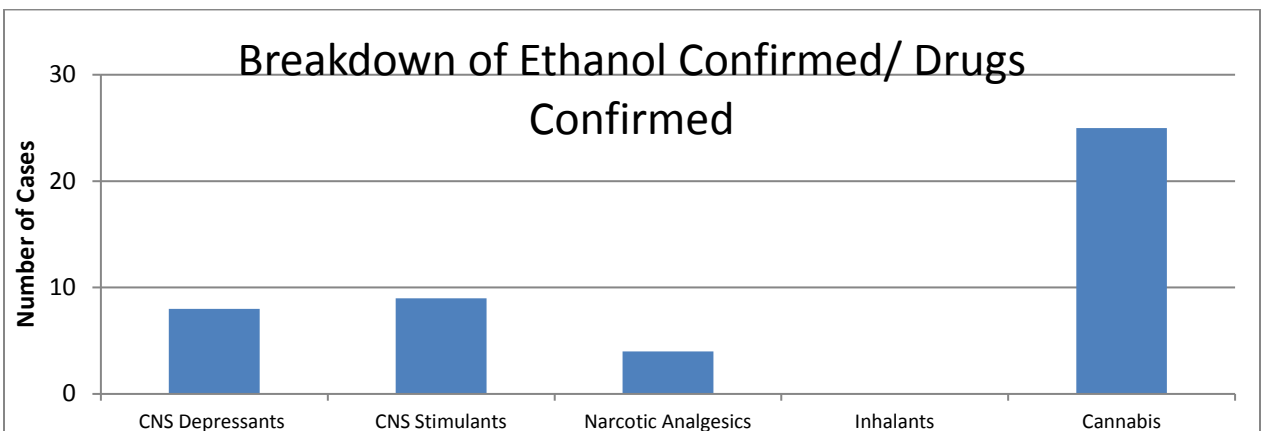
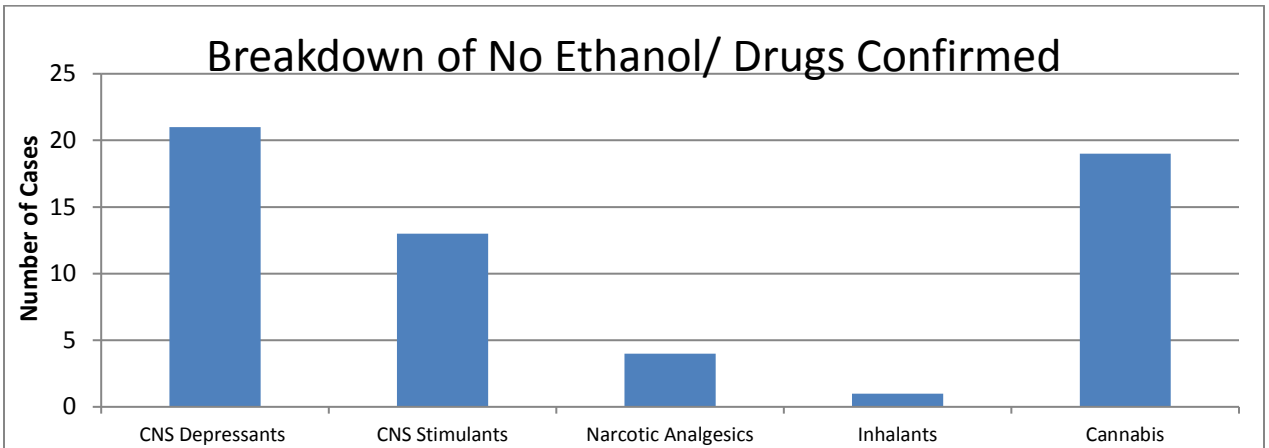
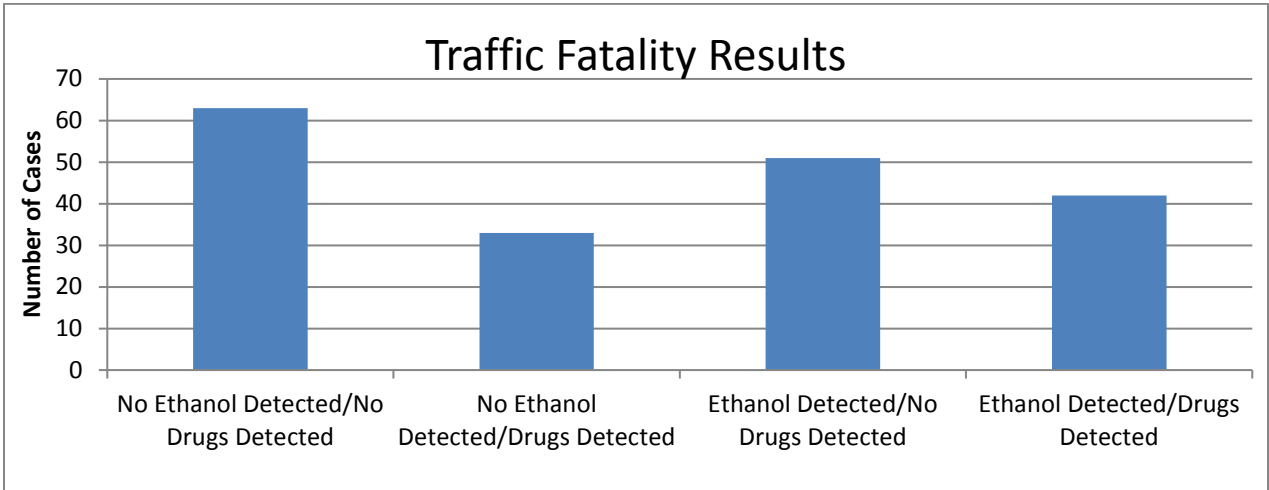
Crash/DUI Summary

The laboratory received 1054 crash cases (5% increase from 2017). The mean ethanol concentration was 0.186 g/100mL. The mean THC concentration was 6 ng/mL. Some cases may be positive for multiple drugs. Ethanol is not included in CNS Depressant drug group below.



TRAFFIC FATALITIES SUMMARY

The laboratory received 191 traffic fatality cases and performed toxicology testing on 189 cases. There is no distinction between a driver and a passenger in the following data. The mean ethanol concentration was 0.18 g/100mL in cases when it was detected. When it was detected, the mean THC concentration was 15.6 ng/mL. Some cases may be positive for multiple drugs. Ethanol is not included in CNS Depressant drug group below.



POSTMORTEM TOXICOLOGY SUMMARY

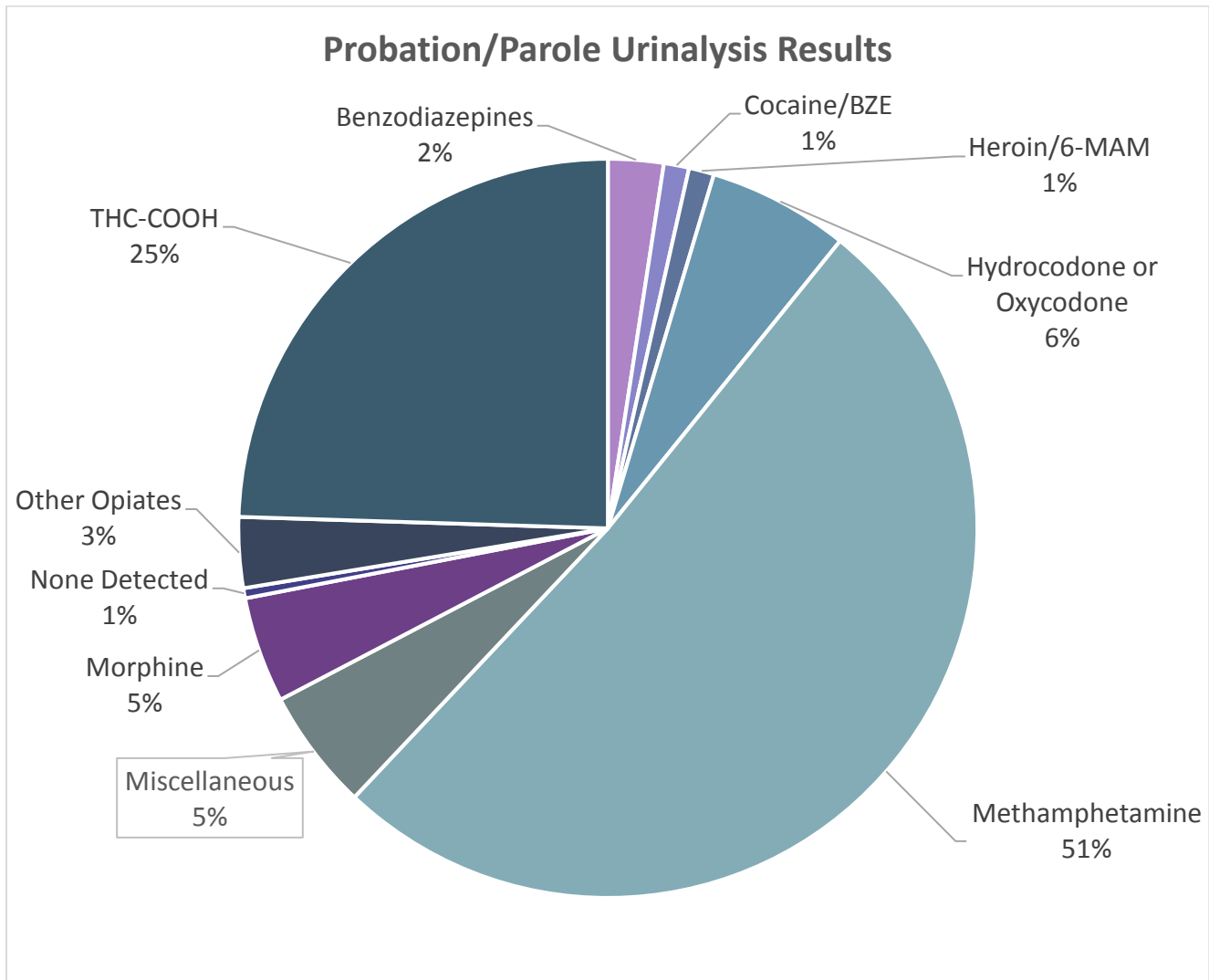
A routine postmortem toxicology testing panel consists of the analysis of volatile compounds (ethanol, methanol, acetone, and isopropanol), illicit drugs, and prescription medications. Case history and requests from the submitting agency decides the final testing panel of each case. All positive drug results have been screened and confirmed by different scientific methods. All significant drug results were quantitated unless directed otherwise.

Medical Examiners performed 612 autopsies in death investigation cases. The toxicology section would have performed testing on most of those cases. It was determined that 126 of those cases had toxicology results of significance. Below is a breakdown of the identified substances and corresponding drug results. The data below does not include deaths where the coroner did not have an autopsy performed.

Toxicology Related Case Breakdown by Cause of Death (Autopsied cases only)		
Cause of Death	# of cases	Comments
Acute Ethanol Intoxication	2	Mean Ethanol: 0.49 g/dL
Complications of chronic ethanol use	23	----
Acute, Single Drug Intoxication		
1. Methamphetamine	9	Mean: 8.9 mg/L / Range: 0.15-54 mg/L
2. Heroin	9	Determined by 6-monoacetylmorphine confirmation
3. Fentanyl	2	19.2 ng/mL and 14.5 ng/mL
4. Oxycodone	1	10.4 mg/L
5. Methadone	1	0.56 mg/L
6. Mitragynine	2	670 ng/mL and 830 ng/mL
7. Metoprolol	1	36 mg/L and ethanol at 0.10 g/dL
8. Lamotrigine	1	37 mg/L
9. Metaxalone	1	31 mg/L
Acute, Poly-Drug Combinations	55	<i>Some cases may fall into multiple categories</i> Methamphetamine found in 18 cases (mean: 1.02 mg/L) Heroin use found in 12 cases Methamphetamine and Heroin combo in 7 cases Fentanyl found in 7 cases (mean: 12.2 ng/mL) Oxycodone found in 6 cases (mean: 0.31 mg/L) Hydrocodone found in 6 cases (mean: 0.17 mg/L) Methadone found in 4 cases (mean: 0.34 mg/L) Mitragynine found in 2 cases (mean: 725 ng/mL) Tramadol found in 8 cases (mean: 3.7 mg/L) Miscellaneous CNS depressants found in 11 cases
Drug and Weather Combinations	4	1. Cold water immersion in association with cocaine and alcohol use 2. Drowning associated with acute mixed drug (chlorpheniramine, dextromethorphan, ethanol) intoxication 3. Hypothermia associated with acute ethanol and marijuana intoxication 4. Hypothermia associated with acute ethanol intoxication
Carbon Monoxide Poisoning	12	10 cases greater than 50% carboxyhemoglobin
Inhalant Intoxication	2	1 case with 1,1-Difluoroethane 1 case with 1,1-Difluoroethane and butane
Ethylene glycol intoxication	1	59 mg/dL

PROBATION/PAROLE URINALYSIS SUMMARY

Our policy is to confirm drugs the submitting agency requested on the submission form based on their screening results. Due to policy changes within the Department of Corrections there have been a decreasing number of submissions to the laboratory over the last five years. Last year there were 397 cases submitted. The chart below outlines the drugs detected and the % found of each. Methamphetamine continues to be the drug detected most often in this subset of cases (found in 51% of all cases).





BREATH ALCOHOL SUMMARY: The Breath Alcohol section was created in the late 1980's by Phil Lively, who implemented the state-wide use of the Intoxilyzer infrared breath analysis instrument. The section now oversees nearly 100 instruments in the field and has almost 2000 certified officers throughout the state. In a typical year those officers run approximately 20,000 breath tests. This number includes DUI and all other forms of use within the state. More accurate state and local testing statistics aren't available with the current instrumentation and software but could be attained by acquiring a newer version of the instrument and its accompanying software.

The section has three main duties that are performed on a regular basis. The first duty includes the maintenance, repair, and calibration of all breath analysis instruments. These instruments are supplied to law enforcement agencies around the state comprising of local, county, state, and federal locations. Montana Administrative Rules require all instruments to be returned to the laboratory at least once a year for this process. The annual certification returns the instruments to above factory standards using the most modern forensic techniques available.

The second duty of the Breath Alcohol section involves the training and recertification of all law enforcement officers. As part of their Montana Law Enforcement Academy, all officers are required to pass a comprehensive 40-hour course in DUI detection, arrest and processing. Officers are from all types of law enforcement agencies, including local, county, state and federal. This course includes basic alcohol pharmacodynamics and pharmacokinetics, breath analysis instrument infrared theory and operation; in combination with Standardized Field Sobriety Testing (SFST). All students are exposed to live alcohol dosed individuals for 'real world' hands-on training and must pass a written and practical test. This course typically has nearly 50 students and is run at least 5 times a year. After achieving this level of certification, all officers are also required to perform a recertification each year in order to maintain their DUI certification status.

The final duty involves the education of breath alcohol testing to various groups throughout the state. The breath alcohol section is involved with training prosecutors, defense attorneys, and judges in this field. In addition, the section testifies in court, for both prosecution and defense, roughly 50 times per year in all jurisdictions (city, justice, district and federal courts) across Montana.

The Chemical Analysis Section

The Chemistry/Trace unit is responsible for the analysis of controlled substances, suspected clandestine laboratory evidence, gunshot residue (GSR), as well as other miscellaneous evidence. Forensic Chemists analyze samples seized in cases involving dangerous drugs and clandestine labs, including the identification of previously unseen analogues now flooding the recreational drug market. The advent of synthetic cannabinoids and other analogues has amplified case complexity. Submissions to this section have more than doubled since 2010.



Staff

Misty Icard Section Supervisor – Billings ABC Board Certified	Bahne Klietz Forensic Chemist – Missoula
Tanna Brown Forensic Chemist – Billings ABC Board Certified	Stacey Wilson Forensic Chemist - Missoula
Mark Winslow Forensic Chemist – Billings	Travis Doria Forensic Chemist - Missoula
OPEN FTE Forensic Chemist - Missoula	Alyssa Hoffman Forensic Chemist - Missoula

Successes

1. Overhauling technical policies to create a more efficient and streamlined testing system.
2. Validated a new THC method to confirm presence of THC from other cannabinoids.
3. Continue to identify new designer drugs (opiate or amine analogues) found at the scene of suspected drug overdose deaths that assist toxicology section and medical examiners.

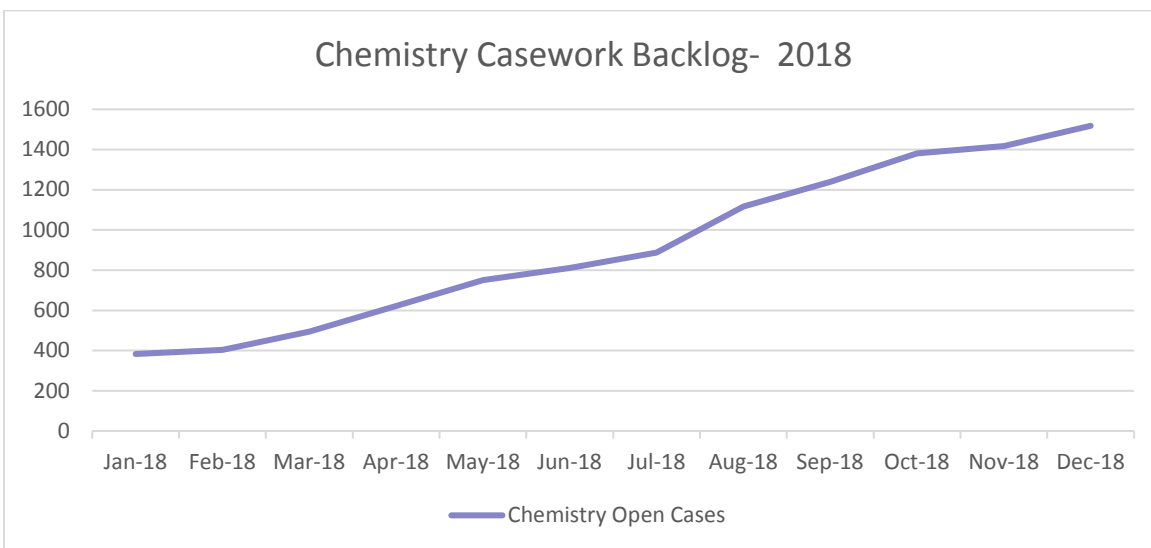
Challenges

1. Staffing issues throughout the year caused turn-around times to increase almost 3X and the number of backlogged cases to increase almost 4X.
2. Learning how to utilize functions in JTrax to make case work more efficient.
3. Continue to integrate operations between Billings and Missoula laboratory.
4. Hired and trained two new chemists who are currently performing casework. Final position will be filled by mid-2019.

Casework Summary

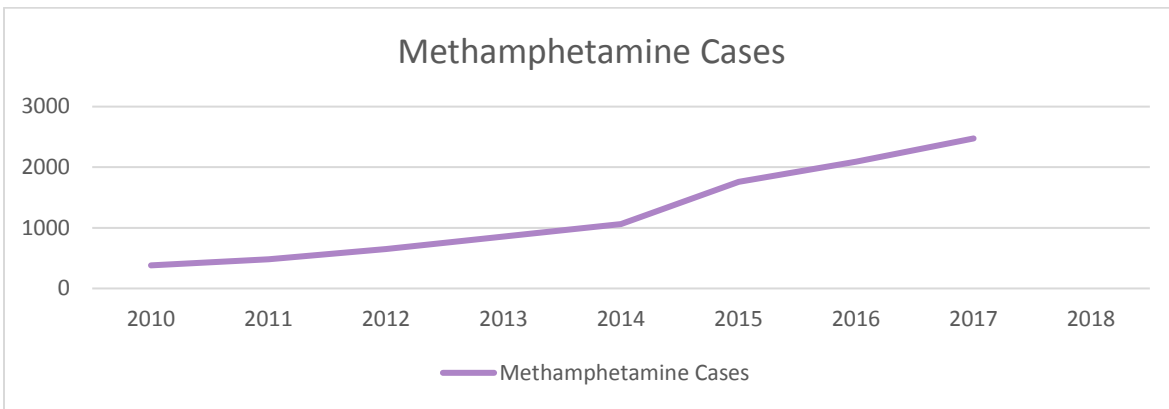
Due to various issues, this section was partially staffed (roughly 50% through part of year) with trained analysts for the majority of 2018. Because of these disruptions the number of cases analyzed decreased and their respective turn-around time increased since the end of 2017. Assuming no other staffing interruptions the backlog should be steadily reduced through 2019.

Year	Number of Cases Submitted Missoula/Billings	Samples Analyzed	Beginning Year Backlog (Days)	Turnaround Time for Year (Days)
2011	1375	1456	346	60
2012	1577	1754	320	104
2013	1348	2015	627	162
2014	1482	2013	1240	224
2015	2221	2248	1051	120
2016	2024/565	3360	560	67
2017	2047/911	3933	366	31
2018	1748/1082	2305	370	86



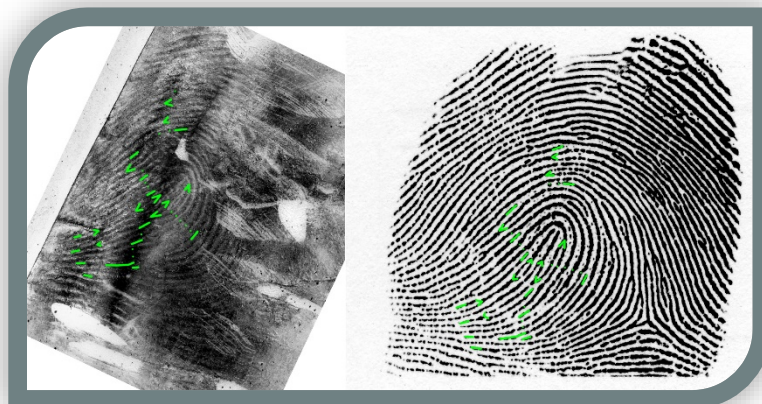
Case Statistics

Year	Meth	Heroin	Fentanyl	Hydrocodone	Oxycodone	Buprenorphine	Morphine	Synthetic Cannabinoids
2010	381	8	5	73	104	13	48	1
2011	480	23	6	84	117	19	49	14
2012	651	60	4	103	87	19	45	94
2013	858	49	5	75	72	14	27	27
2014	1061	50	9	44	56	16	16	27
2015	1758	133	4	37	65	21	26	16
2016	2093	282	9	33	80	19	26	11
2017	2475	307	20	52	56	44	22	13
2018	Report will be updated at later date once cases are all finalized							



The Latent Print/Impression Evidence Section

The Latent Print section analyzes evidence for the presence of latent fingerprints. They then compare them to known prints when possible. The lab participates in Automated Fingerprint Identification System (AFIS), a fingerprint database. Section examiners also analyze footwear impression evidence submitted by law enforcement agencies and compare them to known shoes.



Staff

<p>Kaitlin Delphy Technical Lead Forensic Scientist IAI Board Certified</p>	<p>Stephanie Shappee Forensic Scientist</p>
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Successes

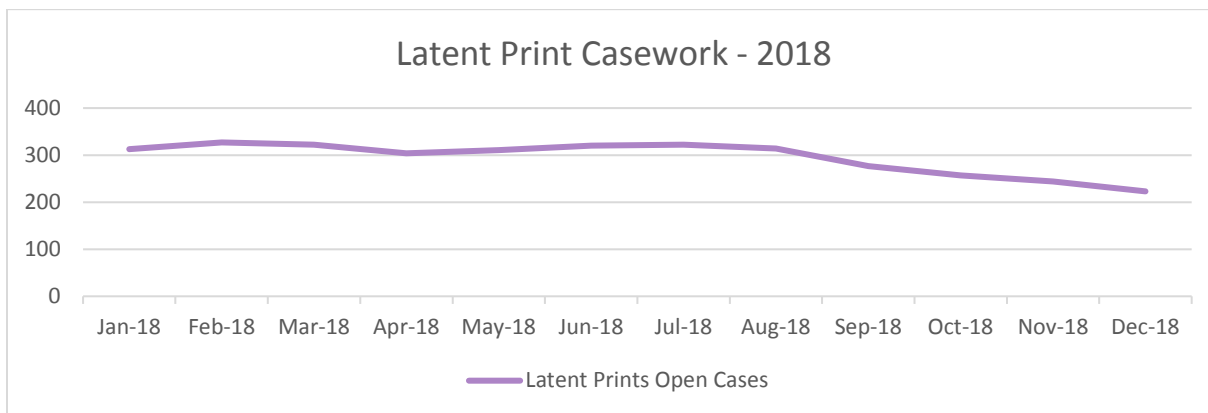
1. Due to the section being staffed with two trained analysts the section backlog has been reduced for the first time in 3 years.

Challenges

1. A risk of maintaining just two FTE in a section creates a vulnerability to analyst turn-over. It takes approximately 1-2 years to recruit and train a new scientist. There is a corresponding increase to the casework backlog when staffing issues happen.

Casework

Over the course of 2019 there was a 29% decrease in backlogged cases. Additional resources are being directed to this section to continue this reduction. There is a plan in place to eliminate this by the end of 2019 assuming there are no staffing changes. Casework will continue to be tracked to determine if this section is appropriately staffed.



The DNA/Serology Section

The DNA section provides quality, accurate, and timely analysis of evidence for the presence of biological fluids and further characterization of those samples using state of the art DNA technologies. In addition, we provide testimony at trial regarding the conclusions of analysis.

Joe Pasternak, DNA Supervisor and Technical Lead
Megan Ashton, CODIS Administrator
Jamie Bray, DNA Analyst
Kristy Harty-Connell, DNA Analyst
Jen Revis-Siegfried, Part-time DNA Analyst*
Lacey Van Grinsven, Serologist
Andrew Bishop, Serologist /CODIS
Rachel Fife, Serologist *
Kate Posner, DNA technician*
Phil Reiner, DNA technician*

*Position funded by federal grant



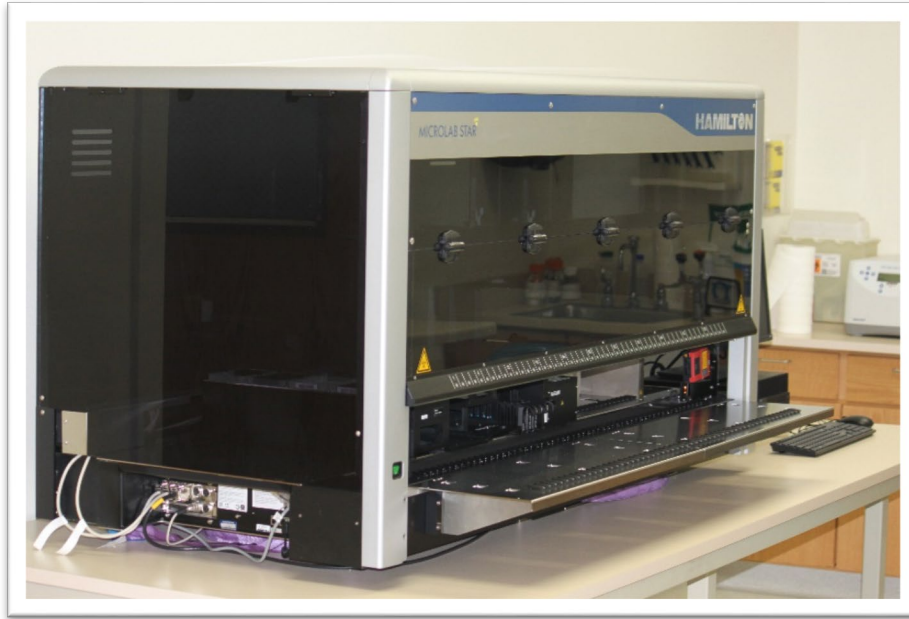
Successes

1. **The Biology section has continued to operate under the Biology Case Submission Guidelines set forth for law enforcement agency DNA lab submissions set forth in 2017.** These guidelines outline the recommended number of items to submit for first tier DNA analysis and are based on offense type and type of evidence. Case prioritization places crimes against persons first, along with identification of human remains, with property crimes to follow. As a result, the Biology section has been able to reduce the serology report turnaround times and increase DNA analysis throughput. This has cumulatively contributed to lowering the Biology section backlog. The original incorporation of the Biology submission guidelines was to keep with national trends for forensic biology submissions and to assist in backlog reduction. This has been found to be an effective tool for managing incoming casework submission and will continue indefinitely.
2. **In cooperation with the MT sexual assault nurse examiners, law enforcement, state's attorneys, and victim's advocates, the Biology section spearheaded the redesign of the Montana sexual assault collection kit (SAK).** The overhaul includes a reduction in redundancies, a lab-focused collection of specimens, more nurse friendly collection format, and updated collection report. This kit started production in fall of 2018 and is currently in use throughout the state.
3. **In order to meet the rising demands of increased sexual assault submissions, in December 2018, the laboratory hired two DNA technicians to conduct male-specific Y chromosome DNA screening of sexual assault kits (SAKs).** Once validation of the method has completed, the new method will replace the former, time-consuming method of SAK testing. This transition aims to decrease SAK analysis turn-around times

while not sacrificing the quality of the analysis. In addition, the male screening process uses state-of-the-art automation to help reduce manual manipulations and worker fatigue. The Biology section plans to have this method online in early summer 2019.

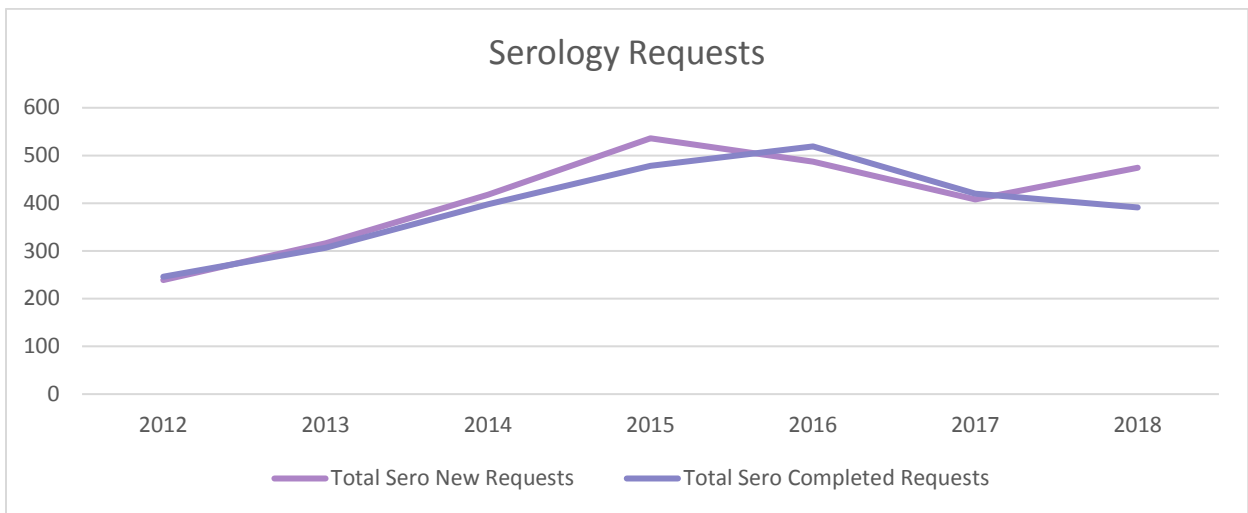
Challenges

1. **Backlogged cases due to the continual increase in DNA case submissions.** The DNA analysis backlog, although lessening for person crimes such as homicides and sexual assaults, continues for those non-violent crimes such as burglaries and thefts. During 2018, the focus of backlog reduction efforts was concentrated primarily on crimes against people to reduce those cases that were most demanding. During the first half of 2019, the laboratory plans to increase DNA analysis of property crimes in order to lessen the turn-around times to that of people crimes.
2. **Increasing need for a full time CODIS convicted offender DNA processing technician.** As the number of cases submitted for DNA analysis increases, as does the amount of work placed upon the CODIS Administrator. The CODIS Administrator is responsible for administering the CODIS program within the biology section, updating analyst CODIS training, dispositioning CODIS hits, authoring investigative lead “hit” letters, database management, and overseeing the processing of convicted offender DNA samples sent to the lab from throughout the state. Currently, a cross-trained serology analyst assists with processing the offender samples in the laboratory, however, this lowers the analyst’s contribution to casework backlog reduction. This balance of work has been effective throughout 2018; however, will not be sustainable as case submissions continue to rise. The laboratory is investigating options to address the need for a full time CODIS technician to alleviate this pending issue.
3. **Increased complexity of DNA results has increased the time required to perform calculations on DNA mixtures.** With a greater number of chromosomal locations and an increased sensitivity, mixed DNA samples often experienced in sexual assault cases and homicides have become increasingly difficult to interpret requiring longer analyst time spent performing calculations. The laboratory plans to use grant funds to purchase and implement probabilistic genotyping software to increase the amount of usable data and perform mixture analysis of these complicated DNA profiles. Implementation will consist of validation, training of staff, staff competency prior to use on casework samples. Start of this upgrade is estimated to be late 2019/early 2020.
4. **Limited space for laboratory analysis and administrative work.** With the addition of two more staff, the biology section is at maximum capacity within the walls of its laboratory work space and administrative area. We are exploring creative solutions for re-organizing these areas to better facilitate our changing processes and new staff size.

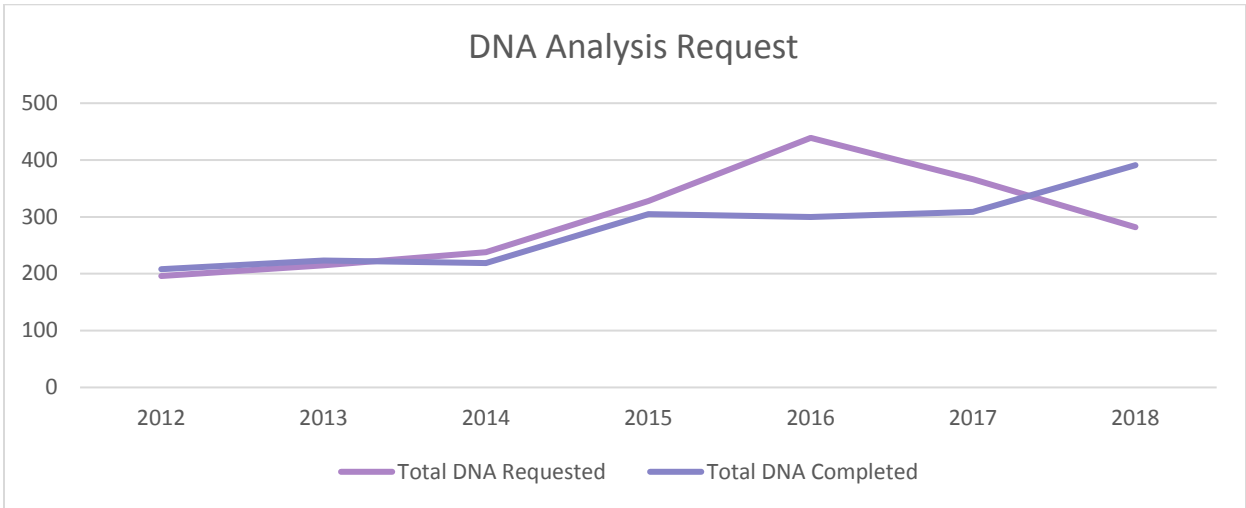


Annual Casework Totals per analysis type

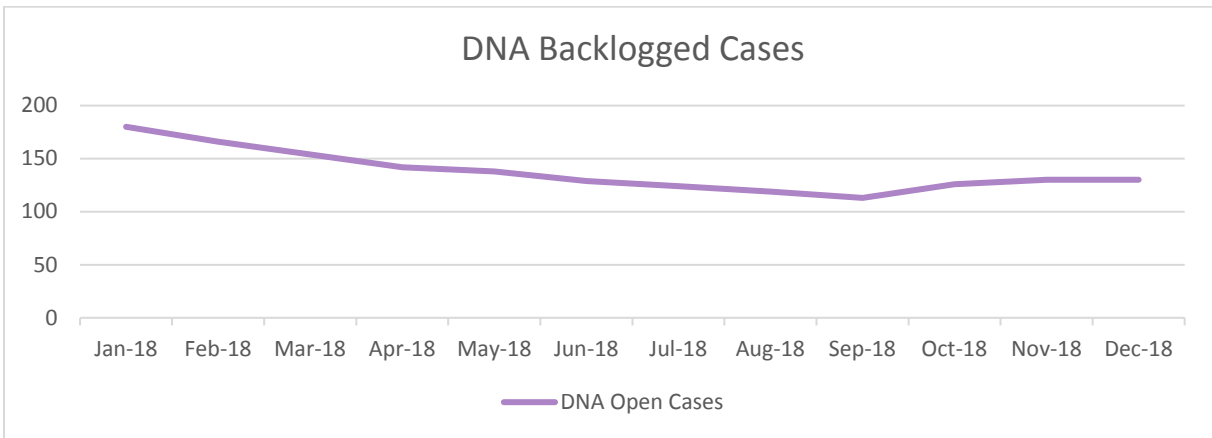
Year	2012	2013	2014	2015	2016	2017	2018
Serology: New Requests	239	316	418	536	487	408	474
Serology: New Requests	98% increase in new requests from 2012 through 2018						
Serology: Completed Requests	246	307	398	478	519	420	391
Serology: Completed Requests	59% increase in completed requests from 2012 through 2018						



Year	2012	2013	2014	2015	2016	2017	2018
Total DNA Requested	196	215	238	328	439	366	282
Total DNA Requested	44% increase in total requests from 2012 through 2018						
Total DNA Completed	208	223	219	305	300	309	391
Total DNA Completed	88% increase in completed requests from 2012 through 2018						



DNA Backlogged Cases



CODIS

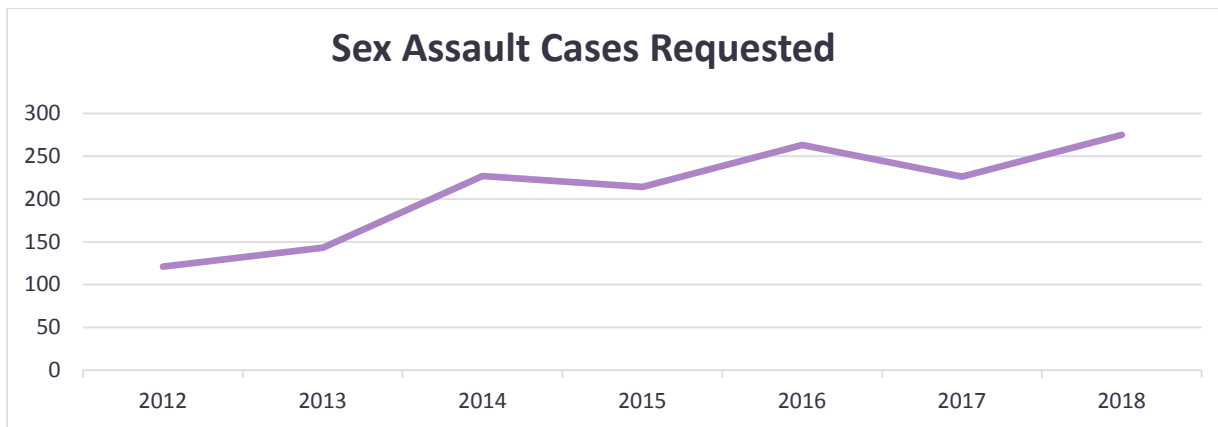
CODIS Totals for 2017 and 2018 – Casework and SAKI

	2017	2018
Casework Forensic Unknowns	105	124
SAKI Only Forensic Unknowns	n/a	129
Total Profiles Entered	105	253
	2017	2018
CODIS HITS	31	138

Sex Assault Cases

Analysis of sex assault cases is significantly more time-intensive than other offenses because those cases typically involve more complex DNA mixtures requiring advanced interpretation techniques. Sex assaults represent approximately 40% of annual casework. This chart reflects the doubling of sex assault cases submitted to the lab over the past five years:

<u>Year</u>	2012	2013	2014	2015	2016	2017	2018
Sex Assault Cases Requested	121	143	227	214	263	226	275



Sexual Assault Kit Initiative (SAKI)

Throughout 2018, the Biology section has been completing the laboratory’s portion of the State of Montana Sexual Assault Kit Initiative (SAKI) project. This project is separate from the present-day casework being conducted by the Biology staff in that the kits under this project were never submitted to the laboratory for analysis. From throughout the state, previously unsubmitted sexual assault kits were collected by the Division of Criminal Investigation totaling approximately 1200 and outsourced to a private laboratory for DNA analysis using grant funds. Those cases producing possibly informative results were forwarded to the MT-FSD for eligible profile entry into CODIS for searching.

Although the actual DNA analysis and technical review of these SAKI cases was performed by outside laboratories, the MT-FSD laboratory is still responsible for verifying CODIS eligibility of profiles, DNA profile entry into the CODIS database, reviewing and issuing reports regarding the CODIS entries, performing confirmation sample DNA analysis for CODIS hits, reviewing and issuing CODIS hit reports, and ultimately authoring and reviewing final DNA comparison reports for those cases where the perpetrator is identified. These SAKI processes are conducted in addition to present day casework responsibilities by current staff within the Biology section.

DNA Analysis of these kits was completed in late 2018 by Sorenson Forensics in Salt Lake City, Utah in conjunction with the ongoing technical review of case files by Marshall University in Huntington, West Virginia. Technical case file review and MT-FSD CODIS reporting are estimated to be finalized by mid-summer 2019.

The Firearms/Toolmarks Section

Description of the section

The Firearms/Toolmark section examine firearms and ammunition from crime scene evidence. In addition, they examine toolmarks when requested. They can determine whether a bullet was fired from a particular gun, and whether a particular tool was used at a crime scene. Within a certain range, they can estimate the distance between a gunshot victim and the gun.



Staff

<p>Travis Spinder Section Supervisor – Missoula AFTE Board Certified</p>	<p>Lynette Lancon Forensic Scientist – Missoula AFTE Board Certified</p>
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Successes

1. Successfully decreased turnaround times.
2. Facilitated multi-section evidence transfers (ultimately decreasing turn-around times).
3. Provided training to user agencies across the state.

Challenges

1. With just two FTE, the section is vulnerable to analyst turnover. It takes approximately two years to train a new examiner during which time the remaining examiner is responsible for providing the training. Casework verification must be arranged with a qualified, out of state examiner. Cases cannot be released to the user agency until the comparisons are verified and the casefile is technically reviewed, resulting in a delay of services.

Casework

Year	2016	2017	2018
Total cases submitted	90	95	91
Total cases worked	91	87	89
Median TAT (days)	67	21	21
95% of cases worked (days)	293	156	77

Quality Assurance/Evidence Section

The Quality Assurance section is expected to maintain the Laboratory's International Accreditation and to continually improve the management system. The Evidence Section ensures evidence is accurately and efficiently transferred, to maintain the integrity of all evidence submitted and to protect it from loss and cross contamination.

The Quality Assurance Manager has the responsibility and authority for ensuring the management system related to quality is implemented and followed at all times. This includes ensuring compliance with ISO 17025, ASCLD/LAB *International* Supplemental Requirements for Testing and Calibration Laboratories and Forensic Science Division policies.

Staff

<p>Emily Wemlinger Quality Assurance Manager / Evidence Supervisor – Missoula</p>
<p>Alysa Nichols Evidence Technician - Missoula</p>
<p>Gaye Gauthier Evidence Technician - Billings</p>



Casework

The Evidence Technicians processed 9125 cases in 2018. Most of these cases have multiple pieces of evidence, some totaling over one hundred individual items. It is an essential and often overlooked role within the Division to document, log, and track the tens of thousands unique pieces of evidence submitted each year.

Successes

1. Both evidence technicians provided training presentations to educate Law Enforcement on how to properly package, seal, and submit evidence. These were well received and will continue into the future.
2. 2018 Testing Surveillance Visit and Calibration Assessment Conformance file preparation went smoothly with ANAB's new ShareFile site.

Challenges

1. With a limited number of trained staff that collect and process evidence the laboratory is vulnerable. The lab is working on redundancies to ensure the proper flow of evidence through the lab.
2. We must schedule work around the courier delivery times. It is normal for all the evidence to arrive after lunch, leading to extremely busy afternoons getting everything entered before day is over.
3. Notification of policy changes and maintaining archived policies is cumbersome. Division is looking into a quality system document storage system.