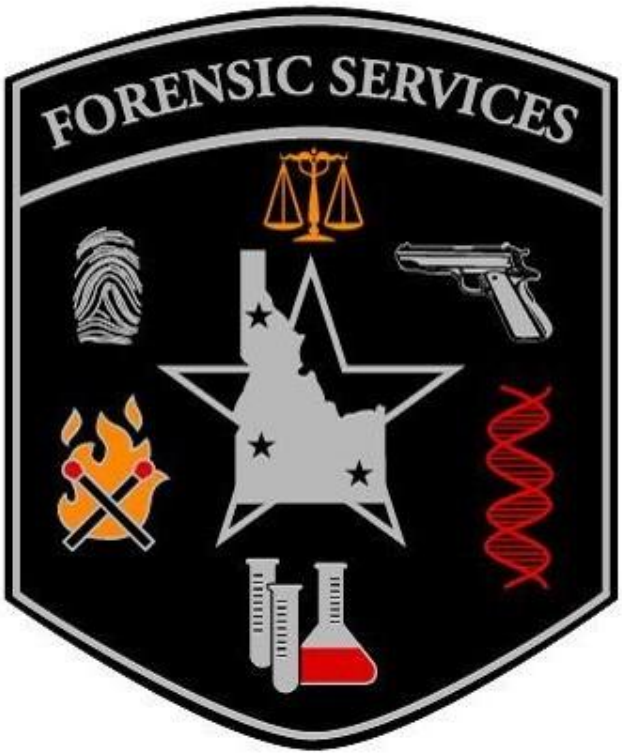
IDAHO STATE POLICE



Toxicology Program Trends

2010

Toxicology Program Trends

Overview and Background

This report will discuss trends in the toxicology program, as well as the number of toxicology cases submitted to the Idaho State Police Forensics laboratories in Region 1, Coeur d' Alene, and Region 5, Pocatello for the past fiscal year of 2010. The phrase "toxicology cases" is defined as those cases which have urine, blood or vitreous humor that are submitted to the laboratory for analysis, qualitatively and/or quantitatively for the presence of drugs and/or alcohol. This analysis falls under three major disciplines: blood alcohol (the level of alcohol in blood), blood toxicology (drugs in blood) and urine toxicology (drugs in urine).

These statistics were compiled from the Idaho Evidence Tracking System (IETS) which is used to log in and track all evidence submitted to the forensic laboratory system. The information in IETS regarding a case is taken directly from the Evidence Submission Form filled out by the agency officer and submitted simultaneously with the evidence to the laboratory.

Toxicology Tracking Information

	Blood Toxicology	Blood Alcohol	Urine Toxicology	Total	2010 Percent	2009 Percent
DRE						
Adult	22	6	147	175	5.1%	5.1%
Juvenile	0	1	15	16	0.5%	0.6%
NJDT	0	0	3	3	0.0%	0.2%
DUI						
Adult	396	1539	400	2335	69%	67%
Juvenile	70	141	64	275	8.1%	8.0%
Probation & Parole						
Adult	2	6	22	30	0.8%	0.6%
Juvenile	0	2	20	22	0.6%	0.3%
Other Criminal	50	74	97	221	6.5%	9.4%
Auto Accident Fatalities	40	74	17	131	3.9%	4.3%
Accident Victim Kits	0	14	0	14	0.4%	1.4%
Death (non-homicide)	47	79	40	166	4.8%	3.0%
Total:	627	1936	825	3388	100%	100%

Table 1: Statistics were compiled from the Idaho Evidence Tracking System (IETS) which is used to log in and track all evidence submitted to the forensic laboratory system.

Terms and Drug Categories

Central Nervous System Depressants (CNS-Depressants), Central Nervous System Stimulants (CNS-Stimulants), and Carboxy-THC account for most of the positive toxicology results obtained after analysis.

Carboxy-THC is an inactive metabolite of marijuana (MJ). Which means, after ingestion, the MJ is broken down in the body to a form that the body can eliminate as waste. There are many MJ metabolites and Carboxy-THC is one of them. Idaho State Police Forensic Service's (ISPFS) current methods for extracting MJ from the blood and urine will extract this metabolite. We have added an appendix to the report this year to help define terms and describe the drug categories and the drugs included in those categories.

Many prescription drugs are impairing and highly abused, which is why we see so many in DUI cases. Some of the most impairing drugs fall under CNS-Depressants drugs. CNS-Depressants drugs have many categories, such as anti-depressants, anti-anxiety, anti-histamines, barbiturates, narcotic analgesics and others. *Merriam-Webster Dictionary* defines a "narcotic as a drug that in moderate doses dulls the senses, relieves pain, and induces profound sleep but in excessive doses causes stupor, coma, or convulsions." An analgesic relives pain. Some of the most common found in our DUI cases are hydrocodone, methadone and oxycodone. The benzodiazepine class drugs are anti-anxiety or tranquilizers, the mostly commonly found in DUI cases are alprazolam, temazepam and lorazepam. One category that is not included in this report but will be in future reports is the inhalant category. We have just implemented a method for tracking the cases that have been positive for inhalants. We have a few every year and they usually are products of paint or air duster inhalation.

CNS-Stimulants drugs that are highly impairing, not usually in prescription form, are amphetamine, methamphetamine and cocaine. Amphetamine can be a prescription, but is most commonly seen as an active metabolite of methamphetamine. Methamphetamine will be reduced to amphetamine after ingestion and is excreted partly as amphetamine. Once broken down into amphetamine, the amphetamine acts as its own drug and produces stimulant effects as well as the methamphetamine, therefore it is an *active* metabolite. We have few cocaine positives, which do not necessarily mean it isn't being used. Cocaine is eliminated from the body very rapidly and if very much time has passed from ingestion to sample collection, it may not be detected.

One reason that drug combinations are listed in each of the drug toxicology categories is because drug combinations can cause *additive* or *synergistic* effects. Additive, for example, means 1+1=2. For example, the additive effects of hydrocodone used in conjunction with meprobamate, which means the impairing effects can be added to create two times the effects. An anti-depressant taken alone in therapeutic amounts (prescribed quantities) may not have any impairing effects, but taken in conjunction with other CNS-D's such as alcohol or other anti-depressants will then have additive effects. Synergistic effects is 1+1 may = more than 2.

Please note that a negative result in one discipline only reflects the testing in that discipline; the case may have had a positive result in another discipline. For example, a case may have had a negative result in blood alcohol, but a positive result for drugs in blood. If both blood alcohol and blood toxicology were requested for a case, a blood alcohol cutoff of 0.10g/100cc of blood or above is a flag to scientists that toxicology testing is not required. In special circumstances, such as felony possession, suicide or possible overdose cases, the toxicology may still be analyzed even if the blood alcohol is above 0.10g/100cc of blood.

Toxicology results for FY2010

The laboratory system received 3,388 toxicology cases for FY 2010, 82 more than last year and 1378 more toxicology cases than FY2006, so over the past 5 years we have had a 40% increase in toxicology cases submitted to the system. Please see **Figure 1** for the comparison between years of submitted toxicology cases. While keeping in mind that some of these samples may be counted twice (a blood alcohol sample maybe sent in for blood toxicology).

Results in each of the three disciplines will be reported out in three categories and will be explained in greater detail in subsequent paragraphs.

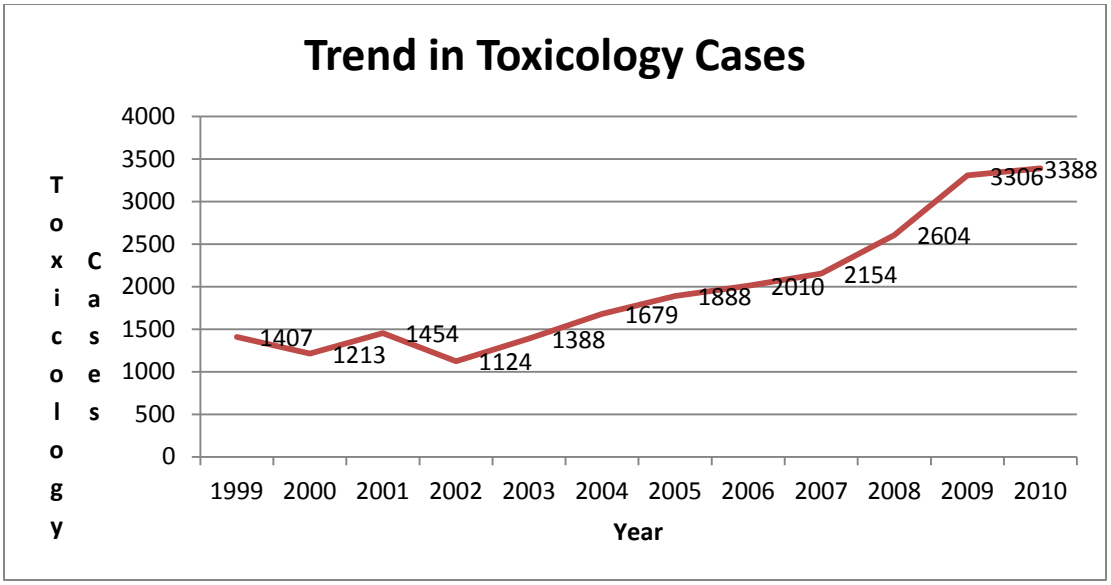


FIGURE 1

Blood Alcohol Concentration (BAC)

The blood alcohol results for adults will be discussed in this report in three levels for adults: negative, less than 0.08 g/100cc of blood and 0.08 g/100cc of blood and above. The three alcohol levels discussed for juveniles are Negative, less than 0.02 g/100cc, 0.02 and above, and inhalants. A visual representation of the results of blood alcohol levels in adults can be found in **Figure 2**. Negative samples were at 14% (with 247 samples processed). The second group – those less than 0.08 – is 6%, (with 112 samples processed). The last level is samples at 0.08 g/100cc of blood and above and is the largest percentage – 80% (1,402 samples processed). There was only a 10 case increase this year from last year.

79 samples from death investigations that are non-homicide were submitted this fiscal year, that figure is up 38 cases from last year. The number of accident fatalities is down by 18 this year. The increase in non-homicide death cases and decrease in accident fatalities may be due to a new system of logging the cases into the tracking system, except that the change was to take place before the FY2010 year.

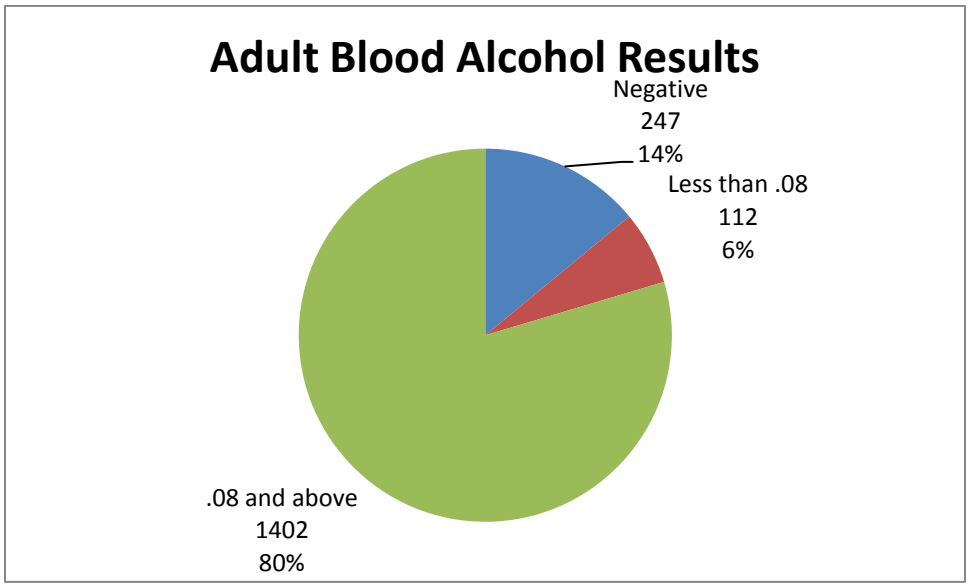


FIGURE 2

Breaking down the adult category further to examine just DUI offenses, there was little increase in adult DUI cases. From 2008 to 2009, the sample count increased by 467 but this year the increase was only 18 cases out of over 1500 DUI cases submitted. The opposite was true in Juvenile DUI cases submitted for BAC analysis. These cases decreased by 29 cases which is a 17% difference from last year. Last year we saw dramatic increases in both adult and juvenile DUI cases and we attributed the increase to the effect of State vs. Diaz and State vs. DeWitt Court of Appeals rulings that have upheld “forcible blood draws”.

This effect appears to have tampered off and results are in line with the *Crime in Idaho Report 2009*, the statistics show only a 1.5% increase in DUI's as compared to 4.5% for the previous year.

We broke down the adult blood alcohol category to look only at auto accident fatalities, the number of cases decreased again by 20%. **Figure 3** is a representation of the breakdown of results in the auto accident fatalities. Not only was there a decrease of samples submitted in this category but there was a 10% increase in negative samples from FY2009.

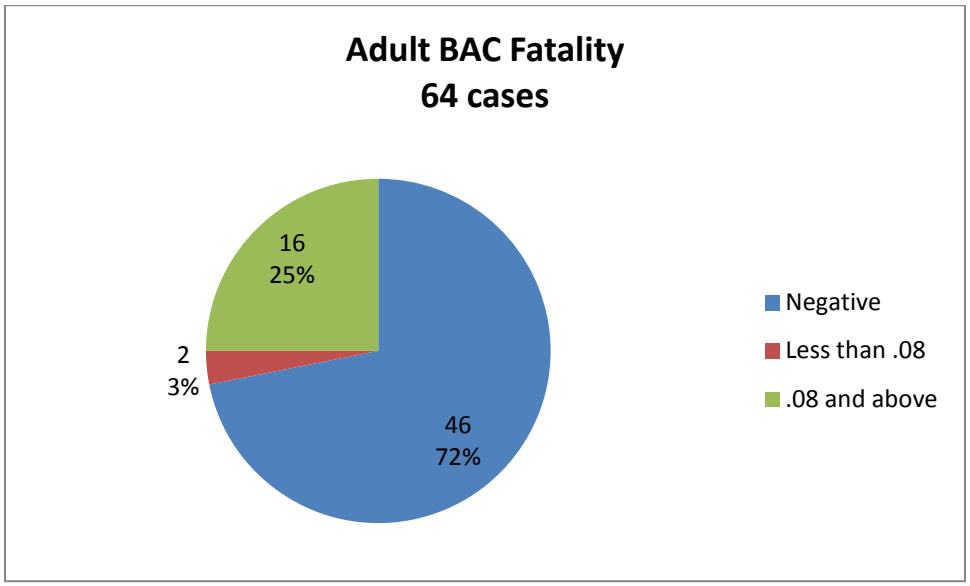


FIGURE 3

The DUI portion of the juvenile blood alcohol results show a total of 141, as mentioned earlier this is a decrease from last year. The decrease was about 30 cases less submitted for analysis and accordingly the cases testing 0.02 g/100cc or above decreased by as many cases. **Figure 4**.

This year we added a category to both adult and juvenile Blood alcohol submittals and the category will cover inhalants. In the past years we have seen the volatile Toluene in samples submitted. Toluene is a compound found when someone has been huffing paint. The past couple of years there have been a decrease in the toluene positive samples and an increase in difluoroethane positives. Difluoroethane is a compound found in "air dusters". The Juvenile category had three samples positive for this compound, also represented in **Figure 4**. We have just begun tracking these cases, so for future publications we may be able to track any new trends.

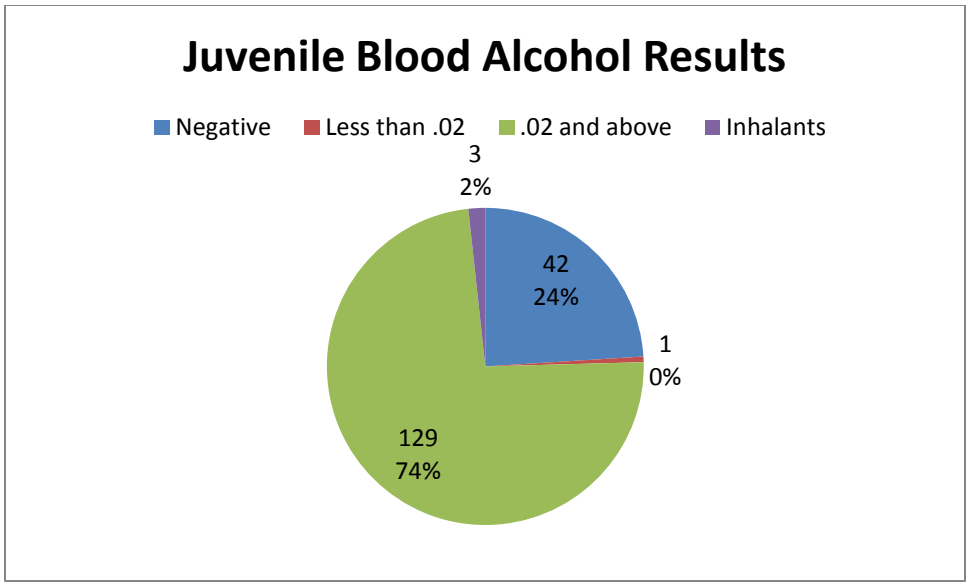


FIGURE 4

Last year 10 samples were submitted in this category all with negative results. This year the samples submitted remained the same results above 0.02 g/100cc increased to 40% (4 samples). **Figure 5.**

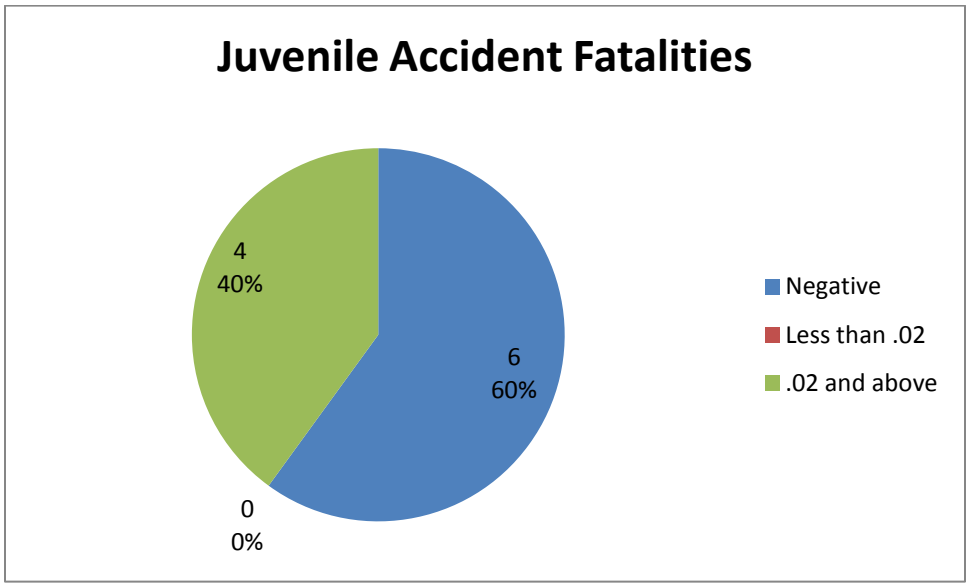


FIGURE 5

Toxicology (Drugs in Blood and Urine)

As in past years, the Idaho State Police Forensic Services Toxicology discipline policy states that samples with a result over a set amount of blood alcohol, currently 0.10g/100cc of blood, will not be retained to be tested for drugs in blood unless there is /are extenuating circumstances.

NJDT's, non-random Juvenile Drug Testing, are of a growing concerning, we get fewer and fewer cases submitted each year and only 3 total were submitted this year. Why this has happened is unclear. Questions that should be addressed include: Is the program not working? Do schools need to be re-educated about NJDT's? Is the economy and lack of full time school resource officers an issue? Are turn-around times a reason for so few?

We know we have seen an increase in juvenile drug toxicology cases, so that does not account for the decrease in NJDT cases. As far as NJDT test results, all three of the cases submitted were positive, 2 for Carboxy –THC and one for a Narcotic analgesic.

DRE's are also of a concern, but only as far as this report is concerned. This program is very successful and hugely helpful regarding toxicology information for analysts. The concern is that we cannot track them in a meaningful manner, because cases submitted are not properly marked as DRE's. DRE cases are counted as DUI cases in our evidence tracking system, so for purposes of this report they will not be differentiated from the other toxicology DUID (DUI-Drugs) cases.

Adult

The total results for drugs in blood and urine in the adult category are shown in **Figures 6 and 7**. In both blood and urine, the single drug present outweighed the drug combination class.

As shown in **Figure 6** in the urine category, Carboxy THC is predominately the drug found in single drug group, where as for blood, CNS-D is the most common single drug found. We would assume with the number of prescription drugs, both prescribed and taken illegally, that the CNS-D would be the most abundant. The urine does not show similar results. This could be due to testing methods for Carboxy-THC in urine is more sensitive than the blood testing method, but mostly because Carboxy-THC tends to be present for much longer periods in urine than in blood. Some of the more prevalent drugs seen in the adult CNS-D group are the prescription drugs alprazolam (Xanax®) and the sleep aid zolpidem, followed by the over the counter drug diphenhydramine. Diphenhydramine is found in cold remedies and sleep remedies.

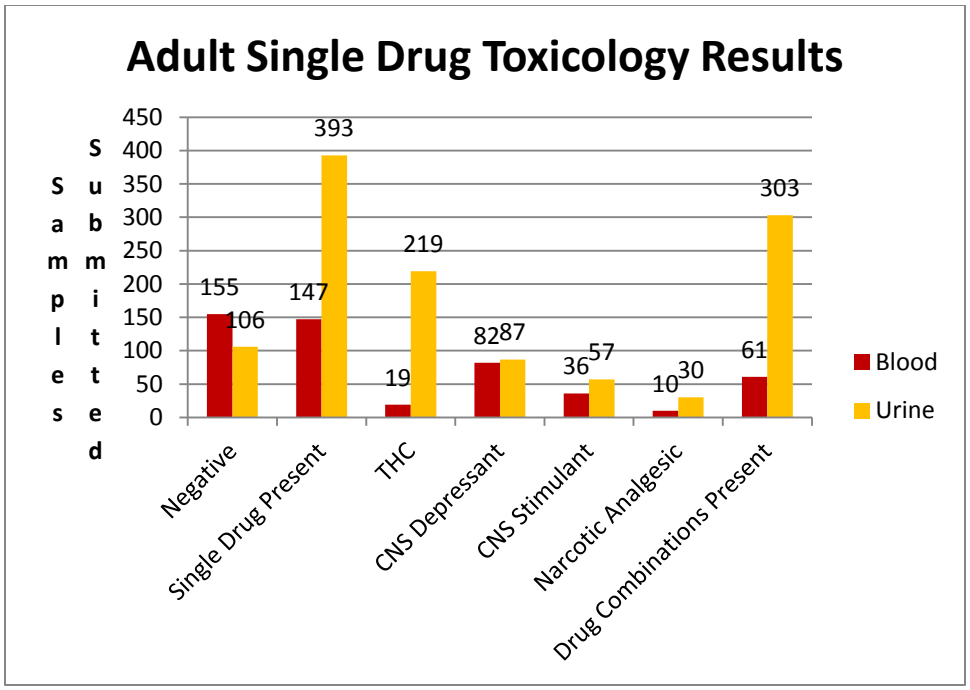


FIGURE 6

The most popular drug combination class in adults is CNS-D with a narcotic analgesic, in both the blood and urine categories, followed by THC/CNS-S in urine and THC/CNS-D in blood, **Figure 7.** The drugs in the anti-depressant class are common and add to the large number of depressants found; some of the depressants include citalopram, sertraline (Zoloft®), and venlafaxine. The most common narcotic analgesics found are hydrocodone, oxycodone and tramadol. Narcotic analgesics and benzodiazepine class compounds like alprazolam are widely abused and addicting.

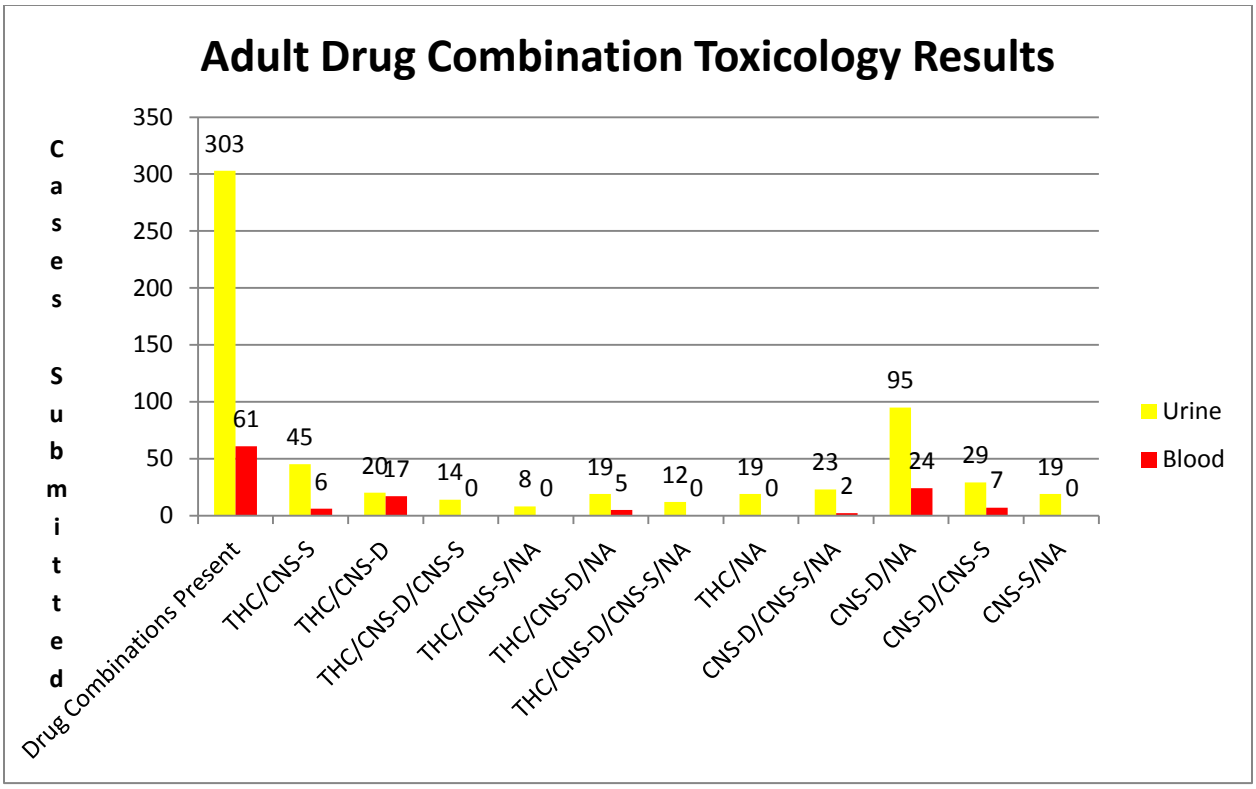


FIGURE 7

In every instance throughout the remainder of this report, whenever CNS-Stimulants, CNS-S, is mentioned, amphetamine and methamphetamine dominate this category, some of the other stimulants seen are phentermine and cocaine. Amphetamine can be found as a prescription drug like Adderall ® and as a metabolite of methamphetamine. The final breakdown of the adult drug results include 106 negative results and 25 not analyzed for urine samples. Negative samples for blood toxicology were 155 with 187 not analyzed. The large number of samples not analyzed in blood samples is due to the blood alcohol results being 0.10 g/100cc or higher, under those conditions, unless extenuating circumstances exist, the samples will not be tested for drugs.

Adult drug results for both blood and urine associated with DUI's and auto accident fatalities followed the same pattern. Single drug present in the most abundance was the CNS-D and for drug combinations CNS-D/NA lead the way.

The laboratories received 95 more urine samples this year, FY2010, than last year. 91 of those samples fell into the adult DUI drug category. Overall the adult DUI's were up by about 22%. Juveniles increased by just over 46% this year in the DUI drug category.

Juvenile

The 46% increase in Juvenile DUI drugs is a major concern. This increase also provides an example of why NJDT's are useful, in determining problems early so they can be prevented later. In the juvenile categories Carboxy –THC dominates. It is found most often in the single drug class and the drug combination classes. **Figure 8** shows a breakdown of Juvenile DUI Drug Results based on negative, single drug, and drug combinations present.

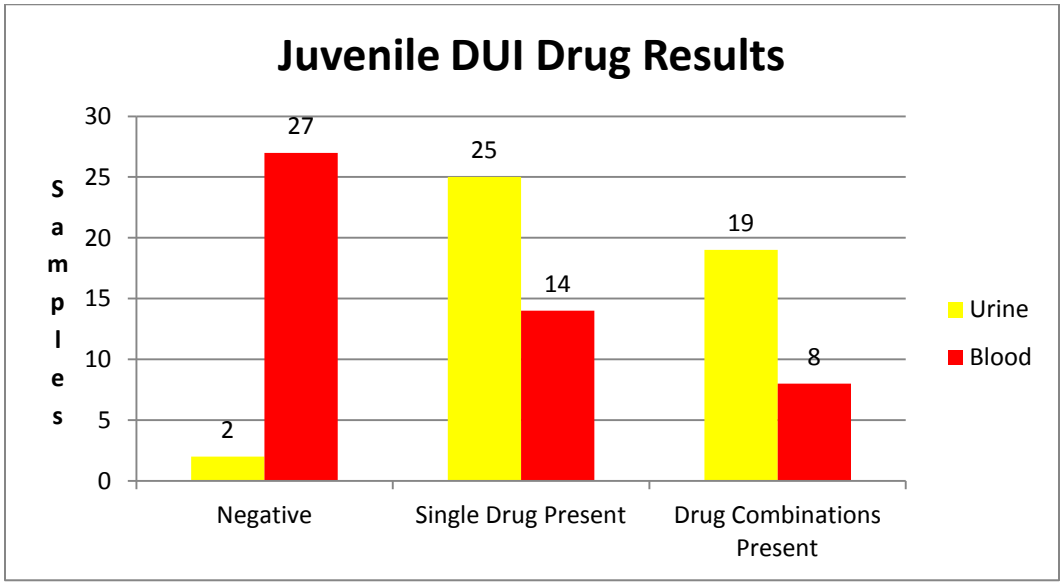


FIGURE 8

Overwhelmingly in the Juvenile category, Carboxy-THC is the drug of choice, both in the single drug and drug combination classes. The most commonly seen drug combinations are THC with a CNS-D, followed by THC with CNS-S. As mentioned earlier most prescription drugs are CNS-D, many of the positive results in this class were THC in combination with one or more of the benzodiazepine class compounds such as alprazolam, temazepam and diazepam. Also diphenhydramine and dextromethorphan weighed heavily on the positive results in both classes. These are over the counter medications used most often in cold remedies. Many people using these medications to relief cold symptoms do not realize that they may be impaired by them. These two drugs are commonly taken intentionally for the side effects, in other words they are abused, and this seems to be more common in juveniles than adults.

Methamphetamine is the stimulant drug seen in the THC/ CNS-S class. It has almost the same weight as the THC/CNS-D in the Juvenile DUI drug category. If one considers this is the only drug that was in the stimulant category versus numerous different prescription and over the counter drugs that can add to the CNS-D category, it is obvious methamphetamine and Carboxy-THC continue to be leading the way in drug abuse for both adults and juveniles.

Juvenile accident fatalities numbered 11 in FY 2010; all were negative with the exception of 3 samples. One was positive for citalopram, an anti-depressant; the other two positive results were for Carboxy-THC.

Overall, the juvenile samples submitted to the lab for testing increased by 20% this year. For both blood and urine drug toxicology, in all categories such as DRE's, fatalities and so forth as outlined in Table 1, Carboxy-THC accounted for a majority of the positive results. **Figures 9 and 10** demonstrate the high percentage of Carboxy-THC usage in the single drug category. Of all positive results for juveniles 87% were positive for Carboxy-THC in urine and 67% in blood. The 20% difference in blood and urine can be, in part, contributed to the fact that Carboxy-THC does not stay in the blood as long as it does in urine.

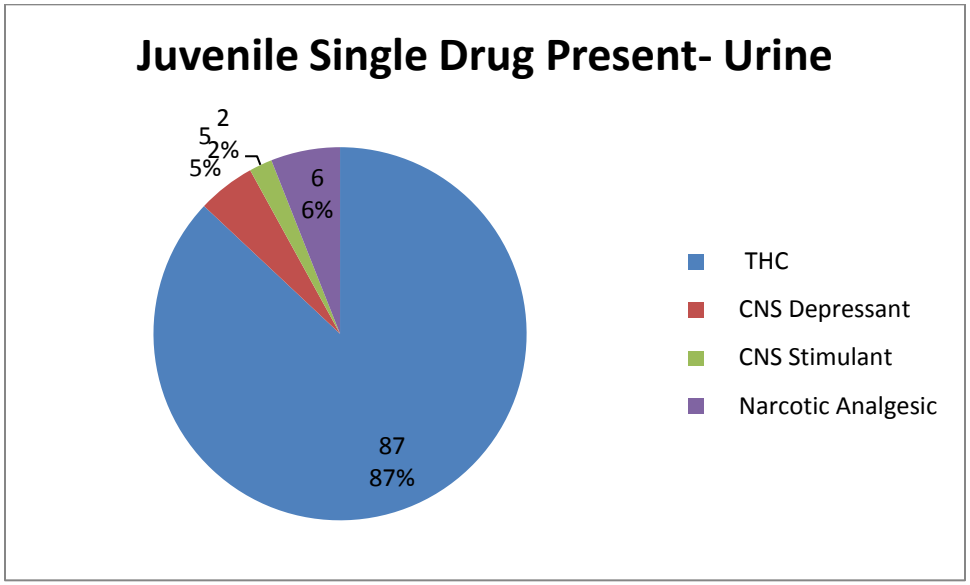


FIGURE 9

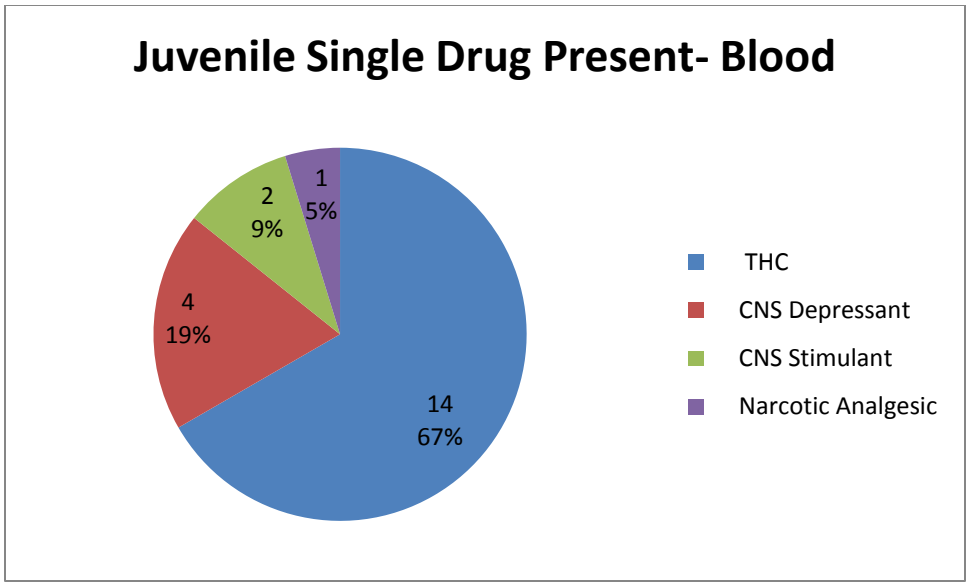


FIGURE 10

Summary

The laboratory system received 3,388 toxicology cases for FY 2010, 82 more than last year and 1378 more toxicology cases than FY2006, so over the past 5 years we have had a 40% increase in toxicology cases submitted to the system. The trend has been large increases in cases submitted for blood alcohol and toxicology, for FY2010 we only had about a 3% increase from FY2009.

One of the reasons for the large increases over FY2008 and FY2009 was the Court of Appeals ruling upholding forced blood draws. Now it would seem we have reached a balance. We predicted that as we received more blood samples, we would begin to see a decrease in urine samples submitted. This, however, did not happen and we received 95 more urine cases than last year, although this was only a 2% increase over last year. We still predict the urine samples to decrease over time. The more testing we are able to do in blood toxicology will decrease the need for urine samples, and the toxicology section of ISP Forensics will also be moving toward testing only blood and not urine whenever possible.

Samples submitted for blood alcohol analysis has increased over the years. This year we also saw an increase in adult BAC cases but only a slight increase, whereas, juvenile BAC cases submitted decreased significantly, by about 17%. Interestingly enough, the cases submitted for DUI drugs in Juvenile samples

increased by 46%. This poses a couple of questions, first have juveniles moved to smoking marijuana as opposed to drinking alcohol? Will this be a trend? Is the juvenile population under the impression that they are not impaired by marijuana usage? Or are they under the impression they are less likely to be caught? Based on our results, the last question has been answered; they will be caught, because marijuana usage does cause impairment.

Blood and urine samples submitted for drug testing increased overall. The increase was due to the 2% increase in urine samples submitted.

Adult toxicology results across the board; DRE's, DUI'S, Fatalities, other offenses and so forth, remained consistent from last year. Highest percentage of urine positive results in the single drug category was Carboxy-THC (marijuana), followed by Central Nervous System Depressants (CNS-D). For drug combinations in both adult blood and urine was the combination of CNS-D with a Narcotic analgesic (NA). CNS- Depressant covers a wide range of drugs and drug categories so the result is expected. The significant drugs in this category that were found were benzodiazepines, such as diazepam and alprazolam, others that were seen often included the muscle relaxer carisoprodol , sleep aids like zolpidem and over the counter medications like diphenhydramine. The most popular narcotic analgesics were the drugs hydrocodone, oxycodone and tramadol .Methamphetamine was the most prominent CNS-S found.

The trend for juveniles samples submitted for blood and urine toxicology increased and significantly. The most common drug found in the samples was Carboxy –THC, and CNS-Depressants. CNS-S followed. As mentioned earlier CNS- Depressant covers a wide range of drugs and drug categories so the result is expected, but in the CNS-S category methamphetamine is almost the only substance accounting for the numbers. Methamphetamine remains a big problem in Idaho for both juveniles and adults. Many of the depressants found included anti-depressants; sertraline, citalopram and venlafaxine. Also found were the benzodiazepine class compounds, diphenhydramine and few barbiturates.

Carboxy-THC continues to be, year after year, the most commonly found drug of abuse. It is used alone or in combination with other drugs from every category. It is by far the most commonly used drug within the juvenile and adult population. It is more prevalent in the juvenile population however. Methamphetamine is the biggest contributor to the CNS-S category in both adults and urine as well.

We had projected that blood alcohol and toxicology cases would increase in 2010, and so it did, but not in a dramatic fashion, because we only received 81 cases more than in 2009. According to *the Crime in Idaho report for 2009,* http://www.isp.idaho.gov/BCI/CrimeInIdaho2009/, there was a 1.5% increase in DUI arrests statewide, the previous year that increase was at 4.5%. Statewide rates are calculated on an adjusted population base of 1,543,741
For FY2011 we are going to see the latest and greatest new drug enter into ISP Forensics database and that is Spice. We are currently testing for it in controlled substances and within a couple of months we will be testing for it in toxicology cases.

DRE DUI cases give rise to a significant amount of the cases and are useful to toxicologists. They will no longer be counted as part of this report, because we cannot get the proper documentation for counting

purposes. They remain contributors to our overall cases and they will remain very important to both forensics and the law enforcement community.

NJDT'S are nearly nonexistent. In our Idaho society of juveniles using illegal substances such as marijuana and methamphetamine in such abundance, it seems NJDT's may be more useful than they have ever been. It is important that this program be revisited and the importance of it stressed to our schools.

Juvenile cases will continue to lead the way in the highest percentages of Carboxy-THC results. We will be watchful to see if a trend is beginning in youths using marijuana and less alcohol.

APPENDEX

Non Random Juvenile Drug Testing (NJDT) Please see Idaho Statues *Title 33. Education, Chapter 2.*

Drug Evaluation and Classification (Information below was provided by the NHTSA *Drug Evaluation and Classification Training Manual,* January 2006 edition.) Changes have been made to help the understanding of the reader, such as Benzodiazepines have been added to anti-anxiety column in the chart and Methamphetamine has been added to list of stimulants.

Central Nervous System Depressants

Central Nervous System (CNS) Depressants slow down the operation of the brain. They first affect those areas of the brain that control a person's conscious, voluntary actions. As dosage increases, depressants begin to affect the parts of the brain controlling the body's automatic, unconscious processes, such as heartbeat and respiration.

Possible Effects of CNS Depressants:

- ✓ Reduced social inhibitions
- ✓ Divided attention impairment
- ✓ Slowed reflexes
- ✓ Impaired judgment and concentration
- ✓ Impaired vision and coordination
- ✓ Slurred, mumbled or incoherent speech
- ✓ A wide variety of emotional effects, such as euphoria, depression, suicidal tendencies, laughing or crying for no apparent reason, etc.

Alcohol is the model for the CNS Depressant category of drugs.

Some major subcategories of CNS Depressants other than alcohol include:

- ➢ Barbiturates
- ➢ Non-Barbiturates (synthetic compounds with a variety of chemical structures)
- ➢ Anti-Anxiety Tranquilizers
- ➢ Anti-Depressants (to combat psychological depression)
- ➢ Anti-Psychotic Tranquilizers
- ➢ Combinations of the above five subcategories

Examples of CNS Depressants

Barbiturates	Other	Anti-Anxiety Tranquilizers Benzodiazepines	Anti-Depressants	Anti-Psychotic Tranquilizers	Combinations
Amobarbital	Carisoprodol Meprobamate-M	Alprazolam	Amitriptyline Hydrochloride	Chlorpromazine	Chlordiazeproxide and Amitriptyline
Pentobarbital	Chloral Hydrate	Chlordiazepoxide	Bupropion	Droperidol	Chlordiazepoxide Hydrochloride and Clidinium Bromide
Phenobarbital	Diphenhydramine Hydrochloride	Clonazepam	Citalopram	Lithium Carbonate	Perphenazine And Amitriptyline
			Desipramine Hydrochloride	Lithium Citrate	
Secobarbital	Diphenylhydantoin Sodium	Diazepam	Doxepin Hydrochloride	Haloperidol	
			Escitalopram		
Barbital	Ethchlorvynol	Estazolam			
	Gamma-Hydroxybutyrate (GHB)	Flunitrazepam	Fluoxetine		
		Flurazepam	Impramine		
	Glutethimide	Lorazepam	Paroxetine		
	Methaqualone	Meprobamate	Phenelzine Sulfate		
	Paraldehyde	Oxazepam	Sertaline		
	Zolpidem	Temazepam	Venlafaxine		
		Triazolam			

Central Nervous System Stimulants

Central Nervous System (CNS) Stimulants speed up the operation of the brain and spinal cord. It is import to emphasize that "speed up" does *not* mean "improve" or "enhance". The CNS Stimulants definitely do not make the brain work better. Rather, they cause the brain and the rest of the nervous system to work *harder*, and often to make more mistakes.

The "speeding up" caused by CNS Stimulants results in significantly increased heartbeat, respiration and blood pressure, all of which can lead to physical harm to the abuser. In addition, the stimulant user experiences nervousness, irritability and an inability to concentrate or think clearly.

Possible Effects of CNS Stimulants

- ✓ Euphoria
- ✓ Anesthetic effect
- ✓ Hyperactive
- ✓ Impaired ability to perceive time and distance
- ✓ Confusion and loss of the ability to concentrate or to think clearly for any length of time

Some major subcategories of CNS Stimulants

- ➢ Cocaine
- ➢ Amphetamines
- ➢ Methamphetamines
- ➢ Others such as phentermine, methylphenidate etc…

Hallucinogens

Hallucinogens are drugs or substances that affect a person's perception, sensation thinking, self awareness and emotions. They may also cause hallucinations. A hallucination is a sensory experience of something that does not exist outside the mind. It may involve hearing, seeing, smelling, tasting or feeling something that isn't really there. Or, it may involve distorted sensory perceptions so that things look, sound, smell, taste or feel differently from the way they actually are.

Possible Effects of Hallucinogens

- ✓ Hallucination
- ✓ Perception of reality severely distorted

- ✓ Delusions
- ✓ Illusions

Examples of Hallucinogens

Naturally occurring Hallucinogens

- ➢ Peyote
- ➢ Psilocybin

Synthetically manufactured Hallucinogens

- ➢ LSD
- ➢ MDA, MDMA, MMDA, TMA, STP, DET, DMT

Narcotic Analgesics (In the annual toxicology report Narcotic Analgesics are counted as Central Nervous Systems Depressants)

There are two subcategories of Narcotic Analgesics. The first subcategory consists of the Opiates. The second subcategory is the Synthetics.

Possible Effects of Narcotic Analgesics

- ✓ "on the nod" (A semiconscious state of deep relaxation, eyelids will be droopy and the head will slump.)
- ✓ Slowed reflexes
- ✓ Slow and raspy speech
- ✓ Slow, deliberate movement
- ✓ Inability to concentrate
- ✓ Slow breathing
- ✓ Skin cool to touch
- ✓ Possible vomiting
- ✓ Itching of the face, arms, or body

C**ommonly-Abused Opiates and Their Derivation From Opium**

- ➢ Morphine
- ➢ Codeine
- ➢ Heroin
- ➢ Dilaudid

- Hydrocodone
- Numorphan
- Oxycodone

Common Synthetic Opiates

- Demerol
- Methadone
- Fentanyls
- MPPP
- Darvon