MINNESOTA BUREAU OF CRIMINAL APPREHENSION

FORENSIC SCIENCE LABORATORY

TOXICOLOGY SECTION

1430 E. MARYLAND AVENUE

ST. PAUL, MN 55106

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- Bemidji Bureau of Criminal Apprehension (BCA) Forensic Science Laboratory
  - Located in Bemidji, MN
  - No Alcohol or Toxicology testing at this site
  - Kits submitted to this location are delivered to St. Paul
- St. Cloud now has a processing site for submission of evidence
  - No Alcohol or Toxicology testing at this site
  - Kits submitted to this location are delivered to St. Paul
- St. Paul BCA Forensic Science Laboratory
  - Alcohol and Toxicology analysis completed in the Toxicology Laboratory section

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ST. PAUL BCA TOXICOLOGY LAB SECTION

- Staff of:
- 1 supervisor
- 2 technical leads
- 10 scientists
  - 2 who only complete alcohol/inhalant analysis
  - 8 who are trained in alcohol and toxicology analysis

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FORENSIC TOXICOLOGY

- Human Performance Forensic Toxicology
  - Did drug use impact behavior?
  - Alcohol: Blood, breath, and urine
  - Drugs: Blood (preferred) and urine

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TOXICOLOGY LABORATORY SERVICES

- Analyze blood/urine for alcohol, inhalants, and drugs
  - Open bottles
- Screen and confirm primarily a limited menu of Scheduled drugs on urine and blood
  - At this time urine screening has a larger menu than blood screening
- Issue reports
- Interpret analytical results
- Expert witness

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WORKFLOW OF TOXICOLOGY SAMPLES

- Perform alcohol testing –
  - Alc is <0.08x, and Tox testing is indicated on kit sheet → drug screening

    (some drugs have a magnified effect when alcohol is present, ie. Benzos or cocaine)
    - DWI, and alcohol is >0.08x, generally stop drug screening/testing.
      - Factors that may influence this: certainty factor, time between incident and collection, warrant
      - PBT - <0.08? May influence testing decisions

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WORKFLOW OF TOXICOLOGY SAMPLES

- Perform inhalant testing at the same time as alcohol testing
- Note – check for type of inhalant present in vehicle – note this on kit sheet. Recording of CAS# from container is also helpful.
- Look around the vehicle for cans!!

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CASE DECISION POINTS

- Review of any PBT of <0.08 by scientist
- PBT = .000, or valid DMT test (<0.08) , move ahead to drug screening.
- Uncertainty with .08x BAC/UAC/Tox request
- Urine drug screens are batched – every other week
- Blood screens are batched – run weekly
- Once screen results are posted in lab computer, the confirmatory analysis begins
- Not all scientists are trained to perform all tox testing

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ALCOHOL WITH OTHER DRUGS

- Synergistic effect (1 + 1 = 10)
  - Drug + Alcohol **>** Drug or Alcohol alone
  - Drug class is important in combination with alcohol (low PBT)

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BLOOD VS. URINE

- Blood Advantages
  - Impaired?
  - Prescription abuse?
    - Check for pill bottles and count pills
- Urine Advantages
  - Synthetics
  - Larger menu
  - Easy to obtain
  - Longer drug detection time
- Inhalants – get a blood or urine
- What drugs are suspected?
  - This could drive decision about which matrix to collect based on testing capabilities.

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TOXICOLOGY TESTING

- Drug screening run as batch analysis
- Blood – enzyme immunoassay (EIA) or enzyme linked immunoassay (ELISA)
- Urine –uses LC-MS/MS (Q-Trap)
  - Liquid chromatography triple quad mass spectrometry
- Need to utilize two distinct types of analytical methods – one to screen and another to confirm.

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DRUG SCREENING

- Samples are batched
- Batching is cost effective & efficient.
- Each batch analysis includes:
  - Negative, low and high controls in the batch

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LIMITATIONS WITH CURRENT BLOOD SCREENING TECHNIQUES

- Lack of specificity
  - Drug classes
  - Looking for specific drug metabolite(s) in sample
- Limitation of reagents
  - vendors don't make reagents for **every** scheduled or prescribed or OTC drug on market
- Cost
- Batch analysis of blood drug screening

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CONFIRMATIONS

- Done by Mass Spectrometry
  - GC/MS
    - Scan all ions
    - SIM (Selective Ion monitoring)
  - LC/MS/MS
    - MRM – Multiple Reaction monitoring

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CONFIRMATORY TESTING

- Batch analysis
- Labor and time intensive – follow standard procedures to separate drug from urine or blood matrix
- Limited menu of what can be confirmed based on current approved procedures in use
- Limited number of instruments available in Tox lab vs. # of staff doing confirmatory testing
- Balance of lab time and court time

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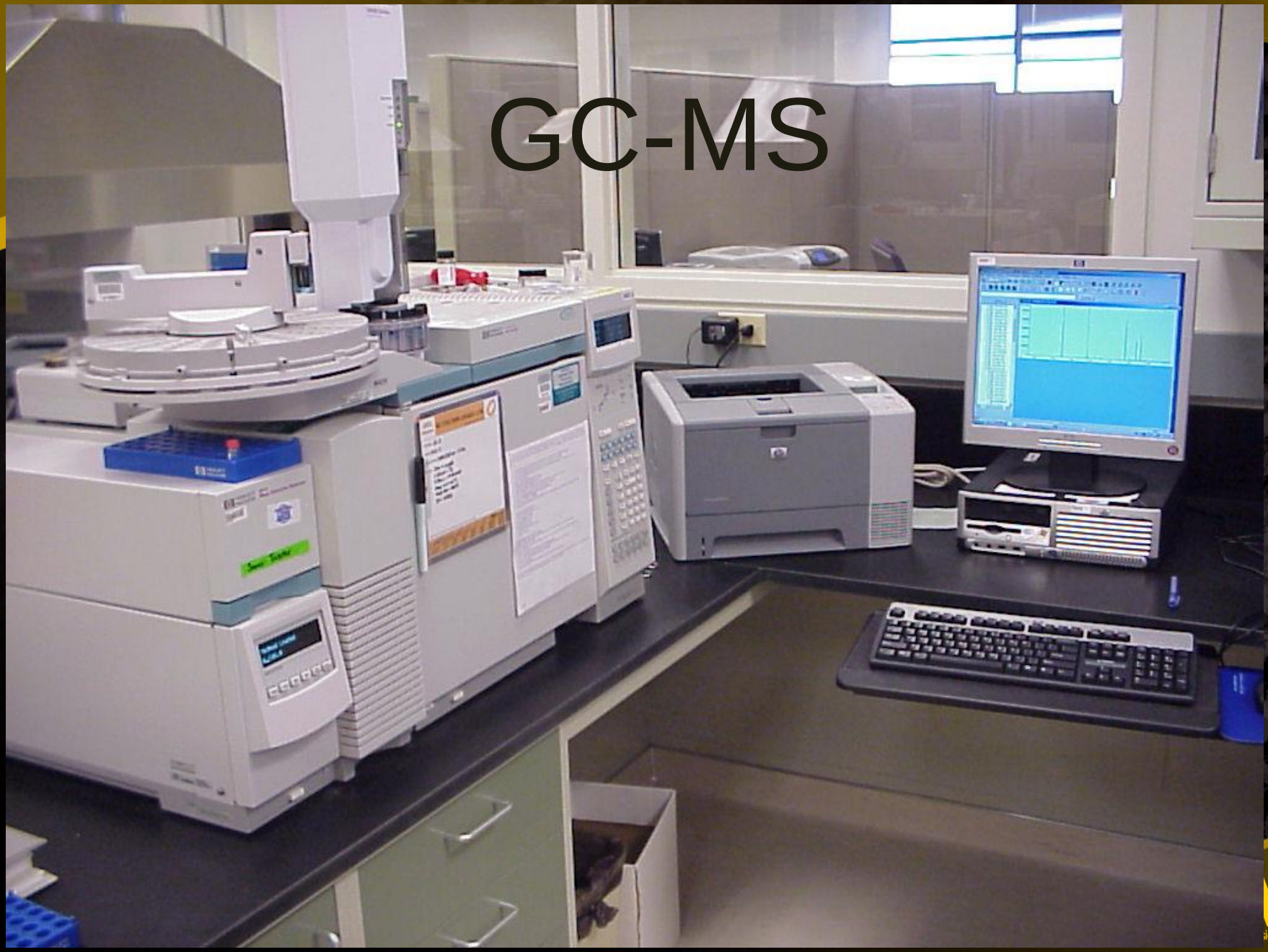
GC-MS

LC-MS/MS

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"WHAT AM I READING?"

POINTERS ON READING THE ALCOHOL AND TOXICOLOGY REPORTS

- No Schedule listed for the drug results on the Toxicology reports
- Certainty reported for any quantification (blood and vitreous samples) for Tox
- Only Alcohol is quantified for urines

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REPORTS

- Blood reports contain quantification (number value with certainty range)
- Urine tox reports only presence – exception is UAC
- Urine Cannabinoids not confirmed – Only screen results reported
- Reports do not contain reference to the Schedules*

*Read all the pages and comments

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WHY THE BCA'S TOX RESULTS ARE ACCURATE AND RELIABLE

- BCA Lab is accredited by ASCLD/LAB (American Society of Crime Laboratory Directors/Laboratory Accreditation Board)
  - Standardized methods/procedures
  - Latest accreditation on12/2014 (5 yr period)
- High number of calibrators and quality control in use (more than is recommended in current forensic literature) ensures accuracy
- Proficiency testing – "purchased unknowns"
- Continuing education of staff
- Board certification of staff

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DRUG CLASSIFICATION BY SCHEDULE IN THE U.S.

- 1970 – Act divided drugs into categories ("Schedules") on the basis of their medical uses and potential for physical and psychological abuse
- 5 Schedules – I through V
- Generally, the states have adapted the federal schedule.

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169A UPDATED

- **169A.20 DRIVING WHILE IMPAIRED.**
  Subdivision 1. **Driving while impaired crime.** It is a crime for any person to drive, operate, or be in physical control of any motor vehicle within this state or on any boundary water of this state:

- (7) when the person's body contains any amount of a controlled substance listed in schedule I or II, or its metabolite, other than marijuana or tetrahydrocannabinols.

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- **609.21 CRIMINAL VEHICULAR HOMICIDE AND INJURY.**
  Subdivision 1. **Criminal vehicular homicide.** A person is guilty of criminal vehicular homicide resulting in death and may be sentenced to imprisonment for not more than ten years or to payment of a fine of not more than $20,000, or both, if the person causes the death of a human being not constituting murder or manslaughter as a result of operating a motor vehicle:
  (1) in a grossly negligent manner;
  (2) in a negligent manner while under the influence of:
  (i) alcohol;
  (ii) **a controlled substance** or
  (iii) any combination of those elements;
  (3) while having an alcohol concentration of 0.08 or more;
  (4) while having an alcohol concentration of 0.08 or more, as measured within two hours of the time of driving;
  (5) in a negligent manner while knowingly under the influence of a hazardous substance;
  (6) in a negligent manner while any amount of a controlled substance **listed in schedule I or II, or its metabolite**, other than marijuana or tetrahydrocannabinols, is present in the person's body; or
  (7) where the driver who causes the accident leaves the scene of the accident in violation of section 169.09, subdivision 1 or 6.

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DRUG IMPAIRMENT

- No per se amount
  - Tolerance
  - Prescription use vs. Abuse
- Blood versus Urine
- DRE evaluation!!!!!!!!!!!!!!

- **Observations are very important.**
- Document, document, document these.

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EXPANDED TESTING REQUESTS

- Synthetic cannbinoids
  - Screened for in urine
  - No blood test available
- Bath Salts
  - Currently screened for in urine (available upon request in blood)
- Fentanyl
  - Currently screened for in urine (available upon request in blood)
- Methylphenidate
  - Currently screened for in urine (available upon request in blood)
- Diphenhydramine
  - Currently screened for in urine (available upon request in blood)
- Cyclobenzaprine
  - Currently screened for in urine (available upon request in blood)

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THINGS OF NOTE

- Unscheduled drugs that could cause impairment not currently tested for at the BCA
  - Doxylamine, Trazodone*, Dextromethorphan
  - Other drugs may be impairing at excessive doses or in combination
    - *Confirm test on the way…
- Retests
- eCharging - tied to **kit sheet** number

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1,1 DIFLUOROETHANE'S GREATEST HITS

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INCREASING CONCERN

2006: 2 cases
2008: 12 cases
2011: 30 cases
2015: 25 cases

Court of Appeals Decision regarding Inhalants:
State of MN vs. Chantel Lynn Carson
Steel County District Court
A15-1678

Other inhalants of interest: Dimethyl ether, Toluene,
Inhaled anesthetics: Sevoflurane, Isoflurane, Desflurane

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IMPORTANT THINGS OF NOTE FOR INHALANTS!

- Check the vehicle!! – cans (full or empty), record CAS number from can
- Inhalant testing NEEDS to be done before drug screening – LET US KNOW IF YOU SUSPECT INHALANT!
  - If every category circled– Inhalant testing won't be completed
  - Lab does not test for Nitrous Oxide

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CHALLENGES TO BRING NEW TESTING ONLINE

- Limitations in screening methods
  - Availability from manufacturers
- What do we look for?
  - Parent drug vs. metabolite
  - What does the drug metabolize to?
  - How long does the drug stay in the system?
- Strict validation guidelines
  - Labor intensive
  - Time away from casework and court

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ODD AND ENDS

- Highest BAC in 2015 = 0.510
- Number of UAC & BACs reported in 2015: 4544
- Average alcohol concentration = 0.15 (in 2015)
- 1 case of dimethyl ether in 2015
- 1922 Blood samples screened in 2015
- 1527 Urine samples screened in 2015
- 4544 Alc cases in 2015
- 3689 Tox cases in 2015

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TOXICOLOGY LAB SECTION INCREASE IN WORKLOAD

- 2013 Toxicology – 1044 urine & 1347 blood samples screened
- 2014 Toxicology – 1294 urine & 1795 blood samples screened
- 2015 Toxicology – 1527 urine & 1922 blood
- Tox only testing is over 45% of all samples we receive and increasing
  - Over 55% of all samples receive tox testing
  - Longer testing time = longer turnaround time = triage

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2015/2016 IN REVIEW FOR ALCOHOL/TOX SECTION

- Down 2 FS positions for over 1 year
- OTS funded scientist positions
  - Allows time for full-time toxicology scientists to work on urine drug screening project in addition to casework
- BCA hired 2 dedicated alcohol scientists
  - Online in October of 2016

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CHECK THE MN BCA WEBSITE

- BCA Website
  - Forensic Science Services
    - Forensic Testing Services
      - Toxicology/Alcohol
    - Click on drugs of abuse in first paragraph

- List of current drugs of abuse and matrix (blood or urine) that are able to be analyzed
  - https://dps.mn.gov/divisions/bca/bca-divisions/forensic-science/Pages/drugs-of-abuse.aspx

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OTHER IMPORTANT LINKS

- MN Board of Pharmacy
- MN Drug Schedules Statute152.02
- MN Rules Chapter 6800

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THANK YOU!

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