VIRGINIA DEPARTMENT OF FORENSIC SCIENCE

EVIDENCE HANDLING & LABORATORY CAPABILITIES GUIDE

TOXICOLOGY

Contact Information

If you have any questions concerning the Toxicology laboratory examination capabilities or evidence handling procedures, please call the Training Section or the Toxicology Section at the Forensic Laboratory that services your area.

Laboratory	Section Contact	Phone Number
Central	**Dr. Jayne Thatcher**	**(804) 588-4191**
Eastern	**Dr. Connie Luckie**	**(757) 355-5847**
Northern	**Dr. Carol O'Neal**	**(703) 334-9739**
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OVERVIEW

The Toxicology Section analyzes blood and other biological samples for the presence of alcohol, drugs and poisons. Types of cases analyzed include driving under the influence/ driving under the influence of drugs (DUI/DUID), drug-facilitated crimes, death investigations, poisonings and manslaughter cases. In addition, the Toxicology Section analyzes beverages for the presence of alcohol.

The Virginia Department of Forensic Science (DFS) supplies DUI/DUID Blood Specimen Collection Kits to law enforcement agencies across the Commonwealth. For each jurisdiction, DFS has designated the regional laboratory to which the agency should submit/mail the Blood Specimen Collection Kits for testing. Testing and testimony will be provided from that DFS regional laboratory. The laboratory designated to receive your Blood Specimen Collection Kits may not be the laboratory to which you submit other forensic evidence. The designation is based upon which laboratory is best able to provide your jurisdiction the timeliest service. Blood Specimen Collection Kits are supplied from DFS with the correctly designated laboratory address on the mailing box.

An Uncertainty of Measurement (UoM) statement appears on the completed Certificate of Analysis (CoA). All measurements have some amount of variation expected within the measurement process. This variation in measurement of alcohol and/or drug concentration has been calculated and will be reported on the CoA.

CAPABILITIES AND SERVICES

Volatile compounds (ethanol, methanol, isopropanol, acetone, etc.)

Drugs of abuse

Over the counter and prescription medications

Miscellaneous (e.g., carbon monoxide, poisoning)

Alcoholic Beverage Content

COLLECTION GUIDELINES

ITEM - DUI/DUID Samples (collected pursuant to implied consent or search warrant using a DFS DUI/DUID Blood Specimen Collection Kit)

> **METHOD** - Use a DUI/DUID Blood Specimen Collection Kit provided by DFS. This kit includes two gray top blood vials, two Certificates of Blood Withdrawal (CBW), a DUI/DUID Submission Information Sheet, povidone iodine swab to cleanse arm, and evidence seals. Please fill out and submit the DUI/DUID Submission Information Sheet with the kit indicating the investigating officer, agency, suspect, jurisdiction, and any facts pertinent to the case.

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Have a physician, registered nurse, licensed practical nurse, phlebotomist, graduate laboratory technician or a technician or nurse designated by order of a circuit court acting upon the recommendation of a licensed physician, use the povidone iodine swab to cleanse the arm and withdraw blood into the two vacutainer tubes provided by DFS (§18.2-268.5). (Figure 1)

The vials shall be sealed by the person taking the sample, or at his/her direction. (Figure 2) The person who seals the vials shall complete the pre-numbered Certificate of Blood Withdrawal forms (CBW) and attach one CBW to each vial. (Figures 3 and 4) The vials shall be placed in a container provided by DFS and the container shall be sealed to prevent tampering with the vials (§18.2-268.6). (Figures 5, 6, 7, and 8) Promptly transport or mail the DUI/DUID container to the designated laboratory address indicated on the mailing box. If the accused is known to have a blood borne disease (HIV/AIDS, Hepatitis B, etc.) the kit must be hand delivered to DFS.

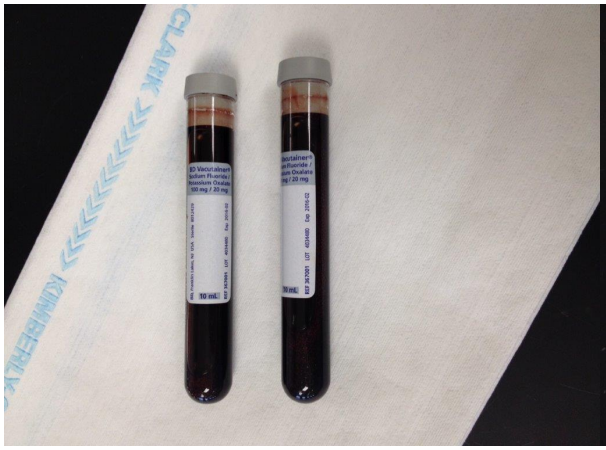

Figure 1: Gray top blood vials filled with blood.

Figure 2: Vials properly sealed using the provided evidence seals.

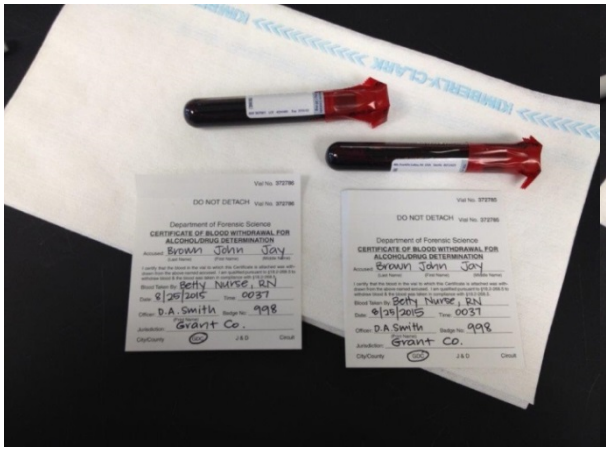

Figure 3: CBWs completed by authorized personnel.

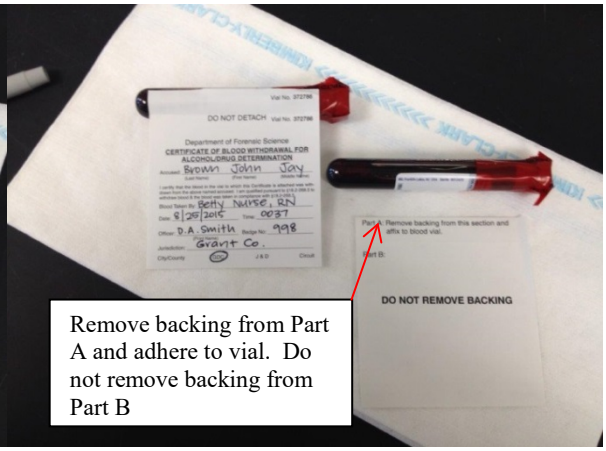

Figure 4: CBW properly affixed to left vial.
Note: Only small numbered strip (Part A) is affixed to the vial. DO NOT remove entire backing and do not tear the CBW at the perforation.

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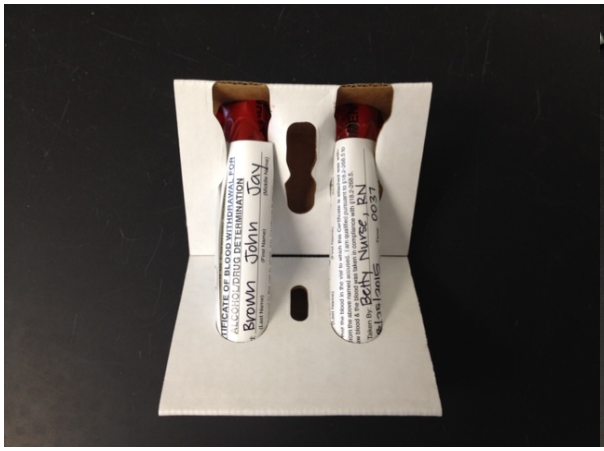

Figure 5: Completed blood vials in specimen holder.

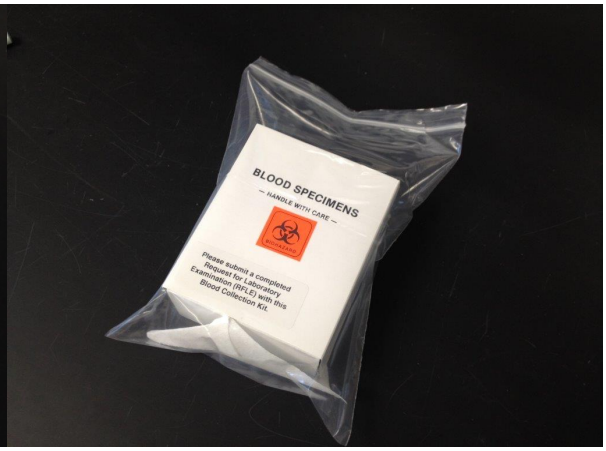

Figure 6: Blood specimin holder with sleeve placed into plastic bag.

Figure 7: Bag with specimens placed into outer container.

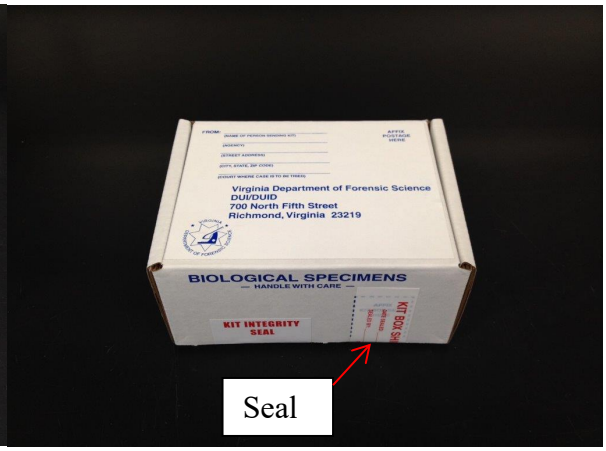

Figure 8: Sealed outer container. (Place in mailing envelope marked BIOHAZARD, along with RFLE, and mail to appropriate DFS laboratory)

DISCUSSION - Once the examination is complete, the completed CoA, with the affixed CBW, will be mailed to the clerk of the court in which the charge will be heard (a copy of the CoA will be mailed to the investigating officer(s) if that information is available). Upon completion of the examination, DFS will preserve the remainder of the blood sample for at least 90 days. DFS will then destroy the remainder of the blood sample if no notice of or court order to transmit the blood sample to an independent laboratory or request to return the evidence from the Commonwealth's Attorney is received (§18.2-268.7).

The DFS Toxicology Section uses a protocol (see Toxicology Procedures Manual on the Manuals and Procedures page at the DFS website) for testing blood samples in implied consent or search warrant cases using a DFS DUI/DUID Blood Specimen Collection Kit. The DUI/DUID protocol is designed to identify alcohol and drugs that can impair driving using two levels of testing as delineated in the table below. Additional testing may be conducted if specifically requested or at the discretion of a DFS toxicologist. This-protocol incorporates an expanded immunoassay screening panel and allows for a more streamlined analysis process.

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Level I	Blood Alcohol Testing
Level II	DUID Screening Panel (Immunoassay) Including: -Amphetamine -Barbiturates -Benzodiazepines -Buprenorphine -Cannabinoids -Carisoprodol/meprobamate -Cocaine/Benzoylecgonine -Dextromethorphan -Diphenhydramine -Fentanyl -Methadone -Methamphetamine/MDMA -Opiates -Oxycodone/oxymorphone -Phencyclidine (PCP) -Tramadol -Tricyclic antidepressants -Zolpidem

Testing Protocol

Step 1: Level I Blood Alcohol Testing:

a. All samples are analyzed for ethanol
b. If ethanol is ≥0.100%w/v, testing is discontinued and the results are reported. The Certificate of Analysis will state that "No other drugs and/or drug classes detected."
c. If ethanol is <0.100%w/v, the results are included in the report and the analysis continues with Step 2.

Step 2: Level II Drug Screening, Confirmation, and Quantitation:

a. If no drugs or drug classes are detected, the results are reported.
b. If any drug or drug class is tentatively present, the sample undergoes confirmatory analysis for drug identification and quantitation, as necessary.

Example Report Wording Resulting from Each Scenario

Scenario 1: Blood alcohol level was greater than 0.100%w/v.

Blood Alcohol Content 0.110 ± 0.005% by weight by volume.
Method: Alcohols by Headspace Gas Chromatography
No other drugs and/or drug classes were detected.

The specimen was screened for the following drugs and/or drug classes:
Ethanol (blood alcohol), methanol, acetone, isopropanol.

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Supporting examination documentation is maintained in the case file. The above-listed methods are the respective quantitation and/or confirmation methods in place at the time of analysis. All methods can be found in the Toxicology Procedures Manual which can be found at https://www.dfs.virginia.gov/documentation-publications/manuals/. Measurement uncertainty is reported at a 95.45% level of confidence for all toxicological analyses except blood alcohol or ethanol which is reported at a 99.73% level of confidence.

Scenario 2: Blood alcohol level was less than 0.100%w/v and oxycodone was present and quantified.

Blood Alcohol Content 0.025 ± 0.001% by weight by volume
Method: Alcohols by Headspace Gas Chromatography
Oxycodone 0.12 ± 0.02 mg/L
Method: Opioid, Cocaine, Benzoylecgonine, Cocaethylene Quantitation and Confirmation by LCMSMS
No other drugs and/or drug classes were detected.

The specimen was screened for the following drugs and/or drug classes:
Ethanol (blood alcohol), methanol, acetone, isopropanol, cocaine/benzoylecgonine, opiates, oxycodone/oxymorphone, methamphetamine/methylenedioxymethamphetamine (MDMA), phencyclidine, barbiturates, benzodiazepines, carisoprodol/meprobamate, fentanyl, methadone, cannabinoids, zolpidem, diphenhydramine/cyclobenzaprine, dextromethorphan, tramadol, tricyclic antidepressants, buprenorphine/norbuprenorphine.

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Scenario 3: Blood alcohol level was less than 0.100%w/v and no drugs or drug classes screened positive.

Blood Alcohol Content 0.025±0.001% by weight by volume
Method: Alcohols by Headspace Gas Chromatography
No other drugs and/or drug classes were detected.

The specimen was screened for the following drugs and/or drug classes:
Ethanol (blood alcohol), methanol, acetone, isopropanol, cocaine/benzoylecgonine, opiates, oxycodone/oxymorphone, methamphetamine/methylenedioxymethamphetamine (MDMA), phencyclidine, barbiturates, benzodiazepines, carisoprodol/meprobamate, fentanyl, methadone, cannabinoids, zolpidem, diphenhydramine/cyclobenzaprine, dextromethorphan, tramadol, tricyclic antidepressants, buprenorphine/norbuprenorphine.

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Supporting examination documentation is maintained in the case file. The above-listed methods are the respective quantitation and/or confirmation methods in place at the time of analysis. All methods can be found in the Toxicology Procedures Manual which can be found at https://www.dfs.virginia.gov/documentation-publications/manuals/. Measurement uncertainty is reported at a 95.45% level of confidence for all toxicological analyses except blood alcohol or ethanol which is reported at a 99.73% level of confidence.

ITEM – Non-implied consent cases DUI/DUID which do NOT use the DFS DUI/DUID Blood Specimen Collection Kit

If the suspect had used or ingested drugs recently (<6 hrs.), blood samples would provide the most probative evidence, although a urine sample can also be collected. If more than 6 hours has passed since the suspected time of drug use, then both blood and urine samples should be collected from the suspect.

METHOD - Blood, urine or other biological samples can be collected by medical personnel using blood vials and containers provided by the medical facility. When submitting hospital vials and containers, please make sure they are leak proof. Submit a Request for Laboratory Examination form (RFLE) with the evidence, including the nature of the offense, manner in which evidence was collected (e.g., search warrant). The testing protocol for non-implied consent DUI/DUID cases may follow the protocol outlined for implied consent DUI/DUID cases (see above) however that is dependent upon sample volume limitations.

DISCUSSION - Once the analysis is complete, the evidence and CoA will be returned to the investigating officer.

ITEM – Other non-implied consent cases (Biological samples collected pursuant to search warrant that are not in DFS DUI/DUID Blood Specimen Collection Kit)
Examples of cases include possession of controlled substance, child endangerment, manslaughter, maiming or any other type of offense in which the arresting officer is interested in determining whether or not the suspect had consumed alcohol or drugs as it relates to a charge beyond an implied/non-implied consent DUI/DUID.
If the suspect had used or ingested drugs recently (<6 hrs), blood samples would provide the most probative evidence, although a urine sample can also be collected. If more than 6 hours has passed since the suspected time of drug use, then both blood and urine samples should be collected from the suspect.

METHOD - Blood, urine or other biological samples can be collected by medical personnel using blood vials and containers provided by the medical facility. When submitting hospital vials and containers, please make sure they are leak proof. Submit an RFLE with the evidence, including the nature of the offense, manner in which evidence was collected (e.g., search warrant) and types of examinations requested (ethanol or specific drugs). Alternatively, the DUI/DUID Blood Specimen Collection Kits may be used for collection of these samples but the submitting officer needs to clearly state that this is not a DUI/DUID

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investigation on the required RFLE. The testing protocol for this type of case will be determined by a toxicologist (or designee) based upon the request and provided history.

DISCUSSION - Once the analysis is complete, the evidence and CoA will be returned to the investigating officer.

ITEM - Drug-Facilitated Crimes Cases

In cases of alleged drug-facilitated crimes, both blood and urine samples should be collected if the alleged incident/drugging occurred within 24 hours of examination. If alleged incident/drugging occurred more than 24 hours but less than 120 hours (5 days) prior to examination, collect and submit urine only. If the time from the alleged incident/drugging and the collection is greater than 120 hours (5 days), the samples will be returned to the submitting agency. This provision addresses the pharmacokinetic properties of most drugs and alcohol and the toxicological significance of analytical results obtained from these samples.

METHOD - The small purple top blood tube in the Physical Evidence Recovery Kit (PERK) does not provide enough sample for a complete toxicological investigation, so additional blood and urine samples are required. When collecting evidence, request the Sexual Assault Nurse Examiner (SANE) to collect additional blood samples in 2 gray top tubes ***and*** a urine sample if the sexual assault occurred less than 24 hours prior to examination. If the sexual assault occurred more than 24 hours prior but less than 120 hours (5 days) to examination, instruct the SANE nurse to collect a urine sample **only**. Keep these samples separate from the PERK and submit them along with the completed *Questionnaire for Drug-Facilitated Sexual Assault Cases* located inside the PERK to the laboratory as a separate item with a request for a toxicological examination.

DISCUSSION - The sooner blood and urine samples are collected after the alleged assault, the greater the chance of detecting drugs that are quickly eliminated from the body if they are present.
GHB panel testing will not be pursued if more than 15 hours (or 8 hours) had passed between the alleged incident/drugging and the collection of urine (or blood) specimen(s). This provision addresses the pharmacokinetic properties of GHB/GHB analogues and the toxicological significance of analytical results that may contribute to the investigation of a drug facilitated crime.

ITEM - Alcoholic Beverage
Suspected alcoholic beverages may be submitted to the Toxicology Section to determine alcohol content. Determination of alcohol content requires at least one ounce of liquid.

METHOD - Submit original container whenever possible. If the original container is open or could potentially leak, transfer at least 1 ounce of liquid to a clean glass screw top bottle prior to submission. If evidence contains multiple samples submit one representative item from each brand or type of beverage for analysis. Submit the samples with the required RFLE indicating the requested examination as “Alcohol Content.”

DISCUSSION - Alcohol evaporates easily so make sure evidence is sealed tightly and refrigerate if possible.

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ITEM - Poisoning Cases

Poisoning cases are extremely rare and require specific handling and collection. Please contact the Toxicology, Controlled Substances or Trace Evidence Sections for suggestions and instructions on submission of poisoning cases. Items such as empty bottles, partially eaten food, liquid from glasses or other containers, medicinal products, as well as many other possibilities, may be the key piece of evidence in these cases. Depending on the nature and circumstances of the poisoning, evidence may be analyzed by the Toxicology, Controlled Substances, and/or Trace Evidence. Note that evidence related to food adulteration may need to be submitted to the Division of Consolidated Laboratory Services.

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