CHAIN OF CUSTODY

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Objectives:

By the completion of the lecture the audience should answer the following questions:

- What is meant by chain of custody?
- How to apply the chain of custody?
- What are the biological materials that are used for testing and how to choose?

What is meant by chain of custody?

It is the ability to trace and safe guard the sample through all steps from collection, analysis, to final report of the result .

How to apply the chain of custody?

1- Sample(s) collection.

2- Personnel and security .

3- Storage and use of sample.

Collection of sample

- Written consent from donor.
- Identification of the donor.
- Type of sample.
- Problems arise from storage, transfer and standards used to test.

1- Sample(s) collection.

Chain of custody sheet or form:

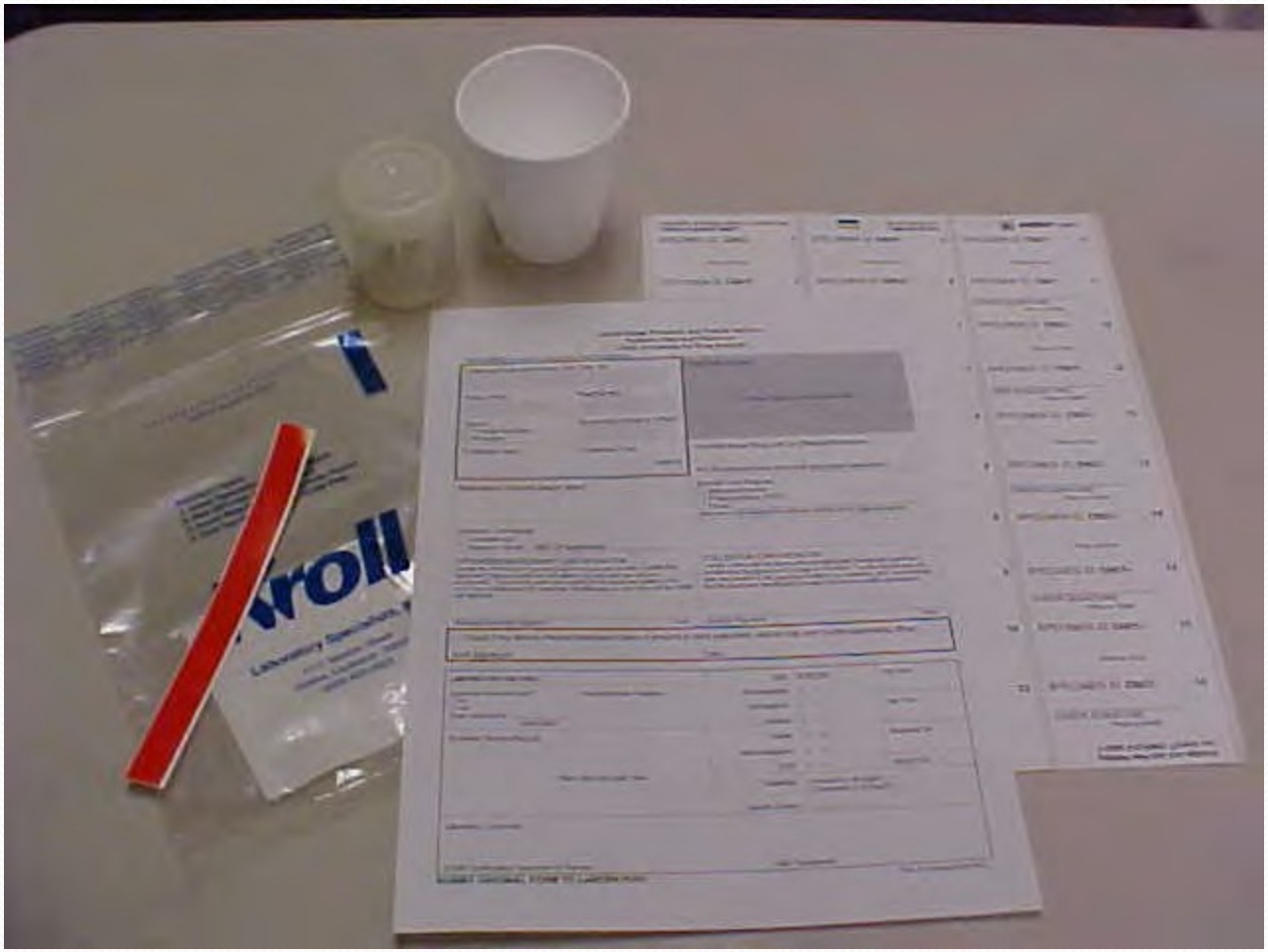
- Sample ID
- Date and time
- Preservation
- Analysis required
- Name of collector

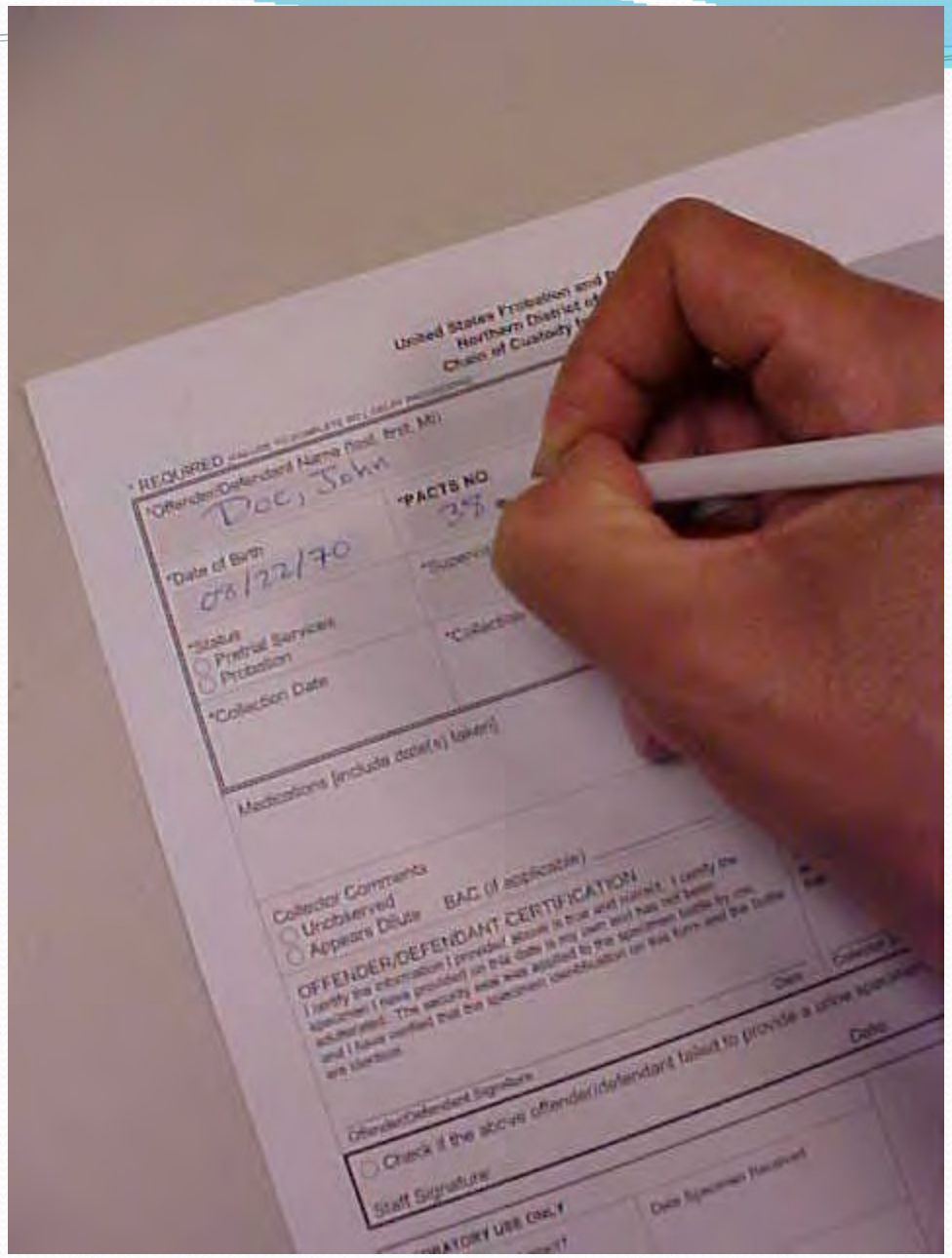
Each time possession of samples is transferred, both the person delivering the sample and the person receiving the sample sign the form and record the date and time on the COC.

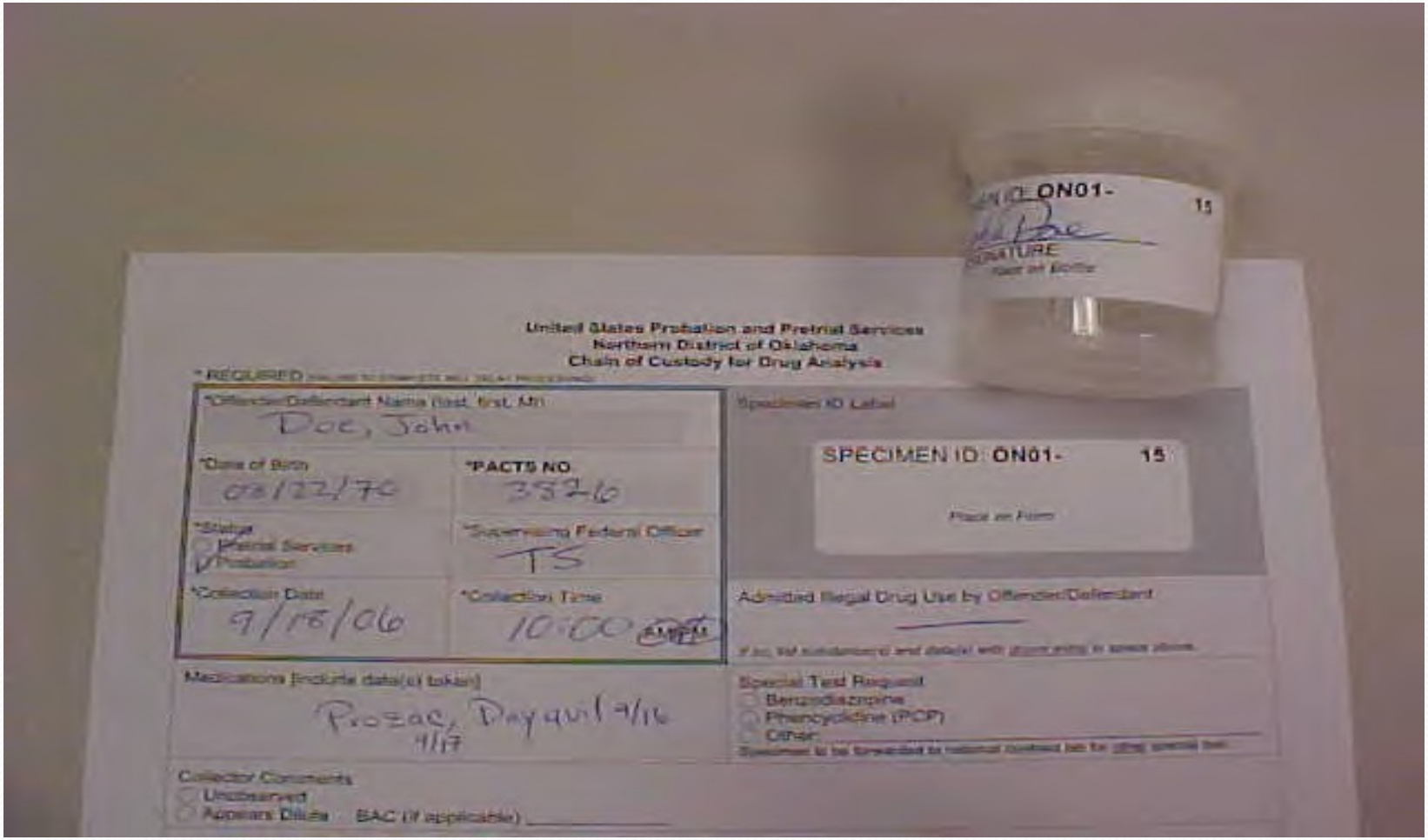
1- Sample(s) collection.

An accompanied analytical toxicology request

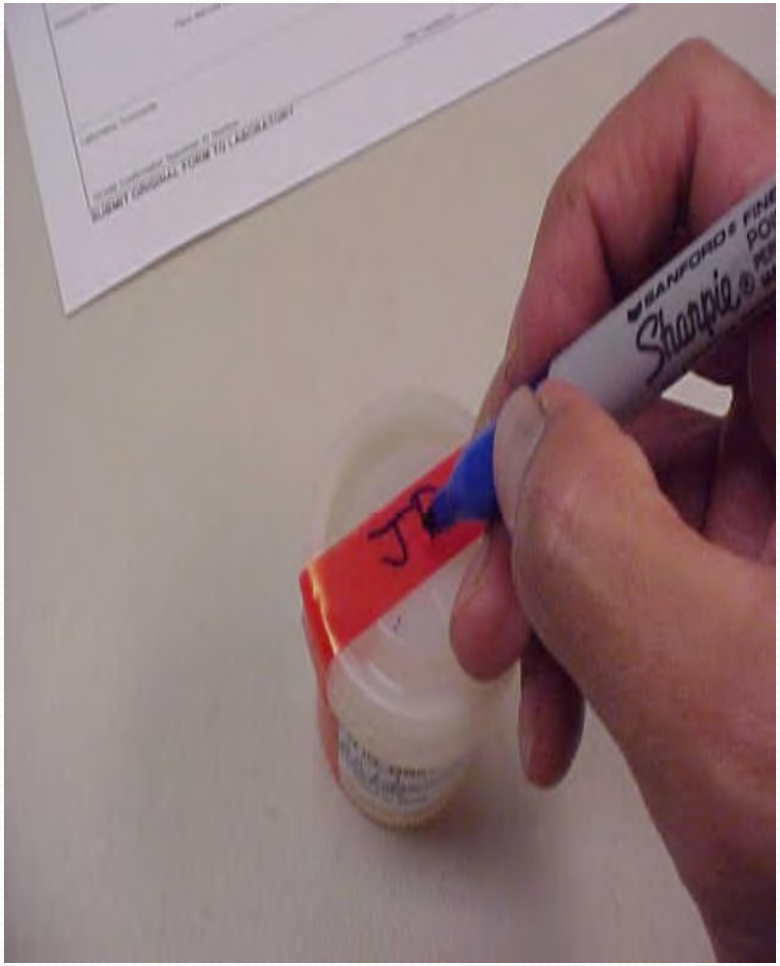
- Suspected agents.
- Suspected dose.
- Time of ingestion and sampling.
- Clinical presentation.
- Location of the patient.

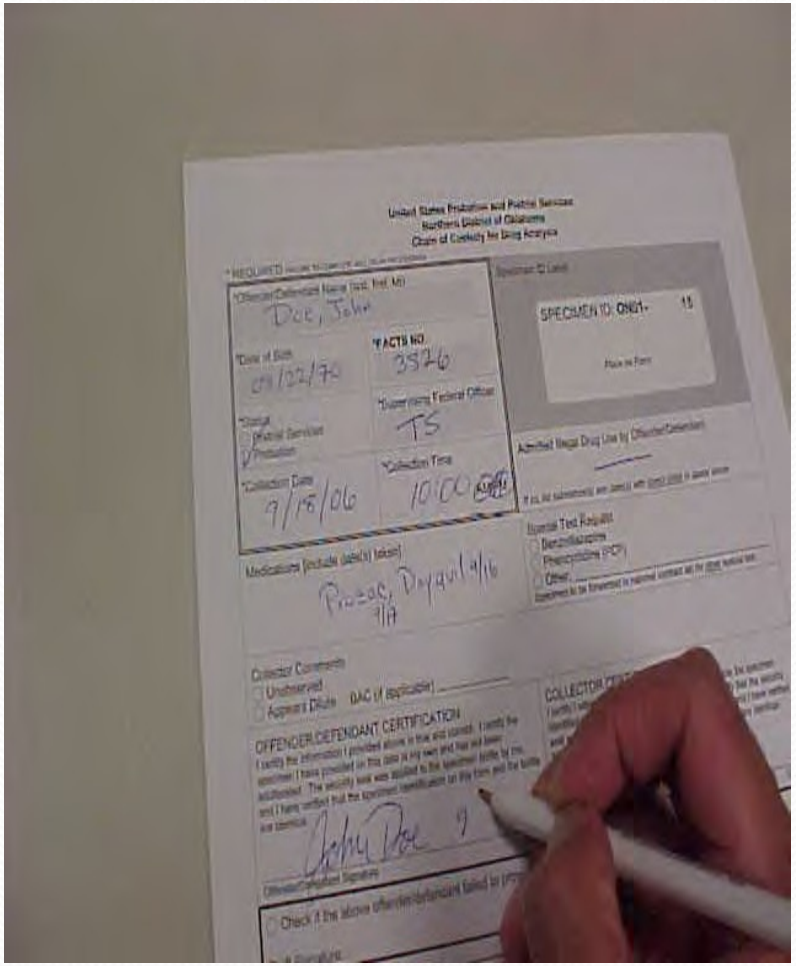


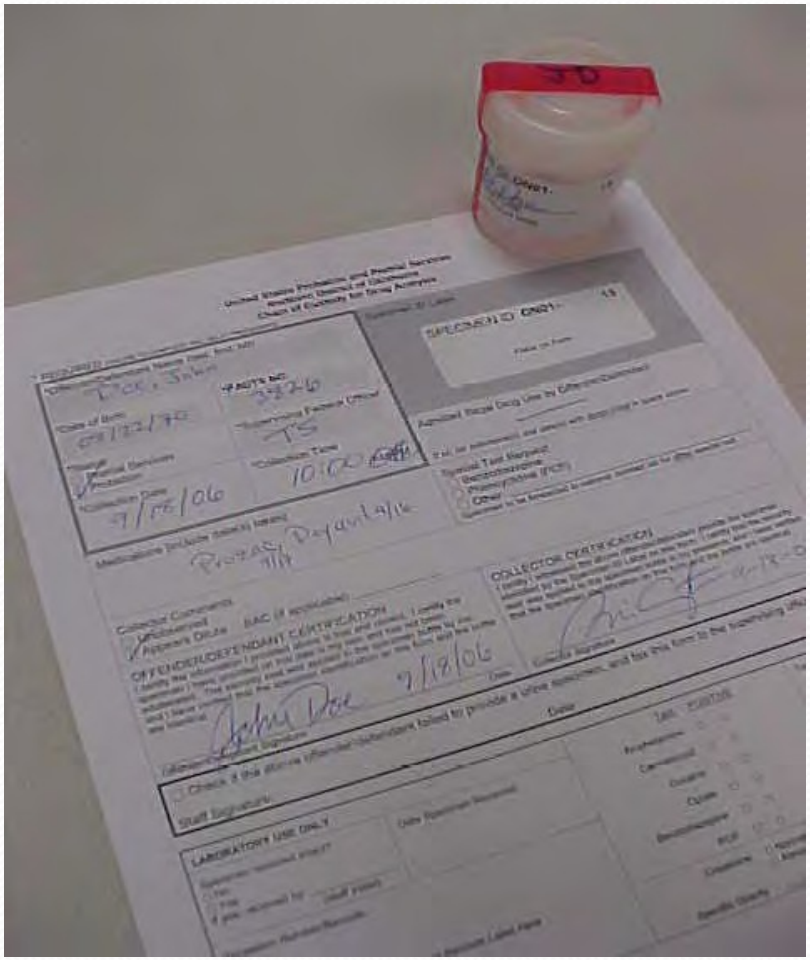

Doe, John
08/22/70
Pretrial Services
Probation
Collector Comments
Unobserved
Appears Dilute
BAC (if applicable)
OFFENDER/DEFENDANT CERTIFICATION
Check if the above offender/defendant failed to provide a urine specimen
Staff Signature


ON01-
15
United States Probation and Pretrial Services
Northern District of Oklahoma
Chain of Custody for Drug Analysis
*Offender/Defendant Name (last, first, MI)
Doe, John
*Date of Birth
02/22/70
*PACTS NO
3526
*Supervising Federal Officer
TS
*Collection Date
9/15/06
*Collection Time
10:00
Specimen ID Label
SPECIMEN ID: ON01- 15
Admitted Illegal Drug Use by Offender/Defendant
Medications (include date(s) taken)
Prozac, Daily 9/16
9/17
Special Test Request
Benzodiazepine
Phencyclidine (PCP)
Other
Collector Comments
Unobserved
Appears Dilute
BAC (if applicable)


SPECIMEN ID: ON01
SIGNATURE
Place on Rou


Sharpie


United States Probation and Pretrial Services
Northern District of Oklahoma
Chain of Custody for Drug Analysis
Doe, John
PACTS NO.
3526
TS
9/18/06
10:00
SPECIMEN ID: ONE1- 15
Prozac, Dayquil 9/18
Collector Comments
Unobserved
Appears Dilute
OFFENDER/DEFENDANT CERTIFICATION
Check if the above offender/defendant failed to provide a urine specimen


United States Probation and Pretrial Services
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Doe, John
PACTS NO.
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TS
9/18/06
10:00
SPECIMEN ID: ONE1- 15
Prozac, Dayquil 9/18
Collector Comments
Unobserved
Appears Dilute
OFFENDER/DEFENDANT CERTIFICATION
9/18/06
COLLECTOR CERTIFICATION
Check if the above offender/defendant failed to provide a urine specimen
LABORATORY USE ONLY


Quest
Diagnostics


Authorized Personnel
Quest
Diagnostics

No Test

- Arrival of sample without chain of custody form.
- Red tamper seal is missed or broken.
- chain of custody form is not signed by either collector or subject.
- Sample ID on label and chain of custody form do not match.
- No initials by the subject on Red tamper seal.
- White sample ID label overlaps the Red tamper seal.

- **Each time possession of samples is transferred, both the person delivering the sample and the person receiving the sample sign the form and record the date and time on the form.**

T.Coliform report 24265

Group report 24270

CHAIN OF CUSTODY RECORD

Analyses Required

Name: Susan Tagesson

Project: Well Group

Address: 500 Foster St
North Andover MA 01845

Phone: (978) 682-8800

Type / Container	Preservation		
T.C.= Time Composite	Metals	HNO3	pH<2
F.C.= Flow Composite	TPH, O&G	HCl	pH<2
Grab	Nitrogen, COD	H2SO4	pH<2
P = Plastic	Cyanide*	NaOH	pH>12
G = Glass	BOD, Solids	sampler and cooler iced	4°C
V = VOA vial	* Neutralize chlorine with ascorbic acid		

Sample Description	Type/Container/Volume	Preservation	T.Coliform	Well Group	NEL ID
Well Water	Sterile / ~120ml	Chilled	X		54827
	Plastic/ 1 L	Chilled, *HNO3		X	54827
Date collected: 4/4/05					
Time collected: 2:45 pm					

Collected by: [signature]

Received by: | Date & Time

Relinquished by: | Date & Time

Relinquished by: [signature]

Received by: [signature] 4/4/05 3:00pm | Date & Time

Comments:
* 250 ml aliquot preserved at lab with HNO3 for metals analysis.
Brian Arnold @ Siemens.com

Northeast Environmental Laboratory, Inc.
108 Rainbow Terrace, Unit H
Danvers, MA 01923
Tel (978) 777-4442
Fax (978) 774-1744

paid in full $50 — $5 charge

1- Sample(s) collection:

In forensic cases : the specimens collection is very important since there is rarely an opportunity to recollect specimens. Bodies have usually sent out of mortuary.

In clinical cases: the presence of drug at the time of original collection is usually desired, hence any later collection is worthless.

Choice of specimens

It depends on:

- The purpose of the testing

-The instrumentation and The methodology

Choice of specimens

In situation:

live persons, the specimens are:

- Blood (for plasma or serum) for quantitative analysis.
- Urine for qualitative.
- Gastric contents may be for diagnosis of toxicities as phosphides rodenticides or for medico-legal causes.
- Other specimen as saliva, hair, nail and sweat are being increasingly used as alternatives to plasma and urine and can be provide additional information.

In dead persons:

- All samples that can be collected from living persons.
- Tissues.

Specimens

1- Blood
2- Urine
3- Gastric
4- Liver and other tissues specimens
5- Bile
6- Vitreous humor
7- Hair
8- Sweat
9- Saliva

Blood

- **Indications: (quantitative analysis)**
  - Analysis for recent ingestion.
  - Therapeutic drug monitoring.

In clinical cases it is taken from the veins in the arms.

In post mortem is preferentially taken from femoral region to avoid contamination from abdominal fluids and contents and to reduce the artefactual due to redistribution.

Blood

- **Volume : 5-20ml**.

- **Serum:** When whole blood is allowed to stand (15 min, room temperature) in a plain tube (no anticoagulant) a clot forms that will retract sufficiently to allow serum to be collected. For many analyses serum is preferred to plasma because it produces **less precipitate (of fibrin)** on freezing and thawing.

Blood

ANTICOAGULANTS

- EDTA
- Oxalate
- Heparin
- Sodium Citrate
- Sodium Fluoride/Potassium Oxalate

Blood

ANTICOAGULANTS

EDTA (Ethylenediaminetetraacetic acid):

- Two forms are used: The tripotassium salt (**K3EDTA**), and the disodium salt (**Na2EDTA**).
- 0.5 -2.0 mg **EDTA** per ml of blood will preserve blood excellently for at least 6 hours. Refrigeration will extend the preservation to 24 hours.

Blood

ANTICOAGULANTS

Oxalate

- A mixture of dry **ammonium oxalate and potassium oxalate** in the ratio of 3:2.
- 2 mg of the mixture will prevent coagulation in 1 ml of blood.

Blood

ANTICOAGULANTS

Heparin

- The optimum concentration is 0.1 to 0.2 mg/ml of blood.
- It interferes with the formation and/or activity of thrombin and the activity of clotting factors IX, X, XI, XII.

Blood

ANTICOAGULANTS

Sodium citrate

- The standard concentration is 1 part 3.8% solution to 9 parts of blood.

Sodium fluoride - Potassium oxalate mixture

- 4 parts sodium fluoride + 5 parts potassium oxalate.
- Optimum concentration is 1 mg of the mixture per 1 ml of blood.

Blood

- **Disadvantage:**
  - **Blood concentration of drugs are often low and short time limited.**
  - **Not all blood levels correlate with clinical effects.**
  - **Basic drugs have large of distribution, so urine is preferable.**

Urine

Collected over interval of time (1, 4, or 24 hours.

Clean, early-morning, fasting sample is the most concentrated one.

Urine

Advantages:

- Concentrations of drugs or their are usually much higher than in blood.
- The drugs may be detected for longer time.
- Easy sample preparation and analysis.
- Volume collected can easily exceed 20ml.
- Non invasive technique for collection.

Urine

Disadvantages:

- Can easily adulterated, diluted or substituted.
- A recently ingested drug may not yet have been excreted into urine, and if it provide little information about the amount present in blood. **So indicated for screening of drug of abuse and sports testing.**
- Bacterial contamination (refrigeration).

Gastric contents

Advantages:

- A very useful indicator of drug exposure.
- The presence of drug in higher dose than the therapeutic dose is a good evidence of recent drug ingestion.
- The whole content of the stomach in deceased person are provided to the laboratory.

Disadvantage:

- **Recent ingestion may be misdiagnosed by re-excretion of the drug in stomach e.g. morphine and heroin.**

Liver and other tissues specimens

Advantages:

Liver :

- Easily collected and easily homogenized.
- **The primary specimens in decomposed cases**

When blood is not available.

Volume :≥ 100 g

Other tissues (skin , fat, muscle and bone) can be useful when a more accurate estimate of total body is required.

Bile

Advantages:

- Drugs can persist for longer time than blood
- Drug can appear before it is excreted in urine.

Volume : ~10mL

Collected in:

- Plain
- Potassium fluoride treated plastic tube
- Glass.

Hair

Advantages:

- To establish drugs used many weeks to months prior to collection.
- Non invasive for pre-employment analysis.
- For metal poisonous metals such as arsenic, mercury and lead and drug of abuse.

Hair

Disadvantages:

- **Contamination from internal or external source**
- **Only for quantitative.**

Weight : at least 50mg

Collected from the back of the head at room temperature in a sealed plastic bag

Hair

Factors affecting retention and concentration of substances in hair:

i Physiochemical properties of substances (basic>neutral> acidic)

) Dose of substance and frequency of administration.

o Mechanism of incorporation (blood, sweat, sebaceous secretions)

b Hair color and type (African and Asian hair show greatest retention)

i Bleaching of hair and other hair treatment.

r Decontamination and extraction method for analysis.

Sweat

- Sweat patches have been used to absorb sweat by keeping in contact with skin for 1-5 days.

- Drugs detected in sweat include: BNZ, amphetamines, cocaine, heroin, morphine, methadone and PCP.

Saliva

- Drugs may enter saliva from blood by:
  - Passive diffusion.
  - Ultrafiltration.
  - Active secretion.

- Specimens can be stored at -20 °c, unless analysis is conducted.

Saliva

Disadvantages:

- Small mount and little ability to repeat analysis.
- Not all subjects will be able to provide saliva on demand.
- Interpretation of saliva drug concentrations is more difficult than blood because it differs according to:
  - Protein binding
  - pKa of drug
  - pH of saliva
- Contamination of saliva by recently ingested drug is a real problem.

Vitreous Humour

- Quite useful for estimation of alcohol, digitoxins particularly when some putrefaction in the body has occurred.

- **Volume : 1-2mL**

- **Storage** in a 2-5mL plastic, plain or potassium fluoride preserved containers at -20 °c or below.

Personnel and security .

- Specific qualification of the laboratory personnel .

- Maintaining of a security system so as the samples are only accessible by authorized personnel.

- The COC forms accompany the samples to the laboratory. When the analysis is completed, the COCs are included with the report.

Storage of sample(s):

- All biological specimens should be stored at 4 °C prior to analysis.

- For medico-legal purposes specimens should be kept at -20 °C for longer times.

Thank you