

# TOXICOLOGY STUDENT PACKET

## STUDENT PAGE

### Purpose

- To examine fluids that can be taken from the body either pre- or post-mortem to help determine cause of death
- To understand the scientific process as it applies to determining cause of death (what a particular result can or cannot tell you)
- To perform various tests and analyze various test results to see what can be learned

### Materials

- 2 Narcotics reagent test tubes
- 1 Vial marked "urine"
- 1 Vial marked "blood"
- 1 Cocaine test key (two-part blue squares)
- 2 Plastic pipettes per group
- 1 Copy of Toxicology Report
- 1 Copy of Toxicology Handbook
- 1 Copy of Toxicology Student Questions

Lab safety equipment is optional but recommended.

- Lab gloves
- Goggles

### Procedure

1. After putting on gloves and goggles, take a clean pipette and use it to transfer fluid from the blood vial into the test tube.
2. Put at least one full pipette of the fluid into the test tube and cap it.
3. Gently squeeze the bottom of the test tube until the cylinder inside breaks. Shake the tube (keeping a finger on the lid to keep it on) until the test chemical and fluid you added mix. A blue color indicates a positive test. Use the color card to determine if you have the appropriate color. Any other color or an absence of color indicates a lack of cocaine and/or closely related drugs, such as procaine, lidocaine or tetracaine.
4. Gently squeeze the top of the test tube until the cylinder inside breaks. Again, shake the tube until the test chemical mixes with the fluid, keeping a finger on the lid. If there is still a blue color in the tube, then cocaine is present. The second half of the test eliminates the related drugs such as procaine, as they do not cause a blue color. Dispose of the test tube in a garbage can with a plastic liner. The top of the tube will begin decomposing after about 10 minutes.
5. Record your results for your final autopsy report.
6. Repeat steps 1-5 for the urine sample. Keep in mind that you should use a clean pipette to avoid any contamination from other fluids or tests.

# TOXICOLOGY REPORT – CASE # 55269M

***Peripheral blood taken from antecubital fossa (arm vein) by hospital personnel when patient was admitted at 11:45 PM on August 26, 2008.***

Ethanol – 0.17G%

Cotinine – Positive

Lidocaine – Positive

Atropine – Positive

Cocaine – Trace

Ethylbenzoylecgonine – 0.12  $\mu\text{g}/\text{mL}$

Benzoylecgonine – 0.36  $\mu\text{g}/\text{mL}$

Ecgonine Methyl Ester – Positive

Opiates – Negative

Cannabinoids – Negative

Benzodiazepines – Negative

Metoprolol – 0.33  $\mu\text{g}/\text{mL}$

Caffeine – Positive

***Urine sample taken from patient by hospital personnel when patient was admitted at 11:45 PM on August 26, 2008.***

Nicotine – Positive

Cotinine – Positive

Lidocaine – Not Detected

Atropine – Not Detected

Cocaine – Positive

Ethylbenzoylecgonine – Positive

Benzoylecgonine – Positive

Ecgonine Methyl Ester – Positive

Opiates – Negative

Cannabinoids – Negative

Benzodiazepines – Negative

Metoprolol – Positive

Caffeine – Positive

# TOXICOLOGY HANDBOOK

**Atropine** – A drug often given by emergency medical personnel to start or stimulate the heart.

**Benzodiazepines** – A group of prescription drugs that depress the central nervous system. They can be prescribed for insomnia, panic and anxiety, high blood pressure or to control certain types of seizures. These drugs can also be injected to control severe muscles spasms or before surgery to relax the patient. Many of these drugs can be habit forming.

**Benzoyllecgonine** – The major metabolite of cocaine. It is biologically active but it does not contribute to the euphoria experienced by the person using cocaine. This compound does affect the coronary blood vessels and contributes to the toxicity experienced by the user.

**Caffeine** – A central nervous system stimulant found in coffee, tea, many soft drinks, several types of food, and many other drugs. Caffeine can increase heart rate, constrict blood vessels, and relax air passages to improve breathing or allow some voluntary muscles to contract more easily.

**Cannabinoids** – A group of drugs that come from the cannabis plant (marijuana). Cannabinoids increase heart rate, cause impairment of short term memory, interfere with concentration and possibly create mood changes. These compounds give the user an altered perception of time and increased feelings of hunger. Higher doses can interfere with motor skills and the ability to perform complex tasks. Individuals on cannabinoids should not operate machinery, drive or work in dangerous environments. Alcohol and cannabinoids have a synergistic effect and increase the toxicity beyond what either drug would have on its own.

**Cocaine** - Cocaine is a strong central nervous system stimulant that constricts blood vessels while also increasing temperature, heart rate and blood pressure. This drug may also cause feelings of restlessness, irritability and anxiety. Cocaine is powerfully addictive and a tolerance to the cocaine high may develop rapidly after first exposure. A first exposure to cocaine can cause permanent damage to the cardiac and respiratory systems. There is no “safe” dose when the drug is administered by individuals other than qualified medical personnel, as the user has no real way of knowing the concentration of the drug when it is obtained on the street. See <http://www.nida.nih.gov/DrugPages/Cocaine.html>. Cocaine works by blocking the uptake of the neurotransmitters norepinephrine, serotonin and dopamine thereby producing a false sense of euphoria, or a ‘high.’

**Cotinine** – A metabolite or byproduct that the human body creates from nicotine. It is an indicator that nicotine has been inhaled or otherwise introduced into the body.

**Dopamine** - Dopamine can be naturally produced by the body or added in the form of a drug. In the brain, naturally produced dopamine functions as a neurotransmitter. Dopamine

can also be supplied as a drug which acts on the sympathetic central nervous system, producing effects such as increased heart rate and blood pressure. However, since dopamine administered externally cannot cross the blood-brain barrier, dopamine given as a drug does not directly affect the brain.

**Ecgonine Methyl Ester** – The cholinesterase enzyme converts cocaine into this substance. This metabolite of cocaine is inactive in the body.

**Ethanol** - A flammable, colorless chemical compound which is found in alcoholic beverages, and is also known as ethyl alcohol or grain alcohol. It is most often referred to simply as alcohol. Ethanol is a sedative hypnotic agent that can have profound impacts on judgment, fine motor function, and reaction time. If consumed excessively, ethanol can impede movement and self-protective reflexes as well as depressing respiration and heart function. For further information on the effects of ethanol, see:

[http://brown.edu/Student\\_Services/Health\\_Services/Health\\_Education/alcohol\\_tobacco\\_&\\_other\\_drugs/alcohol/index.php](http://brown.edu/Student_Services/Health_Services/Health_Education/alcohol_tobacco_&_other_drugs/alcohol/index.php).

**Ethylbenzoylecgonine** – A metabolite that forms in the body when both ethanol and cocaine are present. It is also known as cocaethylene. It is biologically active, like cocaine, but takes longer to be eliminated from the body. Because of this longer elimination time, this compound is more damaging to the heart and cardiovascular system. Ethylbenzoylecgonine has similar euphoric properties to cocaine. Some studies suggest that it is more toxic than cocaine itself, particularly to the heart.

**Lidocaine** – A drug that can be used as a topical anesthetic or as an antiarrhythmic agent. Lidocaine is often administered in emergency situations to strengthen heart contractions.

**Metoprolol** – A prescription drug given for hypertension (high blood pressure). The drug works by slowing the heart rate and relaxing the blood vessels so the heart does not have to pump as hard.

**Nicotine** – A drug found in tobacco that typically enters the system through inhalation or absorption through lips or gums. Nicotine's effects include increases in blood pressure and heart rate, as well as increased respiration. Long term exposure to tobacco and nicotine increases the chances of cancer and heart disease and results in addiction and dependence.

**Opiates** – A class of drugs from the poppy plant, which includes morphine, opium and heroin. Opiates are some of the most effective pain relievers available to physicians for treating pain. However, when used improperly without medical supervision, many opiates can become addictive. Opiates affect the respiratory center in the brain and overdoses can cause a person to stop breathing.