

EDVOTEK® MyLab™ #1232

How is Substance Abuse Determined?

STORE AT ROOM TEMP.



Designed for the Classroom
SINCE 1987

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OBJECTIVES

Students will learn about the effects of drugs of abuse on physical and mental health and the consequences of dependence and addiction. Two reactions for the detection of a drug will be tested on simulated urine samples.

COMPONENTS

This experiment contains reagents and disposables for three (3) experiments. All reagents are simulations.

- Negative Control
- Positive Control
- Driver (D) Urine Sample
- Passenger 1 (P1) Urine Sample
- Passenger 2 (P2) Urine Sample
- Reagent A
- Reagent B
- Reaction tubes with caps
- Microtip transfer pipets

REQUIREMENTS

- Test tube holder
- Permanent Marker

GENERAL SAFETY PRECAUTIONS

Parental or adult supervision required.

1. Designate a clean and uncluttered area for performing experiments.
2. Read all instructions before you begin.
3. Do not eat or drink. Do not apply make-up or contact lenses. Adult(s) should not smoke while performing experiments.
4. Wash your hands before and after performing the experiment.
5. Gloves and goggles should be worn routinely as good laboratory practice.
6. Disinfect the counter top or bench with 70% isopropyl alcohol (rubbing alcohol), or place clean newspaper over the area to be used.

SAFETY PRECAUTIONS

At the end of the experiment, soak all tubes in 10% bleach for at least 20 minutes before discarding them in the trash.

**WARNING: Choking hazard. Product may contain small parts.
Not appropriate for children under 5 years old.
No human or animal products are used in any experiments.**

INTRODUCTION

Drug abuse and addiction can devastate a person's health and can profoundly affect their families and communities. Our society has seen an increase in drug consumption. We are also becoming more aware of the devastating effects of drug dependence and/or abuse. Finally, we are beginning to recognize drug addiction as a complex disease of the mind and body and are investing in new treatment approaches.

"Drug" is the general term used for substances of abuse that include alcohol, addictive drugs, prescription drugs, and over the counter medications. Most misused prescription drugs are painkillers that change perceptions and can result in the temporary removal of unhappiness, physical pain, and feelings of hopelessness. Yet another group of drugs are performance enhancers that are used in various competitive athletics.

The human body reacts to drugs by adapting how the body functions. Misuse of drugs can result in dependencies that can have many physical effects. Drugs can also profoundly influence a person's behavior. When a person is addicted to a drug, behavioral symptoms can persist even when the drug is not physically in their body.

The brain is a complex organ that controls and directs all our activities. It consists of various regions that direct different functions. Drugs that are abused often alter behavior by influencing the brain stem and the limbic system (figure). The brainstem controls heart rate, breathing, eating, and sleeping and is located right above the spinal cord. The limbic system is located on top of the head under the cortex. This is a part of the brain that developed early in human evolution. It regulates emotions like pleasure, fear, and anger. At a cellular level, drugs alter the way nerve cells in the brain send, receive, and process information.

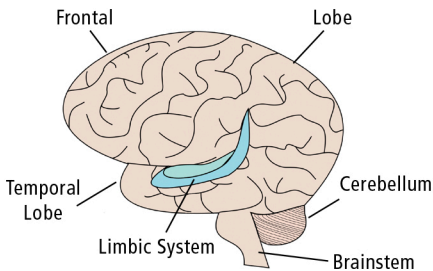


Figure 1: Areas of the Brain

INTRODUCTION, *continued*

Unfortunately, substances that target the human brain do more than temporarily alter a person's moods. Over time, drugs can change the chemistry of the brain and create strong "more" signals that can cloud a person's judgment and influence their actions. When this happens, the person has become addicted to the drug. Other drugs *immediately* alter a person's reaction time and distort their perceptions. This can lead to compromised decision making and riskier behavior.

Substance abuse is the use of any mood-altering substance in a way that has harmful effects. Health officials differentiate between substance use and substance abuse, but it is up to the individual to determine what category their behavior falls into.

Harmful effects of substance abuse can include serious health problems, failure to meet responsibilities, depression, anxiety, impaired emotional control, loss of friends, family tensions, financial problems, legal consequences, injuries, or even death. Because of brain changes, it is often hard for a user/abuser to see these harmful effects. However, for individuals who do think that they have a substance abuse problem, there are treatments including support networks and rehabilitation programs.

There are no clear tests for drug abuse. The only thing scientists can test for is the presence or absence of drugs in a person's body. A drug test is a technical analysis of a biological sample to determine the presence or absence of certain drugs and their metabolites. (Metabolites are intermediate chemicals that are created when the body processes a drug.) Urinalysis is the most common test type and the "Gold Standard" of drug testing. Other types of tests include hair, blood, sweat, saliva, and even breath drug tests.

Drug tests are part of many rehabilitation programs as they help ensure that participants are meeting abstinence goals. Tests for illegal drugs are also used by some employers and are a routine part of many professional sports. Another place drug tests are used is in the emergency room when someone is unconscious and/or exhibiting unusual symptoms and behavior. In some circumstances, the police also use drug tests when a crime or "trigger offense" has occurred, and when there are reasonable grounds to believe that the offense is linked to drug use.

EXPERIMENTAL OVERVIEW

Three individuals who were traveling in a vehicle at high speeds close to midnight were stopped by two state police officers. The officers quickly noticed that the driver and passengers were agitated and unable to clearly answer their questions. The officers also discovered that the driver had a previous arrest record for drug abuse and distribution. When the officers searched the car they found a white powder. When asked, one of the passengers answered this was medication for his headache. Based on their speeding, interview answers, and possible evidence, the officers arrested the driver and the two passengers, brought them to the police station, and obtained urine samples. These samples and the white powder were sent for analysis. Based on chemical analysis in the laboratory, scientists identified the white powder as an over the counter medication known as DR1 that can be abused and made into a powerful drug.

In this experiment, you are the clinical chemists who will test the three urine samples for DR1 using two chemical reactions. The first reaction is a colorimetric (based on color change) test. The second reaction, used to confirm the first, identifies DR1 using both color change and precipitation (the formation of a new and solid chemical). Positive and negative control samples will be used to ensure that the reagents perform as expected and the test was correctly carried out.

EXPERIMENTAL PROCEDURES

1. Label a tube "-". This is your negative control.
2. Add 4 drops of the provided negative control.
3. Label a tube "+". This is your positive control.
4. Add 4 drops of the provided positive control.
5. Add 2 drops of Reagent A to both tubes.
Observe and record any reactions. If there is a color change, proceed to step 6.
6. Add 2 drops of Reagent B to any tube with a color change from step 5. Quickly observe and record any changes within one minute.
7. Label three tubes "D", "P1", and "P2". These are your test samples.
8. Add 4 drops of the appropriate sample to each tube.
9. Repeat steps 5 & 6 to complete the drug test.

NOTE: Observe and record the initial reaction, then gently mix the contents of the tubes and record any subsequent changes within one minute of adding Reagent B.

continued

EXPERIMENTAL PROCEDURES, *continued*

10. Complete the table below. Which individuals tested positive for DR1?

If there is a color change from yellow to purple after adding Reagent A, the test is positive. Confirm any positive tests by adding two drops of Reagent B. Positive tests will change from purple to yellow and form an orange precipitate when B is added.

Sample	Observation Reagent A	Observation Reagent B	Test Results (Positive or Negative)
-			
+			
D			
P1			
P2			

RESULTS

Both Passenger 1 and Passenger 2 should test positive. The driver should test negative.

STUDY QUESTIONS

1. What is the difference between drug use and drug abuse?
 2. What are examples of substances commonly referred to as drugs?
 3. How are drugs detected in human urine?
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TERMS AND CONDITIONS

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ANSWERS TO STUDY QUESTIONS

1. Both involve taking a mood altering substance. Drug abuse occurs when someone continues to use a drug even after it has begun to have negative effects.
2. Alcohol, addictive drugs, prescription drugs and over the counter medications. Other misused drugs are painkillers and performance enhancers.
3. Traces of drugs or their derivative products of metabolism can be traced by either chemical or biological reactions. Often these reactions are colorimetric and make it easy to identify drug use.