



## The Brain on Prescription Drugs Current Trends in Abuse

### Case scenario:

*At 12:30 PM, a 14-year old boy passes out in his classroom and paramedics are summoned.*



### What classes of prescription drugs are most commonly abused or misused?

The most commonly misused or abused classes of drugs are the **Opioids** such as hydrocodone, oxycodone, and methadone, commonly prescribed for pain relief; **CNS depressants** such as benzodiazepines, commonly prescribed for anxiety and sleep disorders; and **CNS stimulants**

such as methylphenidate and amphetamines, commonly prescribed for ADHD, obesity, and narcolepsy.

Data on nonmedical use of prescription drugs by youths is collected by Monitoring the Future (MTF), a National Institute on Drug Abuse (NIDA)-funded agency. MTF has measured and defined attitudes and trends in teen drug, alcohol, and tobacco use in the U.S. since 1975. In 2009, MTF surveyed high school seniors about non-medical use of Vicodin® and OxyContin® over the past year. One in 10 responded they had used Vicodin® in the past year; while one in 20 reported use of OxyContin®. Those surveyed stated 53% of the abused prescription drugs were secured through a friend or relative; while 30% were obtained through a prescription for themselves.

### Case scenario continued...

*When the paramedics arrived on the scene, the teen was very drowsy though able to maintain his airway. He received O<sub>2</sub> at 4L/min and IVFs were started. Enroute to the ED, the teen became respiratory-depressed with a rate of 8 breaths per minute; he received 2 mg of naloxone IV with good response.*

### How does prescription drug abuse affect the brain?

Repetitive abuse of prescription drugs affects the chemical neurotransmitters in the brain. Drugs that have a tendency for abuse either directly or indirectly affect the brain's reward system by increasing levels of dopamine. The increase in dopamine produces euphoria, or a feeling of being "high", which trains the person to repeat the behavior of drug abuse. Over time, the brain becomes accustomed to the flood of dopamine and reacts by producing less of its own naturally occurring dopamine or by decreasing the amount of dopamine receptors in the brain. This leads to an increased tendency towards drug abuse in an effort to bring dopamine function back into balance. Oftentimes this necessitates the abuser using increasingly large quantities of drug to achieve the same effect. This cycle of abuse may lead to tolerance and addiction. Drug-addicted individuals demonstrate changes to areas of the brain that are central to critical thinking, decision making, judgment, learning, memory, and impulse control.

### Case scenario continued...

*Upon arrival to the ED, the teen admitted to taking 1 tablet of OxyContin® and 6 tablets of oxycodone at 11:00 AM, though he did not know the milligram strengths of the tablets. The teen did not require further administration of naloxone and was transferred to a tertiary pediatric hospital for admission to the PICU for observation. He recovered uneventfully and was discharged the following day.*

### What percentage of hospital visits are related to misuse or abuse of pharmaceutical agents?

Hospital visits related to drug abuse is tracked by the Drug Abuse Warning Network (DAWN). In 2006, of 1,742,887 reported visits to Emergency Departments, 28% solely involved misuse or abuse of pharmaceutical agents. The most frequently implicated drugs were methadone, hydrocodone, and oxycodone. The most commonly involved age group was between 18 and 44 years, though no gender predominance was noted.

### What does recent research in prescription drug abuse indicate about current trends?

Research in IV prescription drug abuse by NIDA director Nora Volkow MD shows that certain areas of the brain including the dopamine reward system (ie, striatum) become highlighted with uptake of labeled drug. Figure 1 illustrates that labeled IV methylphenidate abuse results in enhanced uptake as compared to IV cocaine. Youths who solubilized methylphenidate (Ritalin®) tablets and injected IV reported that the “high” they experienced had a more sustained pharmacodynamic effect than IV cocaine.

### How does the Missouri Poison Center contribute to monitoring prescription drug abuse?

The Poison Center participates by contributing data to the RADARS® System (Researched Abuse, Diversion, and Addiction-Related Surveillance) which is a governmental nonprofit operation of the Rocky Mountain Poison and Drug Center of Denver, CO. The information generated from weekly submissions by 49 U.S. poison centers is used to monitor prescription drugs with abuse liability and to provide timely, product specific, and geographically precise data to regulatory agencies, policymakers, and public health officials. RADARS data confirms that prescription opiate abuse is widespread throughout the U.S.

In 2009, the Missouri Poison Center serviced 139,504 requests for live drug identification; 25,300 of these were specifically for hydrocodone. Due to the substantial staffing resources required to maintain an ever-growing request for pill identifications, the Missouri Poison Center no longer provides live drug identification to the **lay public**. Resources have been reallocated to appropriately align with our principal mission of evaluation, assessment, consultation, and management of poison exposures.

The Missouri Poison Center offers an alternative to live drug identification through an automated drug identification assistant which can be accessed by dialing the Poison Center toll-free at 1-800-222-1222. A web-based pill identifier which matches imprint codes with photos can also be accessed by visiting: [www.drugs.com](http://www.drugs.com).



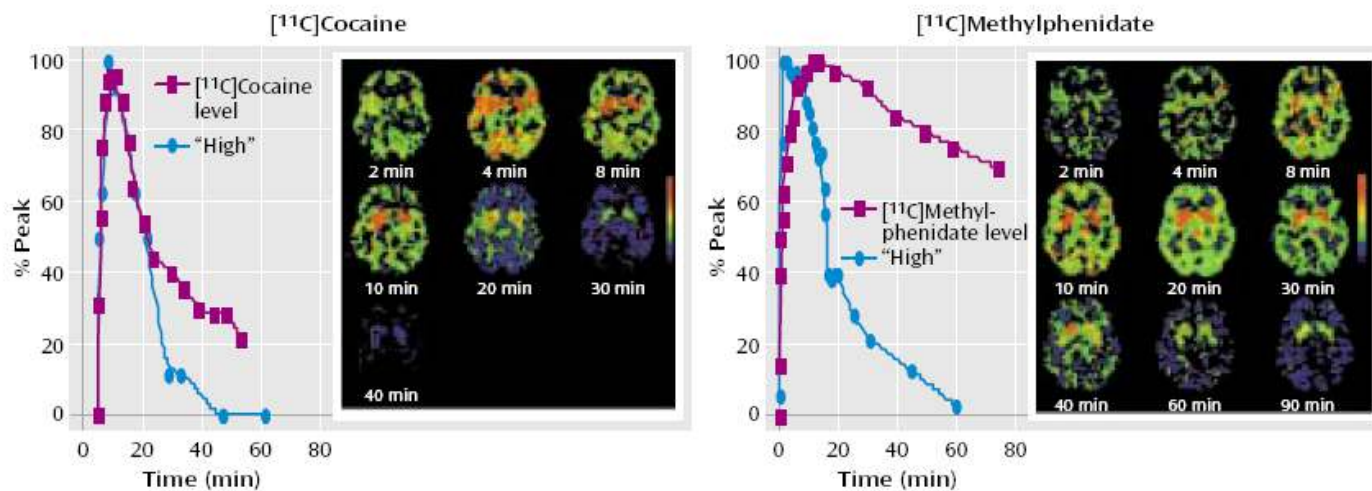
Enter the letters or numbers from your pill



**HINT:** To get more results, enter an imprint only. To further expand your search, try entering only part of your imprint.

For assistance with diagnosis and specific treatment information, please contact the Missouri Poison Center at **1-800-222-1222**.

FIGURE 1. Striatal Uptake and Self-Reports of Being “High” in Cocaine-Abusing Subjects After Intravenous Administration of Cocaine or Methylphenidate<sup>a</sup>



<sup>a</sup> Adapted from Volkow et al. (4): subjects were given pharmacological doses of cocaine (0.6 mg/kg) or methylphenidate (0.5 mg/kg). The graphs show the time activity curves for the concentration of the ligands [<sup>11</sup>C]cocaine and [<sup>11</sup>C]methylphenidate in the striatum alongside the temporal course for subject self-reports of being “high.”

Source: Volkow ND, Swanson JM: Am J Psych 2003

# PoisonSafe Practices

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## Begin 2011 with a Fresh Start

### When was the last time you cleaned out your medicine cabinet?

Poisonings happen. One reason they may happen is keeping expired or unused medicine in the house, creating opportunities for accidents or mistakes. Help keep yourself and your family safe and prevent poisonings by keeping track of the medicines in your home. You may not even realize that you have unneeded, expired, or recalled products. It's time to take action – protect your family and clean your medicine cabinet out! The beginning of a new year is a good time to start. Cleaning out your medicine cabinet is an important step in ensuring the safety of everyone in your household. Ready? Get started.



#### Clean Out Checklist:

- (1) Where are your medicines? Keep medicines and products in your medicine cabinet out of the reach of children and store them in a secure area.
- (2) Keep track of what you have. Approximately six out of 10 teens agree that prescription drugs are easy to get from parents' medicine cabinets.
- (3) Check the Expiration Dates. Almost everything in medicine cabinets has an expiration date, from pain relievers to sunscreen. Check prescription and over-the-counter medications. Expired products should be discarded properly.
- (4) Check for Recalled Products. Check the FDA ([www.fda.gov](http://www.fda.gov)) website to search for recalled products and find out if you have any in your medicine cabinet.
- (5) Throw It Away. Dispose of recalled, expired and unwanted medications and products.

#### Proper Disposal:

Take unwanted medications to a drug take-back program that collects drugs for proper disposal. These programs are offered in many communities throughout the state. Call your city or county government office or health department to check when a program is coming to your area. These events are a safe way to get rid of unwanted medications and keep children, teens, adults, pets and the environment safe and healthy. If a medication disposal program is not available in your area, follow disposal instructions on the drug label or the patient information sheet. Do not flush prescription drugs down the toilet unless the label or patient information sheet tells you to do so.

If a drug take-back or collection program is not available:

- Take your prescription drugs out of their original containers.
- Mix drugs with an undesirable substance such as cat litter or used coffee grounds.
- Put the mixture into a disposable container with a lid, such as an empty margarine tub, or into a sealable bag.
- Conceal or remove any personal information, including the Rx number, on the empty containers by covering it with black permanent marker or duct tape, or by scratching it off.
- Place the sealed container with the mixture and the empty drug containers in the trash.

Certain medicines may be especially harmful and, in some cases, fatal in a single dose if they are ingested by someone other than the person for whom the medicine was prescribed. For this reason, a few medicines have special disposal directions that indicate they should be flushed down the sink or toilet after the medicine is no longer needed so that they cannot be accidentally ingested by children, pets, or anyone else.

#### WHY IS THIS ALL SO IMPORTANT?

**To Prevent Poisonings:** Medications left around the home can be a source of poisonings. Poisonings are not limited to children. Adults often "self-treat" with leftover medications from previous illnesses – a dangerous practice that can result in the person getting sicker or not getting the "right" medicine.

**To Prevent Abuse:** It's been stated that the abuse of prescription medications is the fastest growing drug problem in the nation. This is particularly a problem among teens. Each day 2,500 teens use a prescription medicine for the 1<sup>st</sup> time for a non-medical reason. Medicine cabinets of parents, grandparents, friends or acquaintances are frequently the source.

**To Prevent Misuse:** The sharing of medications with others is an unsafe and potentially deadly practice.

**To Protect the Environment:** Many individuals who would like to dispose of their unneeded medications do not do so because they've heard of contamination of the water supply by medications that are flushed down the drain. Drug "take-back" events offer another option to dispose of medications.

Anyone who has questions about medications or any other potentially hazardous substance is urged to call the Missouri Poison Center at 1-800-222-1222.

# PoisonAlert

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The Missouri Poison Center website is at:

**<http://www.cardinalglennon.com>**. Click on Poison Center under Support Services.



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