Teenage Dextromethorphan Abuse: A Rising Trend

Ilene B. Anderson, PharmD
Clinical Professor
UCSF School of Pharmacy

Senior Toxicology Management Specialist
California Poison Control System - SF
Overview

- Case Studies
  - Pharmacology
  - Clinical Effects
  - Treatment
- Selected Drug Interactions with DXM
- Incidence of Teenage DXM Abuse
- What is being done to curb the abuse?
What is the CPCS?

- CPCS - California Poison Control System
  - 1 800 222-1222 OR 1 800 876-4766
  - 24 hour Emergency Telephone Hotline

- Advice to health care professionals/public

- Over 300,000 consultations a year
  - Calls to the CPCS are voluntary
Case Study

14 year female took #24 ‘Skittles’ during a sleep-over at her friend’s house. Her friends became alarmed when she became agitated and started hallucinating. EMS called.

Vital Signs: HR 150, BP 157/92, T 100

- pupils dilated, nystagmus

One Tonic Clonic seizure soon after ED arrival
**Ingested Product**

**Active Ingredients:**
- Dextromethorphan 30mg
- Chlorpheniramine 4mg
Case Study - Outcome

- Patient was observed for 9 hours
  - Ativan
    - No repeat seizures
  - All symptoms resolved
- Toxicology screen results
  - Positive for phencyclidine (PCP)
  - Acetaminophen was negative
- Patient discharged home
**DXM and the Laboratory**

- **Dextromethorphan**
  - DXM may cause a false positive on the Phencyclidine (PCP) assay

- **Rule out acetaminophen**
  - Common in many OTC cough/cold preps
  - Delayed hepatic toxicity
Dextromethorphan
Pharmacology and Toxicology

[Chemical structure of dextromethorphan]
Dextro-rotatary Isomers

Levorphanol

Dextromethorphan

California Poison Control System
Pharmacology

Dextromethorphan

Dextrorphan (active metabolite)

CYP 2D6

California Poison Control System
Dextromethorphan; Dextrorphan

- Do Not bind to classic opiate receptors
- Minor affinity for ‘opiate’ Sigma (σ) receptor
- Inhibits NMDA Receptor
  - (N-methyl-d-aspartate receptor)
- Inhibits reuptake of serotonin

California Poison Control System
**Toxicology**

**DXM and Dextrorphan**

- **High Dose Dextromethorphan**
  - Antagonism of the N-methyl-d-aspartate (NMDA) receptors
  - Same site of action as other dissociative hallucinogens
- **Ketamine/PCP > Dextrorphan > DXM**
- **Dissociative hallucinations**

---

![Chemical structures](images/dextrorphan.png) ![Chemical structures](images/phencyclidine.png) ![Chemical structures](images/ketamine.png)

**Dextrorphan**  **Phencyclidine**  **Ketamine**

*California Poison Control System*
Clinical Effects ("Plateaus")

- **1st Plateau**: 1.5–2.5mg/kg
  Similar to being intoxicated, GI sx

- **2nd Plateau**: 2.5–7.5mg/kg
  Visual hallucinations, lethargy or agitation, ataxia, nystagmus, tachycardia, hypertension

- **3rd Plateau**: 7.5–15mg/kg
  - Dissociative effects, Disorientation

- **4th Plateau**: 15–30mg/kg
  Fully dissociative (similar to ketamine intoxication), seizures, hyperthermia, arrhythmias
Genetic polymorphisms of CYP 2D6

- **Poor metabolizers (PMs)**
  - Produce less Dextrophan
  - Experience higher incidence of side effects
    - Nausea, Vomiting, Dysphoria
  - Less likely to abuse DXM

- **Extensive metabolizers (EMs)**
  - Produce more Dextrophan
  - Experience more of the euphoric, “desired” mind altering effects
  - More likely to abuse DXM
Hidden Ingredients

Do they pose a risk?
Case Study 2

- A 14yo M skipped school with friends and took 16 Coricidin HBP Maximum Strength Flu tablets to get high.
  - Friends claim he was acting goofy, slept for a while, but seemed okay.
  - Skipped dinner and went to sleep early.
Case study 2; continued

Later that evening he started vomiting
- Mother called the Poison Center
- Patient referred into the ED

Acetaminophen poisoning
- Dose (16 tabs x 500mg = 8,000mg)
- Risk of liver Damage
- Symptoms are delayed about 10 hours.
Product Ingested

Ingredients:
Acetaminophen 500mg
Chlorpheniramine 2mg
Dextromethorphan 15mg
Case Study 2; Outcome

- Laboratory findings
  - Acetaminophen 55 mg/L at 13 hours
  - Elevated liver enzymes by 30 hours
- Patient hospitalized for 3 days
  - Treated with N-acetylcysteine (antidote)
- Liver injury resolved
- Patient discharged on Day 4
Drug Drug Interactions

Do they pose a serious risk?
**Selected Drug Interactions w/ DXM**

- **SSRIs -- Eg: fluoxetine, paroxetine**
  - SSRIs inhibits CYP2D6
    - Risk - Serotonin syndrome
    - AMS, seizure, rigidity, hyperthermia, arrhythmias, HTN
- **Monoamine oxidase inhibitors**
  - Catecholamine uptake/metabolism is altered
    - Risk: Increased sympathomimetic effects and Serotonin syndrome
- **MDMA “Ecstasy”**
  - Reuptake of serotonin is inhibited
    - Risk - Serotonin syndrome
**Why are teenagers abusing DXM?**

- **Euphoria and hallucinations**
- **Commonly available over-the-counter**
  - Legal
  - Relatively inexpensive
  - False perception that use is safe
- **Easy to keep in the home**
  - Parents can be easily fooled
- **Lacks the stigma of a ‘drug of abuse’**
- **Widely advertised on the Internet**
DXM Abuse on the Internet

- The 3rd Plateau: Beginner’s Guide to DXM
- Guide to Using Cough Syrup as DXM Source
- Dextromethorphan Extraction
  - http://nepenthes.lycaeum.org/Drugs/DXM/extract.html
  - http://www.dextroverse.org/txt/cccextraction.txt
Evaluating the Problem

California Poison Control System
Retrospective review - All DXM abuse calls to the CPCS were reviewed over 6 years (1999-2004)
  - Excluded: < 10 yrs, information, sxns unrelated to DXM

Charts evaluated for demographic & clinical data

CPCS Data was compared to national trends
  - AAPCC = American Assoc of Poison Control Centers
  - DAWN = Drug Abuse Warning Network
CPCS Results

- A total of 1382 Patients were included
- 74% involved minors < 18 years of age
- 40% Female
- Median Age = 16 years
- 93% involved minor/moderate outcome
  - 0.5% involved major outcomes; no deaths reported
  - During the study period, the CPCS received 1,336,475 human exposure calls.
Dextromethorphan Abuse
-- Reported to the CPCS --

CPCS total human exposure call volume only increased 1.5%

California Poison Control System
Poison Center Calls

- Voluntary

- Calls regarding ‘drugs of abuse’ are usually triggered by a serious adverse reaction

- No study linking incidence of CPCS calls to general use in the population
National Trends of DXM Abuse
(DAWN and AAPCC)

Year

1999 2000 2001 2002 2003 2004

DAWN
AAPCC (All ages)
AAPCC (Ages 9-17 years)

California Poison Control System
CPCS DXM Abuse: Age Distribution

California Poison Control System
Most Common DXM Products

- Coricidin HBP CCO
- Robitussin
- Nyquil
- Slang
- Other

Coricidin HBP CCO is the most common product.
DXM Containing Products

California Poison Control System
Slang Terms

- Triple C’s, CCC
- Robo’ing, Robotripping
- Skittles
- DXM, Dex, Dexing
- Poor man’s PCP
- Red Devils
What is Currently Being Done to Curb the Abuse?

- **Pharmacy Store Chains / Pharmacists**
  - Voluntary controls to limit the sale of OTC DXM containing products to minors.
  - Eg: DXM products stored behind the counter
    - Selected pharmacies - Birthdate prompt at sale

- **Website deterring DXM abuse**
  - DXM Stories
  - www.dxmstories.com
Legislation

- **North Dakota, Texas (2003) - Defeated**
  - Prohibit the sale of DXM and Dimenhydrinate

- **California (2004) - AB 1853 - Defeated**
  - Prohibit the sale of OTC DXM to minors: J Simitian

- **New York (2004) - S 06244 - Passed**
  - Sale $\geq 2$ DXM to a Minor a Misdemeanor

- **Virginia (2005) - HB 2045 - Tabled**
  - Distribution DXM / Ephedra to Minors a Misdemeanor

- **California (2006) - SB 307 - On Hold**
  - Prohibit the sale of OTC DXM to minors
Take Home Messages

- Beware of Dextromethorphan Abuse
  - Many DXMF containing OTC products
  - Many have hidden ingredients (APAP)
- Reasons for DXMF Teenage Abuse
  - Euphoria, legal, cheap, easily accessible, easy to fool parents.
  - Many Internet websites promote DXMF