Driving Impairment from Dextromethorphan Abuse

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Dextromethorphan

- An over-the-counter antitussive
  - Present in hundreds of cold, cough and flu preparations.
  - Dosing 20-30mg q.i.d. (60-120mg/day)
Dextromethorphan

• Abuse
  – Slang terms:
    – DXM, DM, Dex, Robo, Rojo, Velvet, Skittles, Triple C.
  – Robo-tripping, Skittling, Dexing, Pharming.
Dextromethorphan

- $T_{1/2}$ 3-4 hours
- CYP2D6, CYP3A4

Morphine
Dextromethorphan

• **Pharmacology**
  – Binds at
    • Opioid sigma 1 and 2 receptor agonist
    • Catecholamine reuptake inhibitor
    • NMDA Glutamatergic receptor antagonist
  Other NMDA antagonists:
  – Dextrorphan
  – Phencyclidine
  – Ketamine
Dextromethorphan

• Abuse
  – Continuum of dose dependent effects
    • Intoxication: “stoned and drunk”
    • Restlessness, mild stimulant effect
    • Dissociative/hallucinogenic effects
    • Complex sensory dissociation
      – Jumbling of visual images
      – Loss of depth perception/diplopia
      – Mind body dissociation
Dextromethorphan

- Plateaus of DXM abuse
  - 1st Plateau: 1.5-2.5 mg/kg (150mg*):
    - Mild intoxication, light headedness, euphoria
  - 2nd Plateau: 2.5-7.5 mg/kg (400mg*):
    - Intoxication. Mild hallucinations, loss of concentration, slurred speech, short-term memory impairment.

*Approximate dose in 150lb person
Dextromethorphan

• Plateaus of DXM abuse
  – • 3rd Plateau: 7.5-15 mg/kg (800mg*):
  – • 4th Plateau: +15 mg/kg (>1000mg*)
    – Hallucinations, delusions, sub-anesthetic dose, Mind/body dissociation.
    – Equivalent to a high dose of Ketamine.

*Approximate dose in 150lb person
Chlorpheniramine

- Chlorpheniramine

- $T_{1/2}$ 12-43 hours

- CYP3A4, (CYP2D6)

- Chlorpheniramine overdose: extreme sleepiness, confusion, weakness, ringing in the ears, blurred vision, large pupils, dry mouth, flushing, fever, shaking, insomnia, hallucinations, and possibly seizures.
DXM + Chlorpheniramine

• Typical case – 20 y.o. male driver
  – 0016 hrs: Observed to strike the curb.
  – Drove down the center of the street.
  – Sudden right turn with no signaling.

• Droopy-eyed, sleepy look
• Moved in slow motion
• Handed over entire wallet
• Fumbled for ID
• Slurred speech, flushed face, confused about age
DXM + Chlorpheniramine

- Typical case – 20 y.o. male driver
  - No odor of intoxicants
  - Stumbled, walked slowly and deliberately
  - HGN and VGN with immediate onset
  - Could not balance sufficiently well for SFST
Typical case – 20 y.o. male driver

- Arrested for DUI
- Admits to taking 24 Coricidin® pills several hours earlier for the purposes of hallucinating. Also had smoked marijuana earlier that day, and took Prozac.
DXM + Chlorpheniramine

• Typical case – 20 y.o. male driver

• DRE Exam:

• Alcohol negative by breath

• Appearance: cooperative, slow speech, flushed

• SFSTs: balance problems, not following instructions, stepped off the line

• HGN and VGN present, eyes watery, dilated

• Pulse 102 – 118 bpm, BP 152/110

• Muscle tone normal
**DXM + Chlorpheniramine**

- **Typical case – 20 y.o. male driver**
- Time of stop 00:16hrs
- Time of blood draw 01:30hrs

**Toxicology:**

- Dextromethorphan 0.67mg/L
- Chlorpheniramine 0.18mg/L
- THC/THC-COOH neg
### DXM + Chlorpheniramine

**Admitted abusers (n=5):**

<table>
<thead>
<tr>
<th>History</th>
<th>DXM</th>
<th>Chlorph.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Took 48 Coricidin® pills</td>
<td>0.47mg/L</td>
<td>0.18mg/L</td>
</tr>
<tr>
<td>Took 24 Coricidin® pills 6 hours earlier to hallucinate.</td>
<td>0.67mg/L</td>
<td>0.18mg/L</td>
</tr>
<tr>
<td>Takes 24-32 pills at a time.</td>
<td>0.74mg/L</td>
<td>0.13mg/L</td>
</tr>
<tr>
<td>Drank 2 eight ounce bottles of Equate® and took 20 pills nine hours earlier</td>
<td>1.00 mg/L</td>
<td>Neg</td>
</tr>
<tr>
<td>Drank 2 bottles Robitussin and took 5 trays of Coricidin®</td>
<td>1.22mg/L</td>
<td>0.27mg/L</td>
</tr>
</tbody>
</table>
DXM + Chlorpheniramine

• Blood concentrations (n=5):
  – Range 0.47mg/L – 1.22mg/L
  – (mean 0.79mg/L, median 0.70mg/L)

• Therapeutic concentrations
  – DXM  0.002 – 0.207mg/L after 30mg QID over 7 days
  – CPA  0.01mg/L  3 * 2mg, 4 hrs apart
DXM + Chlorpheniramine

• Driving:
  – Erratic driving, extreme weaving, failing to stop, entering roadway without stopping, collisions, hit and run, speeding.

• Appearance:
  – Generally cooperative, slow to comprehend and respond, speech slurred, poor coordination and movements, flushed face, poor balance
DXM + Chlorpheniramine

• Vital Signs:
  – Pulse (92-162bpm) and blood pressure tended to be high, muscle tone flaccid.

• Eyes:
  – HGN and VGN typically present, often resting nystagmus, droopy eyelids, red eyes.

• Field Tests:
  – Poor balance, slow comprehension, sway
Dextromethorphan and Driving

• Conclusions

– The popular practice of dextromethorphan abuse results in driving impairment.

– Signs of impairment are often a result of combined DXM dissociative and Chlorpheniramine CNS depressant effects.
Dextromethorphan and Driving

• Conclusions
  – Principle indicators:
    • HGN, VGN
    • CNS depression
      – poor balance and coordination
      – slurred or slow speech
    • Elevated pulse and blood pressure
    • Facial flushing and behavioral cues are also diagnostic.
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