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Dextromethorphan in Cough Syrup: The Poor Man's Psychosis

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ABSTRACT *~ Dextromethorphan (3-methoxy-N-methylmorphinan), also known as "DXM" and "the poor man's PCP," is a synthetically produced drug that is available in more than 140 over-the-counter cough and cold preparations. Dextromethorphan (DXM) has overtaken codeine as the most widely used cough suppressant due to its availability, efficacy, and safety profile at directed doses. However, DXM is subject to abuse. When consumed at inappropriately high doses (over 1500 mg/day), DXM can induce a state of psychosis characterized by Phencyclidine (PCP)-like psychological symptoms, including delusions, hallucinations, and paranoia. We report a noteworthy case of severe dextromethorphan use disorder with dextromethorphan-induced psychotic disorder in a 40-year-old Caucasian female, whose symptoms remitted only following treatment with a combination of an antipsychotic and mood stabilizer. While some states have begun to limit the quantity of DXM sold or restrict sales to individuals over 18-years of age, there is currently no federal ban or restriction on DXM. Abuse of DXM, a readily available and typically inexpensive agent that is not detected on a standard urine drug screen, may be an under-recognized cause of substance-induced psychosis. It is imperative that clinicians are aware of the potential psychiatric sequelae of recreational DXM use.* Psychopharmacology Bulletin. *2017;47(4):59–63.*

Introduction

Dextromethorphan (3-methoxy-N-methylmorphinan), also known as "DXM" and "the poor man's PCP," is a synthetically produced drug that is available in more than 140 over-the-counter cough and cold preparations.[1,2] Dextromethorphan (DXM) has overtaken codeine as the most widely used cough suppressant due to its availability, efficacy, and safety profile when taken at directed doses.[3] When used at recommended dosing levels, cold and cough products containing DXM

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cause minor, if any, adverse effects.[4] The most significant cause of adverse effects is DXM abuse.[5] When the suggested dosing regimen of DXM is surpassed for recreational use, an abundance of psychiatric symptoms can result. The effects are dose-dependent and vary from mild motor and cognitive impairment to PCP-like para-psychotic symptoms such as delusions, dissociative states, paranoia, and visual hallucinations. This combination of symptoms can lead to impulsive or violent acts, such as assault, suicide, or homicide.[6] We report an interesting case of severe dextromethorphan use disorder with dextromethorphan-induced psychotic disorder in a 40-year-old Caucasian female, whose symptoms remitted only following treatment with a combination of an antipsychotic and mood stabilizer.

Case Description

Ms. J is a 40-year-old female Caucasian female with an extensive history of substance abuse. She began abusing alcohol at age 14 with the addition of marijuana, alcohol, opiate, and LSD use through her teen years. At age 18, following heavy usage of LSD and marijuana, Ms. J. experienced what she describes as her first "psychotic break." The episode consisted of hyper-religiosity, auditory hallucinations, and delusions of persecution. These symptoms resolved despite continued use of LSD. She continued to abuse a combination of alcohol, marijuana, LSD, valium, and amphetamine-based products throughout her 20's.

Ms. J first used DXM at age 29, reporting that she "loved it from the first try," and felt that it "brought me closer to God." DXM's accessibility, low expense, and lack of detection on urine drug screens appealed to Ms. J. She reports her typical daily dose was 12 tablets of Corcidin™ Cough and Cold TID (providing 1080 mg/day of DXM total) or 9 tablets of Mucinex™ DM Maximum Strength TID (providing 1620 mg/day of DXM total). The recommended maximum daily dosing of DXM is 120 mg. For the next 5 years, Ms. J continued to abuse DXM an average of 3–4 times per month. After learning of her husband's affair, she escalated to daily abuse of DXM, along with marijuana and alcohol, for roughly 6 months, averaging 3 hours of sleep nightly.

At age 35, Ms. J. reported a binge on an estimated dose of 3000–4000 mg of DXM. She was unable to recall any details of the binge; however, she did cause a motor vehicle collision. She then returned to her daily "dose" of DXM (1080–1620 mg/day) for roughly a year. The patient binged once more on 3000–4000 mg of DXM prior to signing her divorce papers. That night, she experienced the following vivid and traumatizing dream: "I dreamt my mother ripped my face off with her fingernails, cut some of my fingers and toes off, and ripped my arm off." The next morning,

she continued to suffer from delusions of persecution by her mother, which resulted in a failed attempt to stab her mother. The patient was then arrested and placed in a rehabilitation facility where she remained sober for 14 months. Within 2 weeks of her release, she resumed her alcohol abuse. Within 4 weeks, she was again abusing DXM. From the age of 37 to 39 years old, the patient would fluctuate between periods of sobriety, weekly DXM abuse, and daily DXM abuse.

In the 4 months prior to her presentation, the patient reports she used DXM once a month at her "average dose" of 1080–1620 mg/day. Her last use was 2 days prior to her hospital admission. Ms. J described her last ingestion as a "dirty high" due to her consuming 3 beers along with the DXM, a combination which she believes further precipitated her psychiatric decompensation.

Ms. J was admitted to our psychiatric unit after she was discovered sleeping in a stranger's house and subsequently assaulted a police officer. Her initial clinical condition limited history gathering, though she reported PTSD, depression, and use of "all" illicit substances. On observation she displayed an irritable affect, labile mood and was suspicious of staff. A urine drug screen revealed only buprenorphine, for which the patient did not have a prescription. Based on her history of depression, she was started on Mirtazapine 15 mg nightly. However, despite the passage of several days for substance washout, she remained inappropriate, hostile, and displayed an illogical, disorganized thought process with delusions of misinterpretation. Following the addition of an antipsychotic, her behavior became more organized and appropriate. The patient then revealed her extensive history of DXM abuse. She was eventually stabilized on Olanzapine 10 mg nightly and Divalproex Extended Release 1,000 mg nightly. The patient ultimately spent twenty days in the hospital before the aforementioned symptoms resolved. She was continued on Mirtazapine, Olanzapine, and Divalproex ER at the time of discharge.

Discussion

Data collected between 2000–2010 on rates of abuse for cough and cold medication containing DXM describe a peak in DXM abuse in 2006 with 34,755 single substance exposures reported by the National Poison Data System.[7,8] Twelve states have prohibited the sale of DXM-containing products to minors, and the FDA has considered increasing sales restrictions.[9] However, the FDA's Drug Safety and Risk Management Committee voted against scheduling DXM in 2010, citing the drug's economic and public health benefits in reducing cough symptoms.[10,11] Additionally, preclinical and clinical evidence exists on the drug's positive effects on seizures, pain, autism,

depression, stroke, traumatic brain injury, methotrexate neurotoxicity, and Parkinson's disease. DXM is also a component in the only FDA-approved treatment for pseudobulbar affect.[12]

DXM's active metabolite, Dextrorphan, a noncompetitive NMDA receptor antagonist, works in similar ways to ketamine and PCP.[13] This mechanism of action explains the similar psychotic symptomatology produced by all three compounds. Typical urine drug screens do not test for DXM and hence may not be considered by clinicians. At high concentrations, DXM can result as a false-positive for PCP on a drug screen, at which point mass spectrometry must determine which substance is present.[6,14] DXM is metabolized by the CYP2D6 system, so fast metabolizers (nearly 85% of the US population) may be more susceptible to abuse.[15]

DXM's progressively severe psychiatric symptoms have been grouped into four dose-dependent presentations. At lower levels (1.5–2.5 mg/kg), MDMA-like perceptual alterations occur. The next level (2.5–7.5 mg/kg) results in impairment of motor, cognitive, and perceptual functioning that is comparable to the combined use of alcohol and cannabis. A higher level (7.5–15 mg/kg) induces intense hallucinations, dissociative symptoms, and agitation similar to low-dose ketamine use. Concentrations greater than 15 mg/kg result in complete psychophysical dissociation similar to high-dose ketamine use, with notably violent behaviors, elevated temperatures, and possible death from cardiac or respiratory arrest.[6] Additionally, a profound withdrawal syndrome has been described consisting of severe vomiting, muscle aches, and diarrhea within the first week of detoxification, followed by night sweats, insomnia, anxiety, and cold intolerance for 3 weeks.[2] No withdrawal syndrome was observed during Ms. J.'s hospital stay, possibly due to reported habits of only binging monthly on DXM proximal to her hospitalization.

The varied dose-dependent presentations of DXM-induced psychosis and lack of DXM detection on urine screening can make properly diagnosing DXM-induced psychosis challenging. Physicians need to include DXM intoxication in their differential when assessing patients presenting with the aforementioned symptoms. The risk of cardiac or respiratory arrest reinforces the need for a thorough substance use history when the context allows.

The therapeutic approach to management of DXM intoxication focuses on symptom resolution. Previously reported psychopharmacologic treatments include short-acting benzodiazepines or low-dose antipsychotics (haloperidol, risperidone, and quetiapine).[6] The efficacy of olanzapine has also been reported.[16] In this report, we describe the use of the unique combination of an antipsychotic (olanzapine) and a mood-stabilizer (divalproex ER) to control severe psychotic symptoms induced by DXM abuse.

Conclusion

This case describes a patient with severe dextromethorphan use disorder with dextromethorphan-induced psychotic disorder. DXM is an easily available, typically inexpensive, over-the-counter medication with abuse potential. While some individual states limit the quantity of DXM sold or restrict sales to those over 18-years of age, there is currently no federal ban or restriction on sales. As an agent of abuse that is not detected on a standard urine drug screen, DXM is likely an underdiagnosed cause of substance-induced psychosis. Awareness of the drug's potential for abuse must be propagated. Physicians should be aware of the psychiatric presentation of DXM abuse and consider this option in the differential diagnosis for patients, especially teenagers and young adults, exhibiting acute-onset of psychotic symptoms. ✤

Disclosures of Potential Conflicts of Interest

Drs. Martinak, Fargason and Birur and MS-4's Bolis and Black have no conflict of interest to disclose. Dr. Martinak and Mr. Bolis are primary authors in the preparation of this manuscript.

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