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# Marijuana Toxicity

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## Continuing Education Activity

The term "marijuana" typically refers to the tobacco-like preparations of the leaves and flowers of the plant cannabis sativa. The active ingredient is believed to be tetrahydrocannabinol (THC), which is also responsible for intoxication. Different preparations of marijuana vary in strength. THC concentrations vary with climate, soil, and cultivation techniques. Additionally, THC absorption varies with the route of administration. This activity reviews the pathophysiology, diagnosis, and management of marijuana toxicity and highlights the role of the interprofessional team in caring for affected patients.

**Objectives:**

- Identify the epidemiology of marijuana toxicity.
- Describe the typical presentation of a patient with marijuana toxicity.
- Review the treatment and management options available for marijuana toxicity.
- Summarize interprofessional team strategies for improving care coordination and communication to advance the prevention and treatment of marijuana toxicity and improve outcomes.

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## Introduction

The term "marijuana" typically refers to the tobacco-like preparations of the leaves and flowers of the plant cannabis sativa and cannabis indica. The plant contains many psychoactive compounds, often referred to as cannabinoids. The primary psychoactive ingredient is believed to be tetrahydrocannabinol, which is also responsible for most of the intoxicating effects experienced by users. Different preparations of marijuana vary in strength, with THC concentration in cannabis varying with climate, soil, and cultivation techniques. Also, the amount absorbed by the body varies with the route of administration. The effects of cannabis depend on various things: the dose, mode of administration, user's prior experience with the drug, user's expectations/attitudes towards the drugs, and social environment when using the drug.[1][2][3]

## Etiology

Marijuana intoxication is dose-related and has multiple names depending on the preparation: grass, ganja, hashish, etc. The amount absorbed by the body varies by the route of administration and concentration of the source being used, which can vary widely. Marijuana is commonly smoked or vaporized due to the rapid onset of symptoms, but marijuana can also be eaten (i.e., "grass" brownies) or drank (i.e., marijuana tea or marijuana tincture). Smoked marijuana has an increased potency, quoted as high as 2.6 times by some sources. Marijuana is used for both recreational and therapeutic purposes. Although some people promote the "harmless" nature of marijuana, acute and chronic intoxication can occur.[4][5][6][7]

## Epidemiology

According to the World Health Organization (WHO), marijuana is the world's most widely cultivated, trafficked, and abused illicit substance. Approximately 2.5% of the world's population (147 million people) uses it. Its use is more prevalent among men than women—a gender gap that widened in the years 2007 to 2014. Use is widespread in the adolescent and young adult population. According to the Monitoring the Future survey, an annual survey of drug use in America's middle and high school students, rates of use within one year ranged from approximately 9% in 8 graders to 35% in 12 graders. In the United States, cannabis is still a Schedule 1, meaning it is not scheduled for federal medical use and has a high potential for abuse.[8]

## History and Physical

The initial state of acute intoxication formulates recreational users' symptoms: euphoria, perception alterations such as time and spatial distortion, intensification of ordinary sensory experiences, and motor impairment. Not all effects of cannabis intoxication are welcomed by users, as some experience unpleasant psychological reactions such as panic, fear, or depression. Acute intoxication also affects the heart and vascular system, resulting in cannabis-induced tachycardia and postural hypotension. CNS and respiratory depression have been noted with high doses in animal models. Studies show that inhaled doses of 2 to 3 mg of THC and ingested doses of 5 to 20 mg THC can cause impairment of attention, memory, executive functioning, and short-term memory. Doses > 7.5 mg/m2 inhaled in adults and oral doses from 5 to 300 mg in pediatrics can produce more severe symptoms such as hypotension, panic, anxiety, myoclonic jerking/hyperkinesis, delirium, respiratory depression, and ataxia. Conjunctivitis is a consistent physical exam finding regardless of the route of administration. In children, neurological abnormalities such as lethargy and hyperkinesis can be signs of life-threatening toxicity. Although acute toxicity is uncommon in non-pediatric patients, those who come to medical attention are more likely to have hyperemesis, behavioral problems, or a medical emergency such as bronchospasm due to inhalation. There is disagreement about how long these impairments persist after taking cannabis, ranging from hours to days. Chronic use may lead to long-term effects on cognitive performance, "amotivational syndrome" (loss of energy and a will to work), and respiratory disorders. There have also been various reports of patients presenting with cyclic vomiting syndrome/cannabinoid hyperemesis. Cannabis intoxication can lead to acute psychosis in many individuals and can produce short-term exacerbations of pre-existing psychotic diseases such as schizophrenia. Psychiatric symptoms observed in some studies include depersonalization, fear of dying, irrational panic, and paranoid ideas.

## Evaluation

The standard urine drug screen can be used to detect THC metabolites, primarily THC carboxylase. The lower limits range from 20 to 100 ng/mL. Second-hand exposure causing positive results is tough to achieve in adolescents and adults, although this has not been studied in children. Reported false positives for THC include dronabinol, efavirenz, PPIs, hemp seed oil, NSAIDs, and baby wash products in infants. Although, false positives are significantly less likely in testing laboratories with gas chromatography capabilities. Positive results for THC carboxylase have been reported up to 10 days after weekly use and up to 30 days after heavy daily use, making the timeline of exposure different and the severity of intoxication difficult to correlate.

Although less commonly used, other ways of detecting marijuana use are available. This includes detecting THC carboxylase in hair, which has the benefit of detection up to 3 months after use but often will not become positive until several weeks after use has been initiated. Detection of

THC can also be accomplished in the oral fluid within 24 hours of use and in blood within about 14 to 21 days of use. Breathalyzer tests have also been proposed, but since small amounts of cannabis continue to be released from fat into the blood long after short-term impairment wears off, this method has not been promoted.

## Treatment / Management

Most adolescents and adults do not warrant testing for the diagnosis or treatment of cannabis intoxication. However, if chest pain is present, it is reasonable to obtain a 12-lead electrocardiogram and possibly cardiac markers to assess myocardial ischemia or infarction. There is thought to be an elevated risk up to 4.8 times for MI within 1 hour of marijuana use. Patients with toxic ingestion should also be screened for co-ingestion, especially if electrolyte abnormalities or OTc or QRS prolongation is noted on EKG. Some patients, particularly children, may require further testing if exposure is unknown, including rapid blood glucose, electrolytes, blood gas analysis, and neuroimaging (e.g., computed tomography of the head). Neuroimaging should be avoided in known cannabis exposures unless focal neurologic findings are also present or concerns for other etiologies such as head trauma exist.

The treatment for marijuana intoxication is symptomatic management. The extent of management has numerous factors, including the age of the individual and the amount of cannabis ingested.  Several cases of accidental cannabis poisoning in geriatric patients have resulted in intensive care admissions due to central nervous system depression. Unintentional ingestion by children has also resulted in similar admissions. In cannabis-induced psychotic disorders, safe cannabis detoxication typically requires 24 hours but sometimes longer if persistent psychosis or unstable vital signs occur.[9][10][11]

## Differential Diagnosis

- Allergic and environmental asthma
- Anxiety disorders
- Atrial tachycardia
- Benzodiazepine toxicity
- Brief psychotic disorders
- Delirium
- Depression
- Hallucinogen use
- Panic disorder
- Primary hypersomnia

## Pearls and Other Issues

There is no experimental evidence to determine the lethal dose in humans, but the dose that kills animals ranges from 40 mg/kg to 130 mg/kg intravenously. Well-controlled studies have not implicated in utero marijuana exposure in any major fetal growth or physical abnormalities, but it may have long-term emotional and behavioral consequences. Marijuana has an affinity for lipids and accumulates in human milk, so its use is contraindicated during breastfeeding.

## Enhancing Healthcare Team Outcomes

Marijuana toxicity is becoming common in emergency rooms all over the nation. The key reason is that there is limited quality control over the manufacturing of marijuana. Thus, many preparations contain varying levels of THC as well as toxic contaminants. Plus, many individuals consume marijuana with other illicit agents, including alcohol. The management of marijuana toxicity is commonly adequate with supportive measures. Because the agent can affect many organ systems, an interprofessional team including internists, psychiatrists, and occasionally cardiologists should assist with managing the patient.

Parents should be educated about the adverse effects of marijuana and urged to store the agent away from the reach of children.

## Review Questions

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