

Angel's Trumpet (*Datura stramonium*) poisoning and delirium in adolescents in Winnipeg, Manitoba: Summer 2006

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TH Wiebe, ES Sigurdson, LY Katz. Angel's Trumpet (*Datura stramonium*) poisoning and delirium in adolescents in Winnipeg, Manitoba: Summer 2006. *Paediatr Child Health* 2008;13(3):193-196.

Over the course of the summer of 2006, four adolescent patients were hospitalized because of intentional *Datura stramonium* (Angel's Trumpet) ingestion. Their records were reviewed for the presence of signs and symptoms of toxicity, clinical course, treatment and outcome. All four patients had a decreased level of consciousness measured by the Glasgow Coma Scale, visual hallucinations, dilated pupils and agitation. The changes in mental status are characteristic of delirium. All four patients were known to abuse substances. The average length of hospitalization was two days. No serious complications were encountered during hospitalization and a full recovery was noted in all patients. The use of sedation and restraints were sufficient treatment modalities. Health care workers should consider anticholinergic plant ingestion as a cause for abrupt onset of delirium.

Key Words: *Adolescents; Angel's Trumpet; Anticholinergic poisoning; Delirium; Emergency*

Substance abuse is a common problem in adolescents who deliberately ingest a variety of substances for their mind-altering properties. *Datura stramonium* (Angel's Trumpet) (Figure 1) is a poisonous shrub that grows widely throughout the United States (1) and in southern Canada (2). It has been planted in Winnipeg, Manitoba, for its aesthetic appeal – the flower has a large trumpet-like shape. Intentional ingestion of the seeds may result in unintentional poisoning due to the anticholinergic properties of the plant. Four cases of *D stramonium* intoxication seen at the Children's Hospital of Winnipeg, Manitoba, during the summer of 2006, are reported, and the common symptoms, characteristics of the plant and treatment of adolescents with poisoning due to Angel's Trumpet are reviewed.

A search of the Child and Adolescent Psychiatry's Consult-Liaison Services intake sheets was performed for the summer months of 2006. The search terms used were Angel's Trumpet or Jimson weed overdose and hallucinogen abuse. Three cases were identified. The process was repeated using the Health Sciences Centre medical records, which revealed one more case that was not found in the

Un empoisonnement par la trompette des anges (*Datura stramonium*) responsable d'un délire chez des adolescents de Winnipeg, au Manitoba, pendant l'été 2006

Pendant l'été 2006, quatre adolescents ont été hospitalisés à cause de l'ingestion intentionnelle de *Datura stramonium* (trompette des anges). Les auteurs ont revu leur dossier afin d'établir la présence de signes et symptômes de toxicité, ainsi que d'analyser l'évolution clinique, le traitement et l'issue. Les quatre patients présentaient tous une diminution du niveau de conscience, mesuré selon l'échelle de coma de Glasgow, des hallucinations visuelles, des pupilles dilatées et de l'agitation. Les modifications de l'état mental sont caractéristiques du délire. Les quatre patients étaient des consommateurs de drogues et d'alcool connus. L'hospitalisation s'est prolongée pendant une moyenne de deux jours. Ils n'ont souffert d'aucune complication grave pendant l'hospitalisation, et ils se sont tous entièrement rétablis. Les modalités de traitement se sont limitées à la sédation et à des moyens de contention. Les travailleurs de la santé devraient envisager l'ingestion de plantes anticholinergiques comme cause possible d'apparition abrupte de délire.

psychiatry records. The Child and Adolescent Psychiatry's Consult-Liaison Service is frequently requested to provide assessment and management of cases of delirium and drug overdose at the Children's Hospital of Winnipeg.

CASE PRESENTATIONS

Case 1

A 16-year-old boy was brought to the Children's Hospital emergency room (ER) with disorientation, hallucinations and combativeness. He had ingested 49 Angel's Trumpet seeds the night before. Initially his vital signs were temperature 36.3°C, pulse rate 80 beats/min, respiratory rate 14 breaths/min, blood pressure 122/68 mmHg and oxygen saturation 98% on room air. His Glasgow Coma Scale (GCS) was 12, and his pupils were 6 mm (normal 2 mm to 3 mm) and sluggish. He responded to his name but was otherwise disoriented. He became agitated and aggressive, and was given 10 mg of intramuscular (IM) diazepam and 10 mg of IM haloperidol because he had spat out the oral medications that were given to him. He was also placed in restraints. The patient remained agitated and was given three more doses of 5 mg IM diazepam over the next 4 h.

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Accepted for publication October 31, 2007



Figure 1) *Datura stramonium*. Reproduced from reference 11

The patient was transferred to the paediatric intensive care unit for further monitoring due to benzodiazepine use. He had an uneventful stay in the paediatric intensive care unit for 12 h and was transferred to the ward and discharged home 36 h later. The patient had a history of mental health problems, polysubstance abuse and contact with Child and Family Services.

Case 2

A 13-year-old boy was brought by emergency medical services and police to the Children's Hospital ER with combativeness and visual hallucinations. The day before his admission, he had ingested Angel's Trumpet seeds and had visual hallucinations that had resolved. On the day of admission, the patient was again hallucinating and was combative. His initial vital signs in the ER were temperature 37.1°C, pulse rate 136 beats/min, respiratory rate 36 breaths/min, blood pressure 140/80 mmHg and oxygen saturation 96% on room air. His GCS was initially 5 but quickly improved to 15, and his pupils were 5 mm. Due to his agitation and combativeness, he was placed in four-point restraints and given two doses of 2 mg IM lorazepam and a dose of methotrimeprazine. He was admitted to the hospital for two days, during which time he had two outbursts requiring security to be called. His creatinine kinase peaked on his second day of admission at 1338 U/L and his myoglobin peaked the same day at 262 ug/L (normal creatinine kinase less than 350 U/L and normal myoglobin less than 70 ug/L). The patient had a history of attention-deficit hyperactivity disorder and substance abuse, and was not currently on treatment. He had been in trouble with the law, was not in school at the time of hospitalization, and had previously been in the care of Child and Family Services. His family history was positive for substance abuse and suicide.

Case 3

A 14-year-old boy was brought by emergency medical services to the Children's Hospital ER due to hallucinations. His mother stated that he ingested Angel's Trumpet

seeds three days earlier. He had been hallucinating, picking things out of the air and talking to people who were not there. These symptoms had decreased and he had gone to a relative's house. His mother received a call that he was again delusional, incoherent and banging his head against the wall. On arrival in the ER, his vital signs were pulse rate 106 beats/min, respiratory rate 18 breaths/min and blood pressure 131/81 mmHg. His GCS was 13 and his pupils were 5 mm and sluggish. He continued to have visual hallucinations. For example, he thought that the blood pressure cord was his vein. He was not agitated in the ER, but 12 h after being admitted to the ward, he became extremely agitated. A code white for behaviour disturbance was called by staff. Security arrived and the patient was restrained and given 2 mg of IM lorazepam. The patient kicked out the glass in a door, and began to spit and swear at staff. His agitation lasted approximately 12 h, during which he continued to scream, swear and tried to remove his restraints. He received a total of four doses of 2 mg IM lorazepam. He had a history of polysubstance abuse and contact with Child and Family Services.

Case 4

A 13-year-old girl was brought by police to the Children's Hospital ER after being found sitting in a downtown skywalk. She was aggressive and giving inappropriate responses. Her initial vital signs were pulse rate 100 beats/min and respiratory rate 30 breaths/min; she was uncooperative with staff who were trying to measure her blood pressure. Her GCS was initially 11 and her pupils were 5 mm to 6 mm. She was given 5 mg of haloperidol in the ER to help her calm down. She continued to have visual hallucinations and was admitted to the ward. In hospital, she remained incomprehensible and became very agitated 12 h postadmission. She had to be restrained and given another 5 mg of IM haloperidol. She settled, and 18 h later was discharged with a normal mental status. She had a history of alcohol and polysubstance abuse, as well as self harm. She was in the care of Child and Family Services at the time of hospitalization.

Table 1 summarizes the characteristics of the patients.

DISCUSSION

The plant *D stramonium*, a member of the nightshade family (3), is known by a variety of names – Jimson weed, loco weed, Angel's Trumpet, Devil's Trumpet, Moon Flower, Witch's Thimble, Devil's Apple, Thorn Apple, Stinkweed, Mad Apple, Devil's Weed, Malpitte and Green Dragon (4,5). The most common name is Jimson weed, a shortened version of 'Jamestown weed'. It was named after the first recorded accidental ingestion occurred in Jamestown, Virginia (USA), in 1676 (4,5).

D stramonium flowers from May to September, and the seeds, which contain the most alkaloid, appear in the fall (6). The spiny pod contains between 50 and 100 brown-black seeds that are 2 mm to 3 mm in width. One hundred seeds contain the equivalent of approximately 6 mg of atropine (6). The plant is an annual that reaches five to six feet in

TABLE 1
Summary characteristics of the four cases

Case	Intensive care unit admission	Month	Initial Glasgow Coma Scale	Hallucinations	Agitation	Pupil size	Psychiatric diagnosis	Days in hospital
1	Yes	August	12	Yes	Yes	6 mm	Hallucinogen abuse	2
2	No	September	5 to 15	Yes	Yes	5 mm	Oppositional defiant disorder	2
3	No	August	13	Yes	Yes	5 mm	Hallucinogen abuse	2
4	No	September	11	Yes	Yes	5 mm to 6 mm	Polysubstance abuse	2

height. It has dark green leaves and trumpet-shaped blue or white flowers (3). The most popular way to ingest this plant is to chew the seeds.

The plant contains belladonna alkaloids – atropine, scopolamine and hyoscyamine – in the seeds, roots, flowers and stems, whose primary actions are anticholinergic (3). The mechanism of toxicity is competitive blockade of acetylcholine at muscarinic receptors, both centrally and peripherally, as well as at end organ sites of the parasympathetic nervous system (4).

D stramonium ingestion results in anticholinergic poisoning. Therefore, the mnemonic ‘hot as a hare, blind as a bat, dry as a bone, red as a beet and mad as a hatter’ also applies to Angel’s Trumpet toxicity. The signs and symptoms of acute anticholinergic activity usually appear within 1 h to 4 h postingestion (3). At first, patients may complain of dry mouth, thirst, blurred vision and photophobia, and appear confused and restless (3). Their skin may look flushed and dry. As time goes on, they become aggressive and may appear to be experiencing amphetamine intoxication (3). Neurological examination may reveal anxiety, delirium, hallucinations and hyperactivity. In severe cases, seizures and coma may develop (3). Physical examination findings may include tachypnea, tachycardia, hyper- or hypotension, hyperpyrexia, dry mucous membranes, and dry and flushed skin. Bowel sounds may be decreased and urinary retention is common. Examination of the eyes reveal mydriasis and cycloplegia, which can persist for days (3).

Delirium is a state of altered consciousness that is usually of quick onset, and has manifestations of fluctuating level of orientation, self-regulation, memory and impulse control. Hallucinations are common. The cause of the delirium is the biochemical poison in the seed. It is an anticholinergic substance that results in a physiological disturbance (7).

Klein-Schwartz and Oderda (6) reviewed 73 Angel’s Trumpet exposures reported to a regional poison centre in Baltimore (USA) over a five-year period. The most frequently reported symptoms included visual and auditory hallucinations, bizarre behaviour, confusion, disorientation, combativeness, restlessness, agitation, blurred vision and dry mouth. Dilated pupils often persisted for several days after ingestion, appearing to be the last manifestations to resolve in a number of patients.

Treatment of anticholinergic toxicity is largely supportive. Agitation should be controlled by titrating intravenous benzodiazepines to sedation. Benzodiazepines are recommended over phenothiazines and butyrophenones because exacerbation or induction of hypotension is unlikely, the possibility of seizures is decreased and anticholinergic effects are absent (8). Haloperidol should be used cautiously in acute Angel’s Trumpet poisoning because it may cause acute dystonia and other movement disorders. Sedation of the agitated patient allows for easier physical restraint. It also prevents self-injury, severe hyperthermia and the development of myoglobinuric renal failure from muscle injury. (8).

The decision to proceed with gastrointestinal decontamination should be individualized. Activated charcoal is most useful in the first hour after ingestion. However, the timing of ingestion is often hard to determine unless witnessed. Early gastric emptying should be considered for large ingestions of an initially asymptomatic patient or in an intubated patient, regardless of the time of ingestion. In most agitated patients, the risks of gastric lavage outweigh the potential benefit (8). Decreased gastrointestinal motility may make activated charcoal more useful in these types of overdoses but one should be cautious in the agitated nonintubated patient due to the risk of aspiration (1,8).

The role of physostigmine, a naturally occurring acetylcholinesterase inhibitor, has been controversial in the management of anticholinergic overdoses. This is due to the potential adverse effects of physostigmine secondary to acetylcholine accumulation (1). These include seizures, muscle weakness, bradycardia, lacrimation, salivation, bronchorrhea, diarrhea and asthma exacerbation (1,8). Physostigmine has been used to treat anticholinergic symptoms such as delirium, coma, severe agitation and symptomatic supraventricular tachycardia. To minimize toxicity, physostigmine should be infused over 5 min in an initial dose of 0.02 mg/kg (maximum 0.5 mg) for children to control severe anticholinergic manifestations. This dose can be repeated as needed. Atropine should be available and the infusion stopped immediately if signs of cholinergic excess appear.

CONCLUSIONS

The four adolescents who had symptoms of agitation and excitement experienced Angel’s Trumpet poisoning. Some

of these plants have toxins that cause symptoms within 1 h to 2 h or, as these four cases demonstrate, there may be a delayed emergence of symptoms. All four patients had a decreased level of consciousness measured by the GCS, visual hallucinations, dilated pupils and agitation. All patients were known to abuse substances and had tried the Angel's Trumpet seeds with the expectation of getting high.

It is the combativeness of the patient that makes management so difficult, especially in the intensive care setting, and leads to the need for chemical or physical restraints. In regard to these four cases, the use of sedation with IM medications, restraints and observation were sufficient treatment modalities. Even though the recommended route of drug administration is intravenous, these patients were much too combative on presentation to administer drugs intravenously. In these cases, the IM route was the route of choice for the safety of the patient and staff.

All of these cases were diagnosed by history and supported by consistent symptomology. The diagnosis hinged on the history of voluntary use of the seeds of the large white flower and the late summer/early autumn time of year. The source of the plant seeds was established in only one of the cases – they were stolen from a public property greenhouse. There was no history of other street drugs taken within one week of the use of Angel's Trumpet. With the history of substance abuse and significant symptoms, it would be wise to conduct toxicology screenings to eliminate the use of other drugs.

When an adolescent presents to the ER with symptoms of an unknown ingestion, part of the standard of care should be to contact the local poison control centre for

assistance. The toxicologist can not only help with the diagnosis, but can assist in formulating a treatment plan.

In the present case study, we report that *D stramonium* is readily available to adolescents in our community and that cases of abuse are likely to occur in clusters. This same type of cluster of poisonings has occurred in the past in other Canadian cities. In 1999, police in London, Ontario, requested that gardeners destroy any Angel's Trumpet plants on their property after five teens ingested the plant (9). In 2005, multiple students experimented with Angel's Trumpet after being told about it by a new student at their school who was describing it as a free drug that grew in the park (10). Health care workers should be aware that anticholinergic plant ingestions are not uncommon in the adolescent age group. This is especially true for adolescents at high risk for substance abuse, as demonstrated in the present case report, in which each adolescent had a prior history of substance abuse. It is prudent to consider anticholinergic plant-based ingestions in the differential diagnosis of adolescents who present with altered mental status, especially during the growing season.

It is also appropriate to consider prevention programs to curtail the use of this plant in public places. Public officials responsible for public lands, parents and health practitioners should be made aware of the toxicity of these plants through public health initiatives and poison control centres. The media is not the best tool for making the public aware of these types of issues because it not only alerts gardeners and parents, but potential youth substance abusers as well.

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