

## ANTICHOLINERGIC HERBAL POISONING: A CASE REPORT

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**SUMMARY** – Poisoning of two young people caused by the intake of tea prepared from the plant *Datura stramonium* L. (jimson weed) of the genus *Datura* is described. The toxic alkaloids of jimson weed, atropine and scopolamine, cause a series of characteristic classic symptoms of anticholinergic poisoning. Dysrhythmias, seizures, hyperpyrexia, coma, and respiratory arrest are less common but also highly life-threatening manifestations of this poisoning that are generally treated with physostigmine. Children are mostly exposed to the poisoning by the plant species from the genus *Datura*, however, the poisoning most frequently occurs due to plant abuse by adolescent addicts. Treatment options for acute intoxication at a detached island health institution are presented along with difficulties encountered thereby.

**Key words:** *Plant poisoning – diagnosis; Plant poisoning – therapy; Plants – medicinal; Plants – toxic; Case report*

### Introduction

Anticholinergic poisoning can occur due to the consumption of plants of the genus *Datura* which contain toxic belladonna alkaloids. These plants grow wild in nature, and some of them are wide-spread in Croatia and accessible to everyone. Due to their hallucinogenic effects they are best known among young addicts. The recognition of signs and symptoms of toxic effects caused by the ingestion of *Datura* enables rapid diagnosis and appropriate therapy in the early phase of this potentially lethal poisoning.

### Case Report

At the end of the summer, a 29-year-old man and 25-year-old woman, a married couple, were brought to our Center by their two neighbors and accompanied by the police requesting our urgent medical help after they had been found in their own home, “in an abnormal condition”. The husband was “very upset; he cried and broke vessels”. The neighbors had to call the police in order to calm them down. The wife “was lying on the floor, motionless, with weak signs of life”.

During the examination, the man was agitated, disoriented and speaking in a bizarre way. His skin was warm, red and dry, his pupils were dilated, and he was tachycardic. Unlike him, the wife was lying motionless, not responding to verbal contact and with weak reaction to painful stimulus. She also had dilated pupils and warm, dry, red skin. She was febrile (38 °C) and tachycardic. The couple had not visited our institution before, although they were known as addicts. We suspected they had taken some narcotic. Fortunately, the neighbors brought with them a plant with a big, white, bell-like flower and indented leaves, which they had found in the kitchen of the couple who, as the neighbors said, had offered them once to drink together a tea made of the plant “Angel’s trumpet”, as they called it. Having translated the term, we quickly found on the Internet that the couple had been poisoned by some plant from the genus *Datura*. The clinical picture also pointed to it, as it was in accordance with the signs of anticholinergic poisoning. We consulted the colleagues from the Jordanovac Center of Toxicology in Zagreb. As the patients showed signs of heavy poisoning, we used physostigmine intravenously in a dose of 1.5 mg in both of them. After 10 minutes, we added 1 mg after which both patients experienced significant improvement. Then we decided to perform gastric lavage and give them activated charcoal. We did urine test panel to five narcotics (details below), which were negative. After almost complete stabilization we transferred the patients, accompanied by a physician

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and ECG monitoring, to the nearest general hospital for observation. Their further recovery was rapid and complete. Later we learned that the plant that had caused the poisoning was known to the inhabitants of our island as *kužnjak*. The man and wife said later that they had picked up the plant "somewhere in the field on the island".

## Discussion

*Datura stramonium* L. (jimson weed; Croatian name, *kužnjak*) is a one-year herbaceous poisonous plant from the family *Solanaceae* (Fig. 1). It can grow up to 100 cm, with spindle-shaped roots, large white glass-like flowers, indented leaves and a quiver-shaped, thorny, multi-seed fruit. It is a cosmopolitan plant wide-spread from southeast Europe to eastern Asia<sup>1</sup>. It grows along the roads, in the fields and at deserted places. The time of blossoming is from June to October. Out of 20 to 25 species of the genus *Datura*, only *kužnjak* grows in Croatia<sup>2</sup>. We can find here some more plants from the family *Solanaceae* that have the same toxic effects as *kužnjak*. The best known are deadly nightshade (*Atropa belladonna*) and black henbane (*Hyoscyamus niger*)<sup>1</sup>. The cultivated species from the genus *Datura*, known under the name of Angel's trumpet, have almost the same appearance as wild growing species and are equally poisonous and dangerous for people.

*Datura* are well-known to various people for centuries also as medicinal herbs and have had wide application in medicine. They have been especially used in healing asthma, diarrhea, renal colic and nocturia, peptic ulcers, Parkinson's disease and epilepsy. As addition to greases, they have been used to alleviate rheumatic pains, hemorrhoids, and to heal wounds and burns<sup>3</sup>.

*Datura* contain toxic belladonna alkaloids of which most significant are atropine (racemic mixture *d* and *l*-hyoscyamine) and scopolamine (*l*-hyoscine). Atropine and scopolamine are strong anticholinergics. They antagonize competitively muscarinic receptors of the smooth muscle tissue, heart muscle, salivary glands, peripheral ganglia and central nervous system<sup>4</sup>.

The concentration of various alkaloids in *Datura* depends on the subspecies and way of cultivating the plant. Structurally similar alkaloids are easily absorbed through mucous membranes, skin and intestinal tract. They metabolize in the liver through hydrolysis and are excreted unchanged *via* the kidney.

All parts of these plants are poisonous, and most belladonna alkaloids are in seeds. Toxic effects are manifested after ingestion of various parts of the plant, e.g., leaves,



Fig. 1. *Datura stramonium* L. (jimson weed, Croatian name, *kužnjak*). The photograph of the plant was taken in the period of blossoming, at the end of August, in the vicinity of a vineyard on the island of Korčula (by the courtesy of Mr. Neven Fazinić, grad. engineer from Korčula).

flowers, especially seeds; most often by preparing teas or smoking so-called stramonium cigarettes. It is not simple to estimate the gravity of poisoning from the data on *Datura* ingestion. On the basis of calculated quantity of hyoscyamine, it is estimated that 50 to 100 seeds contain an equivalent of 3 to 6 mg atropine<sup>5</sup>. The dose of atropine above 10 mg is potentially lethal. Each seed weighs about 1 mg and contains about 0.4% of belladonna alkaloid. Young *Datura* plants contain mainly scopolamine, whereas in older ones hyoscyamine prevails. Considering plant parts, flowers contain 0.61%, fruit 0.66%, leaves 0.38%, pericarp 0.05% and roots 0.23% of belladonna alkaloids<sup>6</sup>.

Due to their high toxicity, *Datura* are not used in modern medicine in the traditional way anymore. Nevertheless, their natural alkaloid components, atropine and scopolamine, are being used; the more so, their semisynthetic derivatives (methylatropine, ipratropium, tiotropium) are used in healing asthma and chronic obstructive lung diseases as well as in some synthetic preparations for the treatment of peptic ulcers (pirenzepine) and urinary incontinence (tolterodine)<sup>4</sup>. In western countries, the poisoning with *Datura* is more often recorded among adolescents who usually drink tea prepared from these plants with the purpose of provoking hallucinations<sup>7</sup>. Accidental poisoning of children attracted to beautiful, big flowers, when poisoning occurs by sucking nectar from the base of the flowers or after eating seeds, is less common.

According to the data of the Jordanovac Center of Toxicology from Zagreb, poisonous plants (including mush-

rooms) are the cause of 1.5%-2% of all registered cases of poisoning in Croatia. Some 5%-6% of these poisonings are caused by the plants of the genus *Datura*. Most commonly reported are poisonings in children aged 10-15 years while playing.

It has been estimated that the use of *Datura* preparations in Croatia is most frequent among addicts, often in combination with other drugs in order to "strengthen or modulate" their effects. They as a rule are reported to health service only when the poisoning is in an advanced stage.

A typical case of poisoning with *Datura* manifests as a syndrome of anticholinergic poisoning, which is often described in the literature as "blind as a bat, hot as a hare, dry as a bone, red as a beet, and mad as a wet hen". This is an illustrative account of classic anticholinergic symptoms: mydriasis, increased libido, redness of the skin, hallucinations and agitation. They are accompanied by tachycardia, urinary retention, slowed intestinal motility, polydipsia, fasciculations, and speech difficulties. The symptoms of poisoning begin 30 to 60 minutes after the ingestion, and the first manifestations of poisoning occur as early as 5-10 minutes of the tea consumption<sup>8</sup>. The first signs of the toxic effects of the *Datura* alkaloids while cigarette smoking are dryness of the mouth and somewhat later mydriasis. The slowed intestinal motility can prolong the elimination of toxic alkaloids causing persistency of the symptoms for up to 48 hours<sup>9</sup>.

In case of severe poisoning, the following disturbances occur: dysrhythmias, ileus, hyperthermia, seizures, coma, and respiratory arrest. Such poisoning can eventually lead to death of the patient, which frequently occurs due to accidental trauma or drowning.

Most of documented deaths were registered in persons simultaneously taking alcohol or some other drugs or narcotics. Therefore, it is always useful to use toxicologic screening. There are several commercially available test panel for rapid detection of narcotics and their metabolites in the patient's urine or blood. As to the awareness of the most frequent narcotics in our region, we currently use test panel for simultaneous detection of amphetamine, metamphetamine, cocaine, morphine, and tetrahydrocannabinol in urine. The results of the tests can be read very easily and do not require additional laboratory equipment. These tests can identify consumers of marijuana and hashish, ecstasy, heroin, cocaine (crack), amphetamine, and some other related narcotics.

Thorough history is very important in the management of acute poisoning by narcotics and/or drugs. Crucial data

can be often obtained from the family, friends, or neighbors of the poisoned. Collaboration with the police department of narcotics is also very important. The treatment of patients poisoned by anticholinergics consists of general measures for patient stabilization, the procedure of gastrointestinal decontamination, and in more severe cases administration of physostigmine. Careful observation in a quiet place may sometimes prove sufficient for complete patient recovery, even without any additional procedures. In patients presenting with pronounced symptoms (especially in the first 6 hours of poisoning), the absorption of anticholinergic alkaloids may be significantly decreased by gastric lavage or ipecac syrup-induced emesis. Activated charcoal binds to toxins and decreases their absorption. The usual dose of activated charcoal for adults is 1g/kg. If the patient is conscious, emesis can be induced by the syrup of ipecac in a dose of 30 ml for adults and 15 ml for children if the patients are awake. Gastric lavage should not be done in unconscious patients without previous intubation of the trachea<sup>10,11</sup>.

The patients with anticholinergic poisoning require ECG monitoring to prevent tachyarrhythmias. At the same time, vital and neurologic functions are observed with special attention to possible hyperpyrexia and convulsions. In severe poisoning with the occurrence of serious dysrhythmias, convulsions, agitation, hallucinations and coma, the use of acetylcholinesterase inhibitor physostigmine is warranted. The initial dose is 1 to 2 mg (0.01 to 0.03 mg/kg) for adults and 0.02 mg/kg for children. The medicine is given slowly intravenously at a maximal dose of up to 4 mg in 30 min for adults. The beneficial effects of physostigmine can be usually experienced within some 15 minutes, and another dose can be given after 30 minutes. When administering physostigmine one should take into consideration the possible cholinergic crisis which includes bradycardia, complete atrioventricular block and asystole, seizures, emesis and bronchorrhea. In case of physostigmine overdose, 0.5 mg of atropine *per* 1 mg physostigmine can be added intravenously<sup>12</sup>.

It is important to note that the drugs of choice to treat acute agitation are benzodiazepines because haloperidol, chlorpromazine and other related neuroleptics can exacerbate agitation and psychosis<sup>5</sup>. Seizures can also be treated with benzodiazepines, whereas symptomatic tachydysrhythmias respond best to propranolol in a dose of 1 mg intravenously during one minute, which can be repeated every 5 minutes to the maximal dose of 5 mg<sup>10</sup>.

The patients who require the use of physostigmine must be hospitalized and observed continuously for at least

24 hours at intensive care unit. The cases of heavy acute poisonings (especially in children) pose a serious problem in our emergency department due to the limited possibilities of complete treatment at the level of detached island medical center at significant distance from the nearest hospital. Therefore, we have made efforts in additional education of the staff, with emphasis on mastering the procedures and skills needed in the treatment of poisoning. We purchased several drugs and antidotes for the treatment of various poisonings as well as a test panel for the detection of some narcotics in urine. A practical problem in treating intoxications in our conditions is that some preparations, and especially specific antidotes, are not on the list of registered drugs, and great efforts are needed to purchase them. We use the advantages of telemedicine in the care of intoxicated patients. A favorable circumstance is the existence of a dialysis unit at our institution.

For every serious poisoning, we consult some clinical departments by telephone, and consultations with the colleagues from the Jordanovac Center of Toxicology from Zagreb are especially helpful.

Taking into consideration the existing difficulties we have been facing for years in treating poisonings, we think there is the need of establishing a national referral center of toxicology, where all patients with life-threatening poisonings would be treated. Then, complete data on poisonings in the Republic of Croatia would be collected at one place, with the possibility of permanent education and urgent consultations. We consider that the establishment of such a center would contribute greatly to the appropri-

ate treatment and prevention of intoxications, which would also reflect favorably on the severe consequences of drug addiction in the country.

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## Sažetak

### ANTI-KOLINERGIČNO TROVANJE BILJKOM: PRIKAZ SLUČAJA

D. Podbevšek

Prikazano je trovanje dvoje mladih ljudi izazvano konzumiranjem čaja pripravljanog od biljke *Datura stramonium* L. (kužnjak) iz roda *Datura*. Toksični alkaloidi kužnjaka, atropin i skopolamin, izazivaju niz znakovitih klasičnih simptoma antikolinergičnog trovanja. Srčane aritmije, konvulzije, hiperpireksija, koma i respiracijski arest predstavljaju rjeđi, ali životno ugrožavajući oblik ovoga trovanja kod kojega se uobičajeno primjenjuje fizostigmin. Trovanju biljnim vrstama iz roda *Datura* najviše su izložena djeca, ali trovanje najčešće nastaje zlouporabom kod ovisnika adolescentne dobi. Ukratko su prikazane mogućnosti liječenja akutnih intoksikacija u otopskoj zdravstvenoj ustanovi i iznesene poteškoće u zbrinjavanju trovanja u našim uvjetima.

Ključne riječi: *Trovanje biljkom – dijagnostika; Trovanje biljkom – liječenje; Biljke – ljekovite; Biljke – otrovne; Prikaz slučaja*