Chronicle of Datura Toxicity in 18th and 19th Century

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Abstract

Background: Datura stramonium is a poisonous and common flowering plant that is a member of the Solanaceae family. Datura poisonings are a rare occurrence in the 21st century, making toxicological information on this plant sparse. Historical information on Datura provides useful information on the clinical symptoms and characteristics of poisonings. This review looks at the state of knowledge on Datura’s chemical properties and clinical characteristics in the 18th and 19th century.

Methods: A literature review was conducted, and an online database search identified 197 articles. Ultimately 42 articles met the search criteria and were included for review.

Results: Medical literature on Datura focused predominantly on clinical poisonings, medical treatments, and identifying its chemical properties. Clinical poisonings included cases of accidental and intentional poisonings, and provided information on the age of patients, their symptoms, and treatments. Datura was also used to treat a variety of conditions, including asthma, inflammatory diseases, epileptic seizures, and hallucinations. Chemical experimentation on Datura commonly looked at isolating alkaloids and assaying their concentrations in various plant organs.

Conclusion: Historical literature on Datura shows that cases of poisoning were a common occurrence. These historical sources provide useful information on Datura poisoning’s clinical findings, and preliminary uses of Datura in medical treatments. Early chemical exploration of Datura also set the groundwork for future research.

Keywords: Datura Stramonium; History; Poisoning

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INTRODUCTION

Datura is a genus of flowering plants that are part of the Solanaceae family (1). Datura are believed to be indigenous to the Americas and Asia, but have been transported around the world and are now widespread as a common garden plant (1). Common names for Datura include Jimsonweed and thornapple. All species of Datura are poisonous. Datura species produce tropane alkaloids, bicyclic and nitrogenous organic compounds that have a significant effect on human and animal physiology (2). Datura is known for its narcotic effects and psychoactive properties (3). All organs of Datura contain alkaloids, and the most common alkaloids found are atropine and scopolamine, both of which have anticholinergic properties (4). While these alkaloids are toxic, they also have many modern day medical applications (4).

Documented cases of Datura poisoning in the 21st century are sparse as they are a relatively rare occurrence. Reported cases tend to be from either accidental consumption among children, or intentional consumption from adolescents for the plants’ hallucinogenic effects (5). The prevalence of Datura toxicity is more common in low and middle income countries (6). Acute Datura stramonium poisoning is clinically distinct and leads to irritability and sinus tachycardia (7, 8). Historical literature and information on Datura is useful in establishing the past knowledge and understanding of these toxic plants, as well as useful information on clinical findings. The objective of this paper is to explore the state of knowledge on Datura in the 18th and 19th centuries, particularly in instances of Datura poisoning and its symptoms and treatment methods, clinical applications of Datura, and its chemical properties.

RESULTS

A review of medical literature on the use of Datura in the 18th and 19th century was conducted. An online search was performed using Pubmed and Simon Fraser University’s library database, which contains a wide variety of journal articles, manuscripts, books, periodicals, and other media accessible to students attending the university. From this search 197 articles were identified. The 197 articles were screened by title and 145 articles were removed. The remaining 52 full articles were then assessed for eligibility. Ultimately 42 articles were included for review (Figure 2). Articles included in this review were English language articles, published before the 20th century, and had a focus on...
on medical outcomes (including clinical poisonings in man), chemical properties, or clinical applications of Datura. Articles were excluded if they did not have a significant focus on Datura, focused on botany or other non-medical topics, or were published in the 20th or 21st century.

**Intentional Poisonings**

Cooke (1860) reports that Datura seeds were often used by criminals to intoxicate victims in Bengal. Cooke states that the seeds have also been used for fatal poisonings in Bombay (9). He also describes the several species of Datura found throughout the world as highly narcotic (9). An article from 1842 reports the use of Datura for criminal activity in Bengal, where thieves would mix Datura seeds with sweetmeats which would then be consumed by their target (often a travel companion), resulting in lethargy in the victim (10). The treatment for Datura poisoning suggested in this article is emetics and cold affusion (10). An article from 1878 reported a story from India originally published in the Chemist and Druggist, where thieves would join a party of travellers, prepare food for the party that would contain Datura seeds, then rob these traveller upon Datura intoxication (11). A paper from 1766 reports that Datura seeds are used by highwaymen in Egypt to rob merchants. Thieves would mix

**Figure 2. Inclusion of articles.**

Datura bread thieves would then rob the merchants of their possessions (12). A correspondence letter from 1890 reported that Datura was one of the preferred methods of poison used among thieves in India (13).
A report published in the *Medical and Surgical Reporter* in 1887 described a double murder in India, where a woman mixed Datura seeds into bread she prepared for her husband (14). When her husband and another man consumed the poisoned bread, they were said to have behaved giddily and madly before collapsing and succumbing to the poison (14). Blyth (1885) also describes the prevalence of the use of Datura in accidental and intentional poisonings in India (15).

Slavens (1831) reports on a family that had different members suffer from Datura poisoning over a period of four months (16). The first two cases of poisoning were proven to be from the consumption of whole Datura seeds, but subsequent poisonings did not show this evidence. It was later concluded that the perpetrator had beat the seeds in a piece of linen, then boiled the linen producing a solution that was added to the victims’ drinks (16). Hooker (1836) wrote about a case where a family of five were poisoned by Datura, where sulfate of zinc with ipecac was used to induce vomiting. It was suspected that a neighbour had intentionally provided the family Datura leaves to eat, yet not enough evidence was available to lay charges (17).

Brièrre de Boismont (1853) described a case where a man attempted suicide by consuming Datura, and proceeded to show giddiness and intoxication, as well as hallucinations (18).

**Accidental Poisonings**

Walker (1885) reported an instance where a girl had consumed ripened stramonium fruit, and presented with symptoms of dilated pupils and swelling throughout the body. The treatment provided to the girl was subcutaneous administration of hydrochloride of pilocarpine, which led to a rapid recovery (19). Brewston (1851) reported two young children having consumed Datura seeds (20). The symptoms reported included fixed, dilated pupils, delirium, and loss of vision (20). In 1874, an article on poisons and poisonous plants reported on *Datura stramonium*. The article outlined that many children die from consumption of the seeds, and that the plant can be used to produce a strong medicine for treating spasmodic cases (21).

Wenzel (1877) reported a girl who showed spasms, pale face, spasmodic breathing and elevated pulse (22). It was later determined that the girl had eaten the leaves and sprouts of *Datura stramonium* (22). Wenzel also described an additional case where a young girl had consumed Datura seeds, leading to convulsions, elevated pulse, and sensitivity to light (22).

Brièrre de Boismont also describes a case of accidental poisoning of three children who consumed Datura seeds in 1843, and the subsequent hallucinations (18).

De Witt (1798) describes two cases of *Datura stramonium* poisoning. The first case consisted of a girl who consumed Datura seeds, resulting in a high fever, dilated pupils, and a weak pulse (23). The second case consisted of a woman who had received bad advice concerning the use of a concentrated solution of dried Datura seeds as a home remedy, resulting in delirium, elevated pulse, and convulsive motions (23).

A communication from 1833 describes three cases of Datura poisoning. The first case was a woman who presented with dilated pupils and lack of vision, pain and confusion, and anxiety (24). The doctor later determined that the patient had been accidentally poisoned by *Datura stramonium* in the leaves her mother had gathered for tea (24). The second case showed similar symptoms of poisoning, and also had stramonium accidentally included in the patient’s tea (24). The third case was a woman who was recovering from dysentery and was prescribed to take one Datura leaf and prepare an infusion to be self-injected. The patient instead had taken a larger volume of Datura infusion that left her comatose, and took multiple days to recover fully (24).

In 1886, a mother and her adult son showed symptoms of Datura poisoning after accidentally mixing Datura seeds into their coffee (25). Symptoms of the poisoning were reported as dilated pupils, dry tongue and thirst, partial delirium, and redness and swelling of the body (25). Both the mother and son recovered from the poisoning, and the treatment used was an eighth of a grain (approximately 8 milligrams) of sulphate of morphia administered every 2 or 3 hours (25).

Gregory (1847) recorded a case of accidental poisoning of a man by Datura, whose symptoms included dilated pupils, reduced vision, difficulty breathing, and slow pulse (26).

**Clinical Applications**

A publication from 1860 states that smoking Datura leaves can relieve asthma, and that consuming large quantities of the leaves will result in “temporary idiocy” (27).

The same article reports that boiling *Datura stramonium* leaves in a litre of water produces a cure for hydrophobia that lasts 24 hours (27). Trouseau (1859) suggests that dried Datura leaves smoked as two cigarettes or through a pipe is the preferred method of asthma attack treatment (28). Trouseau also noted that this treatment appears ineffective in regular tobacco smokers (28). A correspondence from 1812 reported the smoking the roots and lower stem of *Datura* resulted in effective asthma relief (29). Wood (1849) also reports that *Datura stramonium* can be used to treat asthma (30). Cunningham (1828) also supports the smoking of *Datura* seeds as a method to relieve asthma (31).

Wood reports on several other medical uses of *Datura stramonium*, including treatments for epilepsy, neurological and rheumatic conditions (30). Wood also states that *Datura* can also be turned into an ointment for external applications to treat pain and inflammation, and that many American surgeons use *Datura* as a pupil-dilator (30).

Kirchoff (1827) wrote about a treatment for rheumatism where Datura leaves would be boiled into an extract then applied internally or externally to areas of pain (32). An article from 1787 reports that ingestion of *Datura stramonium* seeds results in delirium, and that large doses of these seeds would likely be fatal (33). The same article also suggests that applications of the leaves to the foot can relieve foot spasms, and that applying the leaves as a poultice or ointment can relieve inflammation and hemorrhoids (33). Cunningham described multiple uses of *Datura* for various conditions, including the use of the leaves to reduce instances of epileptic seizures (31). Anderson (1838) reported four cases where the consumption of *Datura* extract was used to successfully treat symptoms of epilepsy (34). *Datura*
stramonium leaves have also been used to treat ulcers and hemorrhoids (31). A stramonium compress was also applied as part of the treatment in a case of an enlarged spleen (31).

Jones (1848) reported using Datura stramonium as an emmenagogue to restore menstrual flow in a patient (35). In 1806, Baldwin wrote about the use of Datura stramonium to cure a case of dropsy, where the leaves of Datura were dried then crushed into pills (36). King (1798) writes that a medicine can be produced from Datura seeds by boiling the seeds in water and producing an extract (37). King then reports the successful use of this medicine in two instances, each where a man showed symptoms of inflamed meninges (37).

Pomeroy (1820) describes preparing pills from the extract of stramonium stalks and leaves to relieve the symptoms of Trigeminal neuralgia (also known as tic douloureux) (38). A response to this report by Orfila describes a similar use of Datura stramonium to relieve a case of severe headache (38). Zollickoffer (1845) provides a procedure for developing a tincture and an ointment of Datura stramonium, and also writes about the use of Datura to relieve chronic rheumatism (39). Moureau (1841) describes the use of stramonium extract to treat ten patients experiencing hallucinations (40). Seven of these patients were completely cured of their hallucinations using this method (40). Briere de Boismont also describes Dr. Moreau’s treatment for hallucinations, where patients are given small doses of clarified sugar of stramonium (18). De Rossett (1802) prescribed a concentrate of Datura stramonium to be consumed by a man who experienced “mental derangement” (41). Seemant (1852) describes the use of Datura seeds in Central and South America, where Indigenous people prepare a drink prepared from Datura seeds which is given to children, and is believed to allow the children to detect gold deposits (42). Children are then provided with an Indian corn beer to reverse the effects of Datura (42). Cooke describes the use of a medicine derived from the leaves and seeds of Datura to produce a coma-like state as part of traditional healing rituals (9). A beverage containing Datura is also used in South American cultures to produce a mental state where individuals are believed to communicate with dead relatives (9). Turner (1864) reported that a patient suffering from Datura poisoning recovered after the use of opium (43). Blyth also describes the delirium of Datura poisoning, as well as methods of pharmaceutical preparations of stramonium tinctures (15).

Chemical Properties

Dohme (1893) assayed the alkaloidal values of different parts of Datura stramonium, and found that the stem followed by the seeds had the largest percentage of alkaloids (44). Mayer (1863) describes a process for assaying the alkaloidal value of Datura stramonium, as well as methods to produce stramonium extracts (45). Nagelvoort (1896) describes an assay process for measuring the alkaloidal value of Datura stramonium (46). Nagelvoort also reports the use of Datura in Chinese teas and traditional medicines (46). Wormley (1894) describes the chemical characteristics of atropine, an alkaloidal substance found within Datura stramonium, and describes its properties through several chemical reagent tests (47). Orfila (1817) performed animal experiments on the effects of Datura consumption through external observation and animal dissection (48). Stephenson (1834) describes the chemical properties of Datura stramonium, as well as its toxic effects on the body (49).

DISCUSSION

Significant insight can be gained from examining the historical medical literature on Datura. In contrast to contemporary cases of Datura poisoning, the majority of cases in the 18th and 19th centuries were from not only accidental ingestion, but also intentional poisonings. Historical cases showed that individuals who unintentionally consumed Datura tended to be very young children and adults. The most common route of poisoning was from ingestion of whole plant parts in children, or contamination of food or drink in adults. A significant number of reports on Datura identified occurrences of intentional poisonings. Papers published in the United States reported a mix of accidental and intentional Datura poisonings, while papers focused on India or Egypt consistently described intentional poisonings. Intentional poisonings is the United States were most likely to come from domestic disputes between neighbours or family members, and doses given were meant to be fatal. Many reports from India and Egypt focused on the use of Datura by thieves, and that these doses were intentionally non-fatal. Datura was shown to be an easily available poison. From the 19th century it is clear that psychoactive compounds such as Datura were in use by thieves. In the 21st century, similar behaviours including date rape have shifted to include more effective and synthetic agents (50, 51).

Datura was substantially used in medical treatments throughout the 18th and 19th centuries. The most common medical use of Datura was through the treatment of asthmatic attacks. Asthma was treated through smoking Datura, and various parts of the Datura plant were suggested for asthma relief, including the leaves, roots, stems and seeds. Datura was also used for several inflammatory diseases, where an extract was consumed or an ointment was prepared. Datura-based medicines came in the form of liquid injections, concentrated solutions for internal consumption, pills, and salves. Datura was also used for mental health issues including hallucinations, and conditions like epilepsy. Datura also was shown to have uses among Indigenous cultures, particularly in traditional medicines and cultural practices for its hallucinogenic effects. Uses of Datura in the 19th century were predominantly focused on asthmatic relief and to treat inflammatory conditions. In the 21st century, the alkaloids found in Datura are used in several medical applications, including pupil dilation, an antidote for organophosphate poisoning, and to reduce heart rate (52).

Investigations into the chemical and pharmacological properties of Datura were also explored in the 18th century. Significant attention was applied to the alkaloids found in Datura and isolating these compounds. While the initial investigations into isolating alkaloids was rudimentary, updated and more effective practices for isolating tropane alkaloids from plants are now used in the 21st century (1, 53, 54).
CONCLUSION

In conclusion, several historical sources on Datura showed that cases of poisoning were a common occurrence, most often through accidental poisoning but also through intentional and criminal poisonings. Information from these sources reveals many of the symptoms of Datura poisoning as well as methods of treatment. Characteristics and demographic information on cases of Datura poisoning were examined, as well as the routes of entry. Several investigations into the chemical properties of Datura were also identified. These articles looked at the chemical and physical properties of Datura as well as methods to isolate alkaloids. Many medical uses of Datura were also found in the literature, particularly its use in asthma treatment. From performing this review of literature on Datura, findings on the clinical symptoms of Datura poisoning and medical uses of this plant were identified.

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