

# Emergency Department Identification and Critical Care Management of a Utah Prison Botulism Outbreak

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**Study objective:** We report botulism poisoning at a state prison after ingestion of homemade wine (pruno).

**Methods:** This is an observational case series with data collected retrospectively by chart review. All suspected exposures were referred to a single hospital in October 2011.

**Results:** Twelve prisoners consumed pruno, a homemade alcoholic beverage made from a mixture of ingredients in prison environments. Four drank pruno made without potato and did not develop botulism. Eight drank pruno made with potato, became symptomatic, and were hospitalized. Presenting symptoms included dysphagia, diplopia, dysarthria, and weakness. The median time to symptom onset was 54.5 hours (interquartile range [IQR] 49-88 hours) postingestion. All 8 patients received botulinum antitoxin a median of 12 hours post-emergency department admission (IQR 8.9-18.8 hours). Seven of 8 patients had positive stool samples for type A botulinum toxin. The 3 most severely affected patients had respiratory failure and were intubated 43, 64, and 68 hours postingestion. Their maximal inspiratory force values were -5, -15, and -30 cm H<sub>2</sub>O. Their forced vital capacity values were 0.91, 2.1, and 2.2 L, whereas the 5 nonintubated patients had median maximal inspiratory force of -60 cm H<sub>2</sub>O (IQR -60 to -55) and forced vital capacity of 4.5 L (IQR 3.7-4.9). Electromyography abnormalities were observed in 1 of the nonintubated and 2 of the intubated patients.

**Conclusion:** A pruno-associated botulism outbreak resulted in respiratory failure and abnormal pulmonary parameters in the most affected patients. Electromyography abnormalities were observed in the majority of intubated patients. Potato in the pruno recipe was associated with botulism. [Ann Emerg Med. 2014;64:26-31.]

Please see page 27 for the Editor's Capsule Summary of this article.

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## INTRODUCTION

In 2010, there were 112 laboratory-confirmed cases of botulism in the United States. The majority of cases occurred in infants (76%); 15% were wound botulism associated with intravenous drug abuse, and only 8% were food borne.<sup>1</sup> The incidence of food-borne botulism in the United States from 1982 to 2002 has been stable, at about 20 cases per year, with occasional outbreaks involving no more than 50 people per year. Of these, one third are caused by toxin type A.<sup>1</sup> Type A botulism toxin is associated with more severe and long-lasting paralysis, with reports of up to two thirds of patients requiring intubation. Before ICUs, the mortality rate was as high as 60% to 70%. However, with intubation and mechanical ventilation, mortality has decreased to 5% to 10%.<sup>2</sup>

*Clostridium botulinum* is an anaerobic, Gram-positive, rod-shaped, toxin-producing bacterium responsible for the botulism toxidrome.<sup>3</sup> Botulism neurotoxin irreversibly blocks presynaptic terminal release of acetylcholine at the neuromuscular

junction, causing flaccid muscle paralysis and eventual respiratory failure. Clinicians should suspect botulism if the patient demonstrates descending peripheral muscle weakness starting with bilateral cranial nerve deficits. Other common presenting symptoms of food-borne botulism include dizziness, blurred vision, dysarthria, and diplopia. Onset of symptoms is usually 12 to 36 hours after ingesting the bacterium, but can also appear within 6 hours to 10 days. Progression of symptoms can be stopped or slowed with early administration of the botulism antitoxin.<sup>4</sup>

Although the illicit manufacture of alcoholic beverages is practiced across the world, the prison setting is particularly challenging. The basic ingredients in brewing alcohol are sugar and yeast. In prison, pure sugar is often unobtainable so it is substituted with ketchup, fresh fruit, juices, and milk. Fruit is mandated to be present in prison cafeterias, making it nearly impossible to ban common pruno ingredients.<sup>5</sup> Additionally, most prisons require inmates to work in the kitchen, where they have access to these ingredients.<sup>6</sup>

### Editor's Capsule Summary

#### *What is already known on this topic*

Food-borne botulism occurs sporadically throughout the United States. In prisons, illicit wine production is a recurrent cause of botulism outbreaks.

#### *What question this study addressed*

One incident in a state prison was investigated when wine ("pruno") ingestion was followed by several cases of botulism.

#### *What this study adds to our knowledge*

Prison wine made with potato resulted in 8 cases of botulism, whereas similar recipes made by the same prisoner without potato did not produce botulism.

#### *How this is relevant to clinical practice*

The development of cranial nerve deficits and descending paralysis in correctional care facilities should lead to consideration of botulism. The inclusion of potato in the pruno recipe was associated with botulism, but there are too few data to prove causation.

The term for jail-made alcohol varies geographically across the United States. It is known as "hooch" in Sing Sing Correctional Facility and "pruno" in San Quentin State Prison, whereas in other regions it is referred to as "white lightning" or "apple-jack."<sup>7</sup> In the western United States, it is generally termed "pruno."

The most important step in the production of pruno is the fermentation of sugar into alcohol. This is performed in an anaerobic environment, which is also conducive to *C botulinum* growth. Botulism outbreaks have been associated with pruno production in other prisons when potatoes have been used.<sup>8</sup> The most recent pruno-associated botulism outbreak occurred in Arizona in 2012 in 2 separate incidents in the same prison.<sup>9</sup>

We report an outbreak of botulism poisoning in prison inmates, associated with homemade wine, who presented to an emergency department (ED).<sup>10</sup> In addition, we explore the unique challenges in diagnosis and treatment of this potentially fatal infection.

## MATERIALS AND METHODS

### Study Design

This is an observational case series of all patients presenting to the ED who were state prisoners with suspected pruno ingestion during October 2011. A sentinel case was identified in the ED, and data were collected on this patient and all subsequent patients during hospitalization. Data were

abstracted retrospectively from the electronic medical records by 2 emergency medicine residents (B.T.W., S.M.S.) and independently verified by an attending physician (E.M.C.). The abstractors were not blinded to the study, and an interrater assessment was not performed. Data collected were the amount ingested and time of ingestion, time to antitoxin administration, symptoms, physical examination results, neurologic examination results, laboratory data, respiratory parameters, electromyogram study results, interventions, and outcomes for each case. Physical examination findings were described as they were documented in the patient's chart. Time of ingestion was determined by patient report. We collected objective data about forced vital capacity, maximal inspiratory force, stool cultures, and electromyogram. All data were retrospectively obtained and clinicians were not blinded to the results of objective measurements. Two-month follow-up on all of the less-affected patients and 6-month follow-up on the most severely affected were obtained through chart review. Microsoft Excel for Mac 2011, version 14.3.8 (Microsoft, Redmond, WA) was used for data analysis.

Approval for this study was obtained from the institutional review board at University of Utah.

### Setting

All patients were initially evaluated in the ED at the University of Utah Hospital, an urban 400-bed tertiary teaching hospital. The state prison has an independently functioning infirmary but transfers patients warranting a higher level of care to the ED.

### Selection of Participants

A sentinel case was identified in the ED, and 11 subsequent patients were identified by state prison and Utah Department of Health investigations and emergency physician and neurologic critical care physician queries.

## RESULTS

The sentinel patient presented complaining of weakness, diplopia, and dysphagia. Physical examination revealed weakness, ptosis, and dysarthria (Table 1, patient #7). This case prompted an immediate investigation by prison officials and the health department, which identified 11 additional potential exposures to pruno, and these patients were referred to the University of Utah Hospital ED for evaluation during the following 48 hours.

A total of 12 inmates presented to the ED with a history of consuming pruno within 4 days of presentation. The amount consumed varied greatly per patient report, with some patients reportedly consuming more than 2 gallons. Four patients consumed a batch that did not contain a potato in the recipe and were either asymptomatic or had symptoms not consistent with acute botulism toxidrome and were discharged. The remaining 8 patients consumed pruno that included potato and presented to the ED at a median time to symptom onset of 54.5 hours from ingestion (range 39 to 89 hours; interquartile range [IQR] 49-88 hours). Both batches of pruno were made by the same

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