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Prelude

- August 2012
- 4 inmates in a maximum security prison (Prison A) diagnosed with botulism
- No laboratory-confirmed source
  - Pruno (prison-brewed alcohol) suspected
The Call — November 24, 2012

- State health department notified of 2 inmates in Prison A
  - Vomiting, dizziness, blurred vision, double vision, dry mouth, difficulty speaking, shortness of breath, upper extremity weakness, and bilateral, symmetric ptosis
Day 1

- Two more inmates with similar signs and symptoms
  - Double vision, slurred speech, upper extremity weakness, and asymmetric extraocular palsy
Day 2

- Three additional inmates hospitalized
  - Nausea, blurred vision, double vision, dysphagia, slurred speech, shortness of breath, and weakness
Day 3

- Eighth inmate admitted to the hospital
  - Vomiting, dizziness, and double vision
Progression

- Seven of eight patients intubated shortly after admission to the hospital
  - Mechanical ventilation

- All received botulinum antitoxin
Clostridium botulinum

- Gram-positive, obligate anaerobic bacterium
  - Found in soil worldwide

- Usually exists as dormant spore in environment
  - Heat-resistant

Clostridium botulinum spores
Accessed online at:
Botulinum Toxin Production

- *C. botulinum* spores germinate into vegetative cells
- Toxin production occurs with specific environmental conditions
  - Anaerobic
  - Low salt
  - Low sugar
  - Low acid (pH > 4.6)
  - Warm temperature: optimum 86–95°F

- Toxin types A–G
  - Type A most common in U.S.
Botulism Symptoms

- Acute, symmetrical, descending flaccid paralysis in a proximal to distal pattern
  - Double/blurred vision
  - Drooping eyelids
  - Difficulty swallowing
  - Dry mouth
  - Altered voice
  - Difficulty speaking
- Toxin ingestion
  - Abdominal pain, nausea, vomiting, diarrhea
- Can progress to respiratory muscle paralysis and death
Foodborne Botulism

- ~15% of all reported botulism cases
  - Approximately 20 cases/year since 2000

- Most commonly associated with consumption of improperly processed home-preserved foods
Objectives

- Confirm the diagnosis
- Define and identify cases
- Identify source of outbreak
- Prevent future cases
Methods

- Interviewed correctional officers and inmates

- Sent specimens from patients and potential sources to CDC for testing
Results — Case Investigation

- Correctional officers reported inmates appeared intoxicated day prior to symptom onset

- On November 23, all eight patients reported sharing a batch of pruno (prison-brewed alcohol) made from potatoes

- Leftover pruno found in hallway near housing for ill inmates
Pruno

- Ingredients commonly include fruit, sugar, and bread
  - Brewed in plastic bag or bottle

- Inmates reported consuming pruno regularly

- Potato-based pruno previously associated with botulism outbreaks in correctional facilities
Onset of Signs and Symptoms

Health and Wellness for all Arizonans

Inmates drank pruno at ~1pm
Case-Patients (n = 8)

- All male
- Median age 25 (range 20–35) years
- Race/ethnicity
  - 6 Mexican-American
  - 2 American Indian
- Median incubation period 29 (range 16–64) hours
Heptavalent Botulinum Antitoxin (BAT)

- Investigational new drug released March 2010 for botulism in adults
  - Licensed March 2013

- Equine-derived antibody to all known subtypes of botulinum toxin
  - A—G
How was the alcohol shared?

Rec Area

Cell 1
Cell 2
Cell 3
Cell 4

Pod A

Officer Tower

Rec Area

Cell 1
Cell 2
Cell 3
Cell 4

Pod B
How was the alcohol shared?

- Inmates in 2 different pods became ill — did go to recreation area at same time
Potential for Sharing Pruno
Laboratory Results — Mouse Bioassay

- All patient serum specimens (n = 8) positive for botulinum toxin type A

- Pruno also positive for botulinum toxin type A
Clinical Course

- Recovery requires nerve regeneration
  - Months to years

- Severity of clinical illness associated with longer persistence of symptoms
Patient Recovery

- 1 patient discharged back to prison within 5 days

- 7 patients transferred to long-term acute care facilities on mechanical ventilation and supportive care
  - Discharged to prison 1–6 months after outbreak
  - Persons with shorter incubation times had longer recovery times

- Patients from August and November outbreaks reported persistent symptoms
  - Weakness, tremors, dry mouth, dysphagia, blurred vision
August & November Outbreaks Unrelated

- Distant areas of Prison A
- No contact between inmate populations
- PFGE patterns from isolates different

[PFGE patterns for August and November outbreaks]
# Prison-Associated Botulism Outbreaks

<table>
<thead>
<tr>
<th>Year</th>
<th>State</th>
<th>No. of cases</th>
<th>Age range (yrs)</th>
<th>No. hospitalized</th>
<th>No. intubated</th>
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</thead>
<tbody>
<tr>
<td>2004</td>
<td>California</td>
<td>4</td>
<td>19–35</td>
<td>4</td>
<td>2</td>
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<tr>
<td>2005</td>
<td>California</td>
<td>1</td>
<td>30</td>
<td>1</td>
<td>1</td>
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<tr>
<td>2011</td>
<td>Utah</td>
<td>8</td>
<td>24–35</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>2012</td>
<td>Arizona — Prison A</td>
<td>4</td>
<td>27–33</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>2012</td>
<td>Arizona — Prison A</td>
<td>8</td>
<td>20–35</td>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>
What’s the Connection?

- In all documented outbreaks, inmates reported drinking pruno made from potatoes
- *Clostridium botulinum* on potato skins from soil
  - Sealed in anaerobic, low salt, low sugar, low acid, warm environment → toxin production
Conclusion

- Potato-based pruno associated with a botulism outbreak affecting 8 persons in an Arizona correctional facility

- August and November botulism outbreaks in Prison A unrelated
Prevention Efforts

- Educate inmates and correctional officers about botulism from potato-based pruno

- Limit access to high-risk ingredients for botulinum toxin production in pruno such as potatoes
Public Health Action

Botulism in Prison

In recent years, there have been several outbreaks of botulism in prisons. Two outbreaks occurred in Arizona in 2012. All the cases were linked to "hooch," also called "pruno" or prison wine, made with potatoes.

This disease causes muscle paralysis so that someone can't move or even breathe. If not treated quickly, botulism can cause death. Even with treatment, people often stay in the hospital for months and full recovery can take years.

The germ that causes botulism, called Clostridium botulinum, makes a toxin when it is in a sealed container (like a jar). These germs come from ingredients like potatoes and other root vegetables, such as carrots or yams, as well as many other sources. This germ lives in soil and is present all over the world.

Preventing Botulism

Don't drink alcohol made in prison.

If you do make or drink alcohol, be sure there are no potatoes or root vegetables (like carrots) in it.

For more information about botulism, visit: www.cdc.gov/ncidod/dvbd/diseases/botulism/

Botulismo en la Prisión

En los últimos años han ocurrido varios brotes de botulismo en las cárcel. Dos brotes ocurrieron en Arizona el año 2012.

Todos los casos estaban relacionados con alcohol llamado una de prisión, pruno o "hooch" que fue hecho a base de papas.

Esta enfermedad provoca parálisis muscular por lo que la persona no puede moverse y ni siquiera respirar. Si no se trata rápidamente, el botulismo puede causar la muerte. Incluso con tratamiento, las personas suelen permanecer en el hospital durante meses y una recuperación completa puede tardar años.

El germ que causa el botulismo, llamado Clostridium botulinum, produce una toxina cuando se encuentra en un recipiente sellado (como una botella). Estos germens vienen de ingredientes como papas, otras verduras como la yuca y el frijol, y de otras fuentes. Este germ vive en el suelo y está presente en todo el mundo.

La prevención del botulismo

No beba alcohol hecho en prisión.

Si usted prepara o bebe alcohol, asegúrese de que no contiene papas u otras verduras u hortalizas de raíz.

Para obtener más información, visite: www.cdc.gov/ncidod/dvbd/diseases/botulism/
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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.
Extra Slides
Complications

- Seven patients developed pneumonia
  - Culture revealed:
    - Methicillin-resistant Staphylococcus aureus
    - Methicillin-sensitive Staphylococcus aureus
    - Enterobacter aerogenes
    - Serratia marcescens
    - Citrobacter koseri
    - Klebsiella pneumonia
    - Escherichia coli
- One patient had cholecystitis
- Five patients had elevated lipase levels
Case Definition

- Signs and symptoms of cranial nerve palsies and weakness, dysphagia, or impaired gag reflex, with onset during November 23 – December 10, 2012, in a Prison A inmate with botulinum toxin identified from a clinical specimen
# Laboratory Results

<table>
<thead>
<tr>
<th>Specimen</th>
<th>No.</th>
<th>Botulinum toxin type A</th>
<th>Clostridium botulinum</th>
</tr>
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<tbody>
<tr>
<td>Pruno</td>
<td>1</td>
<td>Positive</td>
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<tr>
<td>Patient serum</td>
<td>8</td>
<td>Positive</td>
<td>-</td>
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<tr>
<td>Stool</td>
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<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Gastric aspirate</td>
<td>7</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Rectal swabs</td>
<td>7</td>
<td>-</td>
<td>5 positive</td>
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</tbody>
</table>
Botulism Testing – Mouse Bioassay

Patient samples

Patient samples +
botulinum antitoxin type A

Patient samples +
botulinum antitoxin type B

Patient samples +
botulinum antitoxin type E