

# EVAN'S STORY



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## Botulism Overview

- Rare but serious paralytic illness caused by nerve toxin produced by:
  - *Clostridium botulinum*
  - Occasionally: *C. butyricum* or *C. baratii*
- Five types of botulism: foodborne, wound, infant, adult intestinal toxemia, iatrogenic
- All forms can be fatal and are considered medical emergencies

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### *Clostridium botulinum*

- Rod-shaped bacteria found in soil that grow best in low oxygen conditions
- Can exist in a dormant state (endospore) until conditions are favorable
- Seven types of botulism toxin: A-G
  - A, B, E, F cause illness in humans




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### Botulism in the United States

- Average 145 cases reported yearly
  - ~65% infant botulism
  - ~20% wound botulism
  - ~15% foodborne botulism
  - Rare: adult intestinal toxemia & iatrogenic botulism
- Outbreaks
  - Foodborne: usually associated by home-canned food
  - Wound: most associated with black-tar heroin




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### Symptoms of Botulism

- Muscle paralysis caused by the bacterial toxin
- Classic botulism
  - Double / blurred vision
  - Drooping eyelids
  - Slurred speech
  - Difficulty swallowing
  - Dry mouth
  - Muscle weakness
- Infant botulism
  - Lethargic
  - Feed poorly
  - Constipation
  - Weak cry
  - Poor muscle tone
- Left untreated, symptoms may progress
  - paralysis of respiratory muscles, arms, legs, trunk

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### Infant Botulism

- Constipation is often the first sign
- Most recover completely, but severe cases can lead to paralysis or death
  - Fatality rate is less than 2%
- *Clostridium* spores are ingested
  - Spores germinate in large intestine, producing toxin
  - Different than foodborne botulism (ingest toxin)
- Spores are ubiquitous
  - Children and adults regularly ingest them, but rarely contract botulism
- One possible cause of SIDS

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### Prevention of Infant Botulism

- Honey can contain *Clostridium* spores and has been linked to cases of infant botulism
  - In a US survey, 10% of honey samples contained botulism spores
  - CDC, American Academy of Pediatrics and National Honey Board recommend not giving honey to infants less than 12 months of age
- Most cases cannot be prevented
  - Bacteria found in dust and soil inside homes
  - On floors, carpets, and countertops even after cleaning



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### Infant Botulism & the Immature Gut

- The *Clostridium* spores are thought to travel with microscopic dust particles
  - Infants may breathe in spores
  - Spores mix with saliva and are swallowed
- Rarely, adults with recent intestinal surgery or otherwise altered intestinal tracts have contracted botulism through ingesting spores
- Therefore, researchers believe an incompletely developed intestinal flora may be to blame



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### Infant Botulism in Michigan 1985-2012

Date	Gender	Toxin Type
May 1985	Female	A
October 1985	Male	A
February 1989	Female	B
September 1991	Female	B
October 1991	Male	B
November 1997	Male	A
February 2002	Male	A
May 2012	Male	B

- 62.5% Male
- 50% toxin A; 50% toxin B

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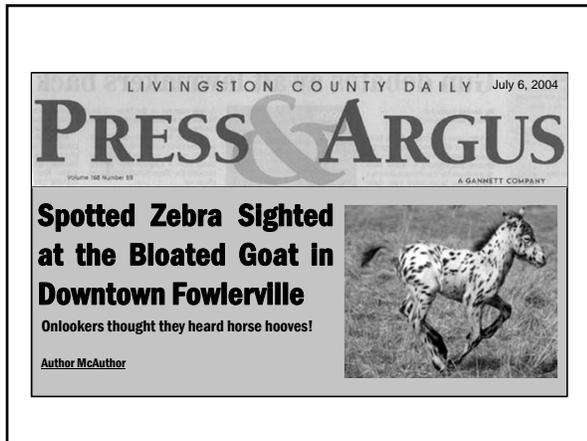
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### Case History

- 40 week c-section-birth weight 7 lb 12 oz/ now 6 months old
- Mom-31-Registered Dietician
- Dad-39-Engineer
- Caucasian/first child/Breast-fed exclusively
- Mild jaundice-resolved quickly
- Immunizations UTD
- Healthy/no medical issues
- No daycare/very sterile environment

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### Symptoms

- 5-13-12-Last bowel movement on 5-9-12-weak, hoarse cry, fussy, feeding poorly
- 5-14-13-No wet diapers/went to AA-ER-given a suppository-sent home
- 5-14-13-Mom still concerned-saw PCP-referred back to ER-treated for dehydration- admitted to pediatric floor for decreased activity and mental status



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### R/O Diagnosis

- Dehydrated-10%
- Blood glucose-57 mg/dl
- Abd ultrasound and heat CT-negative
- R/O Meningitis-LP done-Protein-32 White cells-3
- R/O Sepsis
- R/O-Endocrine Syndrome
- R/O seizures
- Mom put symptoms into WEB MD-Botulism first diagnosis she saw

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### Hospital Course-5-16-12

- Limp and expressionless
- Very altered weak cry
- Poor, weak, suck
- Difficulty breathing
- Decreased responsiveness
- Pupils fixed and dilated
- R/O Botulism now a possible diagnosis
- Transferred to PICU
- Feeding tube inserted/Oxygen administered



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**Call from Dr. Ruta Sharangpani – MDCH**

- Advised LCDPH of possible Infant Botulism case
- Requested CD nurse call and interview Mother
- Will do Botulism testing/only if treatment started/BabyBIG-available from California
- Testing expensive and takes time

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**Interview with Evan’s Mom**

- Current weight 18#'s
- Uses teething rings about 6 times per day
- No honey consumption
- Exclusively breast-fed
- Had about one tablespoon rice cereal on 5-13-12/only time fed solids/they do have the box-Nature’s Best-taken to the hospital
- Extensive landscaping done a few weeks ago/organic cow manure/mulch/and flowers.
- Evan has never had bottled or well water

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**Interview continued**

- No one else in the family ill
- Evan was sitting on a blanket in the yard/while Dad was doing yard work
- Evan had pictures done in the yard on 5-13-12
- Pets include two dogs and one cat-all well-cat is exclusively inside, dogs are primarily inside
- No re-modeling inside the home

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**Interview-continued**

- Travel-only to St. Claire-MI-on Easter
- No daycare/no one else watched Evan
- Honey in the home-Dad has not had any for several months
- Maple Syrup in the home/Organic-Meyer brand/ Dad does use occasionally
- 5-11-12-Went to Mom's sister's house-played with 3 year old/and 11/2 year old cousins-they are well/played outside/sat in grass on a blanket

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**Case conference**

- Environmental/Dr. Lawrenchuk/Tiffany Henderson-Regional Epidemiologist/Rebecca Cook-Nursing Supervisor/Linda Weiman-CD coordinator
- Discussed case/interview results
- Talked to Dr. Levine/U of M
- Decision to test/treat for Botulism
- BabyBIG ordered from California
- Stool testing started at state lab

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**Laboratory Testing: Infant Botulism (1)**

1. Stool is diluted, spun until clear (supernatant) and prepared for mouse injection and for culture
2. Supernatant for mouse injection is divided into aliquots:
  - a) Left untreated
  - b) Treated with heat (inactivates all toxin types)
  - c) Treated with enzyme (ensures toxin is active)
  - d) Combined with antitoxin (neutralizes a specific toxin)




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### Laboratory Testing: Infant Botulism (2)

3. Samples of aliquots are injected into pairs of mice:

Sample	Antitoxin	Note
Heat-treated supernatant	No Antitoxin	Inactivates Toxin
Enzyme-treated supernatant	No Antitoxin	May Help Activate Toxin
Supernatant	No Antitoxin	...
Supernatant	Antitoxin A	...
Supernatant	Antitoxin B	...
Supernatant	Antitoxin E	...
Supernatant	Antitoxin Trivalent ABE	Combination of 3 Antitoxins



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### Laboratory Testing: Infant Botulism (3)

4. Mice are observed for 4 days



5. Concurrently, the sample undergoes an enrichment process where the culture is grown for 4-7 days




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### Laboratory Testing: Infant Botulism (4)

6. If test is negative:

- a) No mice die during the 4-day observation
- b) Entire mice injection process repeated with enriched culture

7. If test is positive:

- a) Mice die if antitoxin *does not match* toxin type
- b) Mice live if antitoxin *matches* toxin type




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**Laboratory Testing: Infant Botulism (5)**

- 8. To confirm initial positive results, organism is identified, purified, and grown in pure culture
- 9. Mice are injected with purified organism plus antitoxin




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**Case Test Results!**

Sample	Antitoxin	Testing Results
Supernatant	Antitoxin A	Mice died
<b>Supernatant</b>	<b>Antitoxin B</b>	<b>Mice lived</b>
Supernatant	Antitoxin E	Mice died
<b>Supernatant</b>	<b>Antitoxin A, B, &amp; E</b>	<b>Mice lived</b>
Supernatant	No Antitoxin	Mice died

- Testing results indicated botulism toxin B
- Do NOT wait for laboratory results to treat
  - Lengthy testing process with many potential iterations
  - Under the best circumstances, lab confirmation is achieved in approximately **65%** of the cases that are clinically diagnosed

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### Preliminary Report

- Clostridium Botulism toxin type B

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### Clinical Course

- Received BabyBIG
- Within 24 hours improvement noted
- Started moving head from side to side
- 5-18-Passed swallow study for thickened liquids
- PT/OT started
- Discharged from the hospital 5-26-12

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### Recommendations for Parents

- **Precaution Duration**
  - The toxin is thought to be shed in the stool 90 days.
  - The bacterial organism is thought to be shed in the stool for 3-4 months.
- **Hand Hygiene**
  - Always practice good hand washing, especially after a diaper change. Soap and water or alcohol-based hand sanitizer can be used.
  - Use gloves with leaky diapers and if there are any cuts on the hands of the person changing the diaper.

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**Recommendations for Parents**

- **Soiled Clothing and Diapers**
- Soiled clothing should be washed using hot water as the heat inactivates the toxin.
- It is important to keep dirty diapers away from other family members, visitors, and away from pets.
- Perhaps an outdoor trash that has a lid, but whatever system works for the family.

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**Recommendations for Parents**

- **Vaccines**
- Administer inactivated vaccines according to immunization after baby has returned to health.
- Live vaccines-discuss with PCP prior to administration regarding spacing of vaccines.

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**Recommendations for Parents**

- **Activities around others, including children**
- Diaper care should be done away from others, especially other children.
- Do not share toys or other items that children may touch or put in their mouth.
- There is no issue with visitors coming into the household.

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### Referrals

- Early On
- PT/OT
- Public Health follow-up
- MD follow-up

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**Resources**

- Botulism. CDC.  
[www.cdc.gov/nczved/divisions/dfbmd/diseases/botulism](http://www.cdc.gov/nczved/divisions/dfbmd/diseases/botulism)
- <http://diseases.emedtv.com/infant-botulism/infant-botulism.html>
- Infant Botulism and Honey. MT Sanford, E Atkinson, J Ellis. University of Florida IFAS Extension. Oct 2009.

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