Scientific Articles / Reviews

Botulism: A rare but fatal food poisoning

Botulism is a serious but relatively rare food borne illness. It is caused by the toxins produced by bacterium *Clostridium botulinum*. Different strains of the bacterium produce different neurotoxins and types A, B and E are most frequent. Botulism is associated with ingestion of preformed toxin from improperly preserved / canned, fermented or smoked foods eaten without sufficient cooking. Completely cooked food left out at room temperature for several hours may also get contaminated with *Botulinum* spores from environment or in food itself, and germination of these spores in anaerobic and high pH conditions (pH > 4.6) can produce botulin toxin. The toxin is common in home canned foods including low acid preserved vegetables as green beans, spinach, mushrooms and beets, also in canned fish (tuna), fermented fish, ham, chicken and sausages. The toxin is destroyed by boiling food for 5 minutes.

Although the disease is mainly food borne, it can also be transmitted through wound infection. The organism may enter the wound and produce toxins. Intestinal infection in infants (infant botulism) is caused by spores in honey or corn syrup which germinate in the intestine producing toxins. The incidence of botulism is low, but mortality rate recorded worldwide is high if treatment is not provided immediately and properly.

Mechanism of toxicity
Botulin toxin irreversibly binds to presynaptic cholinergic nerve terminals. The toxin becomes internalized and inhibits the exocytosis of acetylcholine thereby decreasing its release at the nerve terminals. Severe muscle weakness results and death is caused by respiratory failure. The toxin doesn't cross the blood brain barrier.

Clinical presentations
Food borne botulism
It occurs after 18-36 hours of ingestion of toxin contaminated food. Initial symptoms may be non-specific such as sore throat, dry mouth, GIT upset, later diplopia, ptosis, dysphagia dysarthria and other cranial nerve weakness appears, followed by progressive symmetrical descending
paralysis, respiratory muscle weakness and respiratory arrest. Patient remains conscious and there is no sensory loss. Pupils may be normal / dilated / unreactive. Constipation and urine retention are common. There is usually no fever. Similar symptoms may be seen in other individuals who had shared the same food.

**Infant botulism**
It is not caused by ingestion of preformed toxin but by in-vivo production of toxin in immature infant gut. The common signs and symptoms include hypotonia, constipation, tachycardia, difficulty in feeding, diminished gag reflex and head lag.

**Wound botulism**
It occurs from infected wounds. The typical symptoms are seen within 4-14 days of infection.

**Diagnosis**
- History of ingestion of home canned or smoked food
- Typical signs and symptoms
- More than one person is usually involved.
  Determination of toxin in serum, stool, vomitus, gastric contents and suspected food item may be useful from public health view point.
- Electromyography may reveal normal or decreased motor action potential.
- Routine laboratory investigations including CSF examination can exclude other causes of CNS effects.
- Differential diagnosis: myasthenia gravis, sudden infant death syndrome, Eaton-Lambert syndrome and a variant of Guillain-Barre syndrome. Sometimes intermediate neurotoxic syndrome occurring after organophosphate contaminated food ingestion may also present like botulism (1).

**Treatment**
1. **Emergency supportive care**
   - Maintain airway, assist ventilation (endotracheal intubation and ventilation, O₂)
   - Obtain arterial blood gases and observe closely for respiratory weakness as respiratory arrest can occur abruptly
   - Intravenous fluids or tube feeding as required

2. **Specific antidote treatment**
   - **Botulin antitoxin:** It is available as Botox Type A, 100 units / vial. It binds to free toxin and prevents progression of illness. However it does not reverse established neurotoxic manifestations. It is maximum effective when given within 24 hours of the onset of symptoms. Determine sensitivity before giving the antidote. Empirical dose for suspected botulism is 1-2 vials. For proven cases, 4-5 vials are given iv initially followed by another dose as required after 4-hours.
   - Infant botulism is managed by supportive treatment and usually recovery occurs within 4-6 weeks without the antitoxin. Antibiotics and cathartics are not recommended.

**Complications**
Certain complications such as aspiration pneumonia, respiratory distress, and long-lasting muscle weakness can occur.

**Prevention of botulism**
- Do not give honey or corn syrup to infants below one year of age.
- Always discard bulging cans or off-smelling preserved food.
- Sterilize (pressure-cook for 30 minutes) home-canned foods.
- Keep foil-wrapped baked potatoes and other vegetables hot or in the refrigerator, not out side at room temperature for more than 2 hours.
- Acidification and addition of salt in food reduces growth of bacteria / spores and toxin production.

**References**

**How important is product labeling and packaging in prevention of poisoning?**

Product labels are an essential part of hazard communication, providing the user with information about the chemical nature of the hazard, the identity of the substance, advice in case of exposure, instructions for storage and use, and cautions or warnings. The information may be given in words or presented in symbols or pictograms. The regulations and standards regarding labeling and packing of various products from cargo
to containers sold to consumers, exist in most countries including Oman. Appropriate labeling is essential, but it is ineffective if the print is too small to read easily, or it is not in the local language. However, even good labels will be useless if the original container has been discarded and the product has been decanted into another container or repacked locally. This is a common practice in the markets, where traders buy pesticides or kerosene in bulk and then sell in small amounts with no labels or incomplete and wrong labels.

Poison Control Centre came across some pesticide products, where the labels were wrong, incomplete and illegible. The two of these products were solids, repacked locally with wrong and incomplete labels and were being sold as rat poison. The chemical analysis of these products revealed presence of a pesticide, called Methomyl (a toxic carbamate preparation) and Benzene hexachloride (HCH), a banned persistent organic pollutant, both of them, in fact are not effective as rat poisons. The third product, which we came across was a miticide (diazenone, op) for use in animals (Newsign), manufactured in Jordan. The chemical ingredients, the directions for the use, warnings, first aid measures in case of exposure, were not clear and were in Arabic. Such product containers, if brought by the patient’s relatives for identification to assist in the diagnosis and management of the case, will instead mislead the clinicians.

Apart from the label, appearance of the container is an important factor in accidental poisoning in children. Containers of chemicals that resemble food or beverage containers are an obvious hazard. We came across a product labeled as "lamp oil" in one of the supermarkets in Muscat. The bottle looks exactly as the drinking water bottle, as shown.

---

**Current Concerns**

**Health effects of mobile phones**

Technologies using the electromagnetic spectrum have extensively contributed in the fields of telecommunication, medicine, travel, education, business and industry. The new devices though, provide immense benefits and have reshaped our lifestyle, have nevertheless raised sufficient concerns about health safety. Electric and magnetic fields (EMF) are invisible lines of force that surround any electrical device, gamma rays, X-rays, visible light, UV/IF, microwaves, radiowaves and security devices. Different forms of electromagnetic energy are distinguished by frequency expressed in hertz (Hz). Power-frequency EMF is 50-60 Hz, carries very little energy and has no ionizing and thermal effects. Microwave ovens produce 60Hz (inside 2.45 billion Hz), cellular phones communicate by emitting high frequency electric and magnetic fields (10-300 GHz) similar to those used for radio and television broadcasts. These are called radiofrequency (RF) energy. Other equipments using this energy are pagers, cordless phones, radar, industrial heaters, and medical devices.

RF energy is a type of non-ionizing radiation. Large amount of RF energy can heat tissues. The amount of RF radiation routinely encountered is too low to produce heating effects.

To date, all expert reviews on the health effects of exposure to radiofrequency (RF) have reached the conclusions that there have been no adverse health consequences from exposure to RF fields below the international guidelines on exposure limits published by the International Commission on Non-ionizing Radiation Protection (ICNIRP, 1998). The limits in the ICNIRP guidelines are highly protective and are based on the available scientific evidence. In 2000, WHO issued a Fact Sheet on "mobile phones and their base stations", that stated "present scientific evidence does not indicate the need for precautions for the use of mobile phones. If individuals are concerned, they might choose on their own or their children's RF exposure by limiting the length of calls or by using 'hand-free set' to keep mobile phones away from
the head and body". This information provided in the WHO Fact Sheet (#193) is still valid. Further as part of its charter to protect public health and in response to public concern, WHO has established the International EMF project in 1996, that continues to assess the scientific evidence of possible health effects of EMF in the frequency range from 0-300GHz, which include radiofrequency fields also (10MHz to 300GHz). In collaboration with international agencies (EPA, FDA, FCC) and organizations, WHO is pooling resources and knowledge concerning effects of exposure to electromagnetic fields (EMF) and making a concerted efforts to identify gaps in the knowledge, recommend focused research programmes that allow better health risk assessments to be made, conduct updated reviews and work towards an international consensus and resolution in the health concerns.

Abstracted from: Cell phone facts (FDA Information 2005)
WHO/Workshop on guiding public health policy in areas of scientific uncertainty 2005

Regulatory Issues

New policy on lead in children’s metal jewelry announced by U.S. Consumer Product Safety Commission

Foodborne diseases are caused by agents that enter the body through the ingestion of contaminated food or water. These diseases are sometimes inaccurately referred to as "food poisoning." Foodborne illness or foodborne diseases are now the generally preferred terms. Each year, unsafe food is responsible for illness in at least 2 billion people worldwide. Food and waterborne diarrhoeal diseases are the leading causes of illness and death in less developed countries killing approximately 1.8 million people annually, most of whom are children. Acute diarrhoeal diseases also represent one of the most frequent causes of morbidity and mortality among children below 5 years in the Eastern Mediterranean Region, where only a small fraction of all foodborne illnesses are recognized and reported. Although major foodborne disease episodes are due to microorganisms however, chemical hazards and poisoning due to natural toxins are also quite common. Foodborne illnesses create an enormous social and economic burden on communities and health system.

Threats to the food safety come from many sources, from production to processing, storage, preparation and handling. Some local customs involved in food preparation may add to these threats. In an effort to reduce the global incidence of foodborne disease, WHO launched a "5 keys" strategy at the "Global Forum of Food Safety Regulators" held at Bangkok, Thailand in 2004. The food safety regulators from the sectors of

A new “5 keys” strategy launched by WHO to reduce global incidence of food-borne diseases

Foodborne diseases are caused by agents that enter the body through the ingestion of contaminated food or water. These diseases are sometimes inaccurately referred to as "food poisoning." Foodborne illness or foodborne diseases are now the generally preferred terms. Each year, unsafe food is responsible for illness in at least 2 billion people worldwide. Food and waterborne diarrhoeal diseases are the leading causes of illness and death in less developed countries killing approximately 1.8 million people annually, most of whom are children. Acute diarrhoeal diseases also represent one of the most frequent causes of morbidity and mortality among children below 5 years in the Eastern Mediterranean Region, where only a small fraction of all foodborne illnesses are recognized and reported. Although major foodborne disease episodes are due to microorganisms however, chemical hazards and poisoning due to natural toxins are also quite common. Foodborne illnesses create an enormous social and economic burden on communities and health system.

Threats to the food safety come from many sources, from production to processing, storage, preparation and handling. Some local customs involved in food preparation may add to these threats. In an effort to reduce the global incidence of foodborne disease, WHO launched a "5 keys" strategy at the "Global Forum of Food Safety Regulators" held at Bangkok, Thailand in 2004. The food safety regulators from the sectors of
health, agriculture and trade focused on developing common understanding on
strengthening food safety systems globally and reducing the burden of foodborne disease. The
WHO brought out the 5 simple measures which can be taken on an individual level, while
preparing or consuming food. These included (i) keep hands and cooking surfaces clean, (ii)
separate the raw and cooked food while storing, (iii) cook food thoroughly, (iv) keep food stored at
safe temperatures, and (v) use safe water and safe raw ingredients. The "5 keys" strategy is
complemented by a manual, which helps
individuals to adopt good food handling practices.
The basic training manual that assures effective dissemination of information, is meant for the
Food Safety professionals, teachers and other organizations dealing with food safety, and is to be
used for the selected target groups including food handlers and school children. The five main
messages are being translated into over 25 languages, and the global manual that looks at the
core messages is adapted to the local situations.
Source: FDA / Centre for food safety & applied
nutrition

Poison Control Centre News

- Central Registry of Poisoning Cases: Data of 2005

The total number of poisoning cases registered
during 2005 were 5889 and 42% were children in the
age group of less than 12 years. Males
outnumbered females amongst children while
female cases were more in the age group of
13->40 years.

<table>
<thead>
<tr>
<th>Age group</th>
<th>No.</th>
<th>%</th>
<th>Males</th>
<th>%</th>
<th>Females</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adolescents &amp; Adults 13-&gt;40 years</td>
<td>3420</td>
<td>58</td>
<td>1639</td>
<td>48.0</td>
<td>1781</td>
<td>52.0</td>
</tr>
<tr>
<td>Children ≤12 years</td>
<td>2469</td>
<td>42</td>
<td>1471</td>
<td>59.6</td>
<td>998</td>
<td>40.4</td>
</tr>
<tr>
<td>Total</td>
<td>5889</td>
<td>100</td>
<td>3110</td>
<td>52.8%</td>
<td>2779</td>
<td>47.2%</td>
</tr>
</tbody>
</table>

Sex distribution in different age groups

![Sex distribution in different age groups](image-url)
### Types of Poisoning and Envenomations Encountered in 2005

<table>
<thead>
<tr>
<th>Type of Poisoning</th>
<th>No. of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown</td>
<td>306</td>
</tr>
<tr>
<td>Food Poisoning</td>
<td>142</td>
</tr>
<tr>
<td>Industrial</td>
<td>31</td>
</tr>
<tr>
<td>Household</td>
<td>79</td>
</tr>
<tr>
<td>Kerosene</td>
<td>30</td>
</tr>
<tr>
<td>Pesticide</td>
<td>13</td>
</tr>
<tr>
<td>Pharmaceuticals</td>
<td>176</td>
</tr>
<tr>
<td>Other Insect bites</td>
<td>307</td>
</tr>
<tr>
<td>Bee/Spider/Wasp sting</td>
<td></td>
</tr>
<tr>
<td>Scorpion sting</td>
<td>1868</td>
</tr>
<tr>
<td>Snake bites</td>
<td>262</td>
</tr>
</tbody>
</table>

N=5889

### Types of Poisoning Cases in Different Regions & Referral Hospitals

<table>
<thead>
<tr>
<th>Types of Poisoning</th>
<th>Muscat</th>
<th>N. Bahla</th>
<th>S. Bahla</th>
<th>N. Sharqiya</th>
<th>S. Sharqiya</th>
<th>Dhakiliya</th>
<th>Dhihira</th>
<th>Masardhar</th>
<th>Dhofar</th>
<th>Al Wusta</th>
<th>Royal H.</th>
<th>Total Number</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snake bite</td>
<td>1</td>
<td>19</td>
<td>120</td>
<td>34</td>
<td>17</td>
<td>12</td>
<td>34</td>
<td>3</td>
<td>4</td>
<td>15</td>
<td>0</td>
<td>3</td>
<td>262</td>
</tr>
<tr>
<td>Scorpion sting</td>
<td>5</td>
<td>161</td>
<td>703</td>
<td>1042</td>
<td>35</td>
<td>21</td>
<td>279</td>
<td>79</td>
<td>40</td>
<td>298</td>
<td>2</td>
<td>10</td>
<td>2675</td>
</tr>
<tr>
<td>Bee/Spider/Wasp</td>
<td>15</td>
<td>70</td>
<td>790</td>
<td>822</td>
<td>29</td>
<td>5</td>
<td>20</td>
<td>75</td>
<td>36</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1868</td>
</tr>
<tr>
<td>Unknown</td>
<td>8</td>
<td>72</td>
<td>56</td>
<td>63</td>
<td>29</td>
<td>5</td>
<td>0</td>
<td>35</td>
<td>10</td>
<td>4</td>
<td>6</td>
<td>19</td>
<td>307</td>
</tr>
<tr>
<td>Pharmaceutical</td>
<td>5</td>
<td>31</td>
<td>33</td>
<td>14</td>
<td>24</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>25</td>
<td>31</td>
<td>176</td>
</tr>
<tr>
<td>Pesticide</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Kerosene/Petrol</td>
<td>0</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>8</td>
<td>4</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>Household product</td>
<td>0</td>
<td>11</td>
<td>26</td>
<td>10</td>
<td>7</td>
<td>0</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>10</td>
<td>79</td>
</tr>
<tr>
<td>Industrial product</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>51</td>
<td>13</td>
<td>142</td>
</tr>
<tr>
<td>Food Poisoning</td>
<td>7</td>
<td>0</td>
<td>54</td>
<td>7</td>
<td>2</td>
<td>25</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>25</td>
<td>0</td>
<td>21</td>
<td>142</td>
</tr>
<tr>
<td>Unknown Poisoning</td>
<td>3</td>
<td>23</td>
<td>51</td>
<td>88</td>
<td>4</td>
<td>2</td>
<td>91</td>
<td>4</td>
<td>7</td>
<td>22</td>
<td>4</td>
<td>7</td>
<td>306</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>44</td>
<td>393</td>
<td>1851</td>
<td>2088</td>
<td>150</td>
<td>74</td>
<td>445</td>
<td>202</td>
<td>99</td>
<td>376</td>
<td>48</td>
<td>119</td>
<td>5889</td>
</tr>
<tr>
<td><strong>Percentage (%)</strong></td>
<td>0.7</td>
<td>7.6</td>
<td>31.4</td>
<td>35.5</td>
<td>2.5</td>
<td>1.3</td>
<td>7.6</td>
<td>3.4</td>
<td>1.7</td>
<td>6.4</td>
<td>0.8</td>
<td>2</td>
<td>100.0</td>
</tr>
</tbody>
</table>
- Poisoning prevention programme was conducted in the Regional hospitals of Sohar and Ibira during March and April 2006.

- Poison Control Centre staff addressed the pediatricians at the Royal Hospital and discussed about Lead poisoning in children, diagnosis & prevention-April 2006.

- A Seminar on National Guidelines on Poisoning Management was held on 28 June, 2006. HE Dr. Ali Jaffer Mohammed, Advisor of Health Affairs inaugurated the Seminar and released the National Guidelines on Poisoning Management. WHO Representative in the Sultanate and experts from the Royal Hospital, Sultan Qaboos University Hospital and all regional hospitals were present at the event. The ‘Guidelines’ and a bedside poster for “Emergency evaluation and management of poisoning cases” will be distributed to every hospital and health centre in the country to assist the A & E Staff in management of poisoning cases.
A Seminar on National Guidelines on Poisoning Management was held on 28 June, 2006.

**Regular Features**

**Brain Teasers**

1. Flumazenil is not indicated in suspected serious cyclic antidepressant overdose.
   - True
   - False

2. Metallic mercury when inhaled is toxic to CNS and is pulmonary irritant, but when ingested it is non-toxic.
   - True
   - False

3. Camphor, a common constituent of topical preparations used as counter irritants, is non-toxic to children when ingested.
   - True
   - False

4. One 500mg tablet of theophylline could be toxic to a child.
   - True
   - False

5. Fomepizole, a potent inhibitor of alcohol dehydrogenase is indicated in methanol or ethylene glycol poisoning.
   - True
   - False

6. The antidote for acute methanol intoxication is
   - Atropine
   - BAL
   - Ethanol

**Forthcoming Conferences / Training Courses / Symposia**

- A Workshop on Central registry of Poisoning Cases in 2006

---

**Patron**
Dr. Ali Jaffer Mohammed
Advisor, Health Affairs,
Supervising D.G.H.A., MOH

**Chairperson**
Dr. Salim Al Wahaibi
Director of DEH&ME

**Editor**
Dr. S.B. Lall
Head, Poison Control Centre

**Editorial Team**
Ph. Sheikha Al Harthy
Mr. Mohammed N. Al Habsi
Mr. Matter M. Al Riyami
Mr. Khalid N. Al Kharusi

**Editorial Office**
Directorate of Environmental Health and Malaria Eradication
Poison Control Centre

Tel.: (+968) 24566510
Fax: (+968) 24562688
(+968) 24563121
(+968) 24566510

P.O. Box: 393 Postal Code: 113
Muscat, Sultanate of Oman
Email: onmail898@omantel.net.om

**Courtesy:**
BUSINESS INTERNATIONAL GROUP L.L.C
P.O. Box 1268, Salb
Postal Code: 111, Sultanate of Oman
Tel.: (+968) 24814732, Fax: (+968) 24813924
E-mail: big@big.com.oom