Plants and Berries

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Objectives

- Recognize toxins and toxicity of common plants and berries
- Understand seasonality of poison center plant calls
- Know the top ten dangerous plants
- List a specific therapy for Oleander poisoning
Plant Exposures

- Plant exposures in children show **temporal consistency**
- Each year a spring peak occurs when children get into flowers. That is followed by a fall peak when children find and eat berries.
Summary of exposure

- 8 year old developmentally delayed boy
- Ingested at least a handful of purple berries
- Immediate onset of symptoms
- Chief complaint “They taste like burning”
- Abdominal pain
- Syncope
Poisonous berry by color

- **Purple berries**
  - Pokeweed
  - Deadly nightshade
  - Elderberry
  - Chokecherry
  - English ivy
  - Juniper
  - Monkshood

- **Red berries**
  - Yew
  - Lily of the Valley
  - Black Bryony
  - Silver nightshade
  - Euonymus
  - Holly
  - Nandina
Pokeweed: *Phytolacca americana*

- **Saponin**
  - severe hemorrhagic gastroenteritis
  - onset within 6 hours

- **mitogens**
  - immature plasma cells
- Phytolaccine (RIP 1)
- Root > tea > unripe berries
  > ripe berries (10=severe)
Type I vs Type II RIPs
Ribosome inhibiting proteins

- Single polypeptide chain
- Minimal oral absorption
- Local cytotoxicity
- Examples:
  - Phytolaccine (pokeweed)
  - Momordin (bitter melon)
  - Elderberry
  - Iris

- Alpha (active) and beta (binding) chain
- Also called toxalbumins
- Good oral absorption
- Systemic toxicity
- Examples:
  - Ricin (castor bean)
  - Abrin (jequirity bean)
  - Robin (black locust)
  - Phoradendron (Am mistletoe)
  - Viscumin (Eur mistletoe)
Type 1

Polypeptide with enzymic activity

Type 2

A chain  B chain

Polypeptide with lectin activity

-S-S-
Case report

49 year old male, in the yard weeding, dug up and ate a 3 inch piece of white root that he thought was carrot. He developed epigastric pain and repeated vomiting soon after exposure, which resolved with ondansetron and IV fluids. The plant was identified by a botanist as Phytolacca americana. “He is lucky to be alive.”
Pokeweed

- **Cardiac effects**
  - hypotension, Mobitz I heart block, tachycardia, V-fib
- May be related to parasympathetic effect
- Treatment: atropine, ACLS, fluids, monitor 24 hrs
Could Ralph have gotten sick from raw ripe pokeberry?

- Berries are innocuous (Thienes, 1955)
- Root is 5 – 8X more active than berries (Jack, 1942)
- Berry juice used to color wine
- Single dose of any amount not fatal to mice (Ogzewalla, 1962)
- Human adult fatal dose is 45 pounds of berries
- GI irritant effects possible from large amounts
Type 2 RIP: *Ricinus communis*

- 1 seed = 10 mg ricin
- 1 seed lethal to child
- 8-10 seeds lethal to adult
- severe hemorrhagic gastroenteritis
- GI onset < 6 hrs
- cytotoxic effects $\geq$ 2-5 days
- multi-organ failure
Type 2 RIP: *Abrus precatorius*

- Rosary pea
- Jequirity bean
- Abrin
- Lethal dose = 1-2 chewed seeds
Type 2 RIP: *Robinia*

Black Locust

- Treatment
- Aggressive decontamination
  - WBI
- Maintain hydration
- Observe 8 hours
Atropa Belladonna

- Deadly nightshade
  - *Atropa belladonna*
  - 2-5 berries serious to child
  - 10-20 berries fatal to adult
  - Contains atropine, scopolamine, hyoscyamine
  - Roots > seeds > leaves > flowers

*Image credit: Atropa belladonna from Cornell University*
Cyanogenic Plants

- Prunus species
  - cherry laurel
  - pit cherry
  - wild black cherry
  - chokecherry
  - plum
  - bitter almond
  - peach
  - apricot

- Pear seeds
  - apple seeds
  - crabapple
  - elderberry
  - hydrangea
  - bamboo
  - cassava
Chokecherry (Prunus virginiana)

- Fruit edible without seed
- Seed contains amygdalin
- Leaves, shoots, bark contain prunasin
  - 3.7 mg/g of leaf HCN
  - 13 g leaf “fatal”
Elderberry

- Sambrunigin
  - Cyanogenic glycoside
- RIP type 1
  - Vomiting, bad taste
- Anthocyanodins
  - Great antioxidant
- 3 mg HCN per berry
  - 16 uncooked, unripe berries “fatal”

“The flu fighting fruit”
“Bavarian pensioners left perplexed by the theft of young hydrangea plants have been told by police that young people are raiding gardens to smoke the flowering plant for its rumoured marijuana-like high.”

The Local, April 4, 2013
“Apparently there are certain types of Hydrangeas that, when smoked, cause a stoned feeling similar to weed. The only problem is there are dangerous levels of cyanide in the leaves”

- 4 cyanogenic glycosides in leaves
  - 3 mg per gram of leaves
  - 16 g leaves is “fatal”
“One more point. These flowers are to be looked at and NOT EATEN. A couple of years ago, there was a nationally reported case of food poisoning which occurred down the road from my house in Tsukuba at the curious and pricey Italian restaurant Toeimon Sakae. The chef garnished a dish with leaves of hydrangea. These were subsequently consumed by the unsuspecting diners. This resulted in what must have been an unforgettable scene, right out of Monty Python. You see, the leaves of ajisai have always been used to induce vomiting, especially when poisons were consumed. Imagine then, the eight customers wretching uncontrollably, spewing out their expensive dinners onto the antique furniture and tatami mats! Interestingly, the penalty for this chef`s oversight was a mere one-day suspension of business.”
Nice or noxious?
Juniper (Juniperus ...)

Clinical/historical use
- *Juniperus*
  - *arizonica* (reddieberry juniper)
  - *coahuilensis*
  - *communis* (common)
  - *deppeana* (alligator)
  - *monosperma* (oneseed)
  - *osteosperma* (Utah)
  - *pinchotii* (Pinchot’s)
  - *scopulorum* (Rocky mountain)
- Kidney and urinary health
- Flavoring

- Extremely bitter
- GI irritant
Juniper ingestions - PCC

Effects (all mild)

<table>
<thead>
<tr>
<th>Age (year)</th>
<th># berries</th>
<th>effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toddler</td>
<td>1-2</td>
<td>Emesis</td>
</tr>
<tr>
<td>1</td>
<td>Unknown</td>
<td>Face rash</td>
</tr>
<tr>
<td>1.5</td>
<td>Unknown</td>
<td>Diarrhea</td>
</tr>
<tr>
<td>2</td>
<td>Unknown</td>
<td>Emesis</td>
</tr>
<tr>
<td>3</td>
<td>Unknown</td>
<td>Emesis</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>Emesis</td>
</tr>
<tr>
<td>5</td>
<td>Unknown</td>
<td>Mouth pain</td>
</tr>
</tbody>
</table>

No effect cases
- 60 ingestions
- Median age 2 years
  - Range 10 months – 48 years
  - 2 adult ages not recorded
  - Median quantity 1 berry
  - Range 1-12 berries

Mild cases
- 6 ingestions

Unless severe symptoms – monitor all quantities at home
Monkshood
(*Aconitum napellus*)

- Potent Na+-channel opener
- Paresthesias, dysrhythmias (Torsades), seizures
- Yellow-green vision
- 1 tsp of root fatal
- Dermal route toxic
- Tx: amiodarone (5/9 pts), atropine for bradycardia; cardioversion ineffective
Red/Orange berries

- Black bryony
- Silver nightshade
- Euonymus
- Holly
- Lily of the Valley
- Nandina
- Yew
Nandina (*Nandina domestica*)

### Clinical/historical use
- **Nandina domestica**
  - Heavenly bamboo
- Plant alkaloid
  - Nantenine
  - $\alpha_1$ and 5-HT$_{2A}$ antagonism
  - Mice studies as MDMA antagonist
- Higenamine
  - Tracheal relaxation through $\beta_2$ adrenoreceptors
  - Guinea pig studies

### Toxicity
- No cases of human toxicity
- Avian toxicity
  - Cedar waxwings
  - Lesions consistent with cyanide poisoning
- Seeds/berries cyanogenic
  - 3 mg/g
- Seeds/berries cyanogenic
Nandina ingestions - PCC

**Effects (mild)**

<table>
<thead>
<tr>
<th>Age (year)</th>
<th># berries</th>
<th>effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 mo.</td>
<td>1</td>
<td>anorexia</td>
</tr>
<tr>
<td>16 mo.</td>
<td>Unknown</td>
<td>---</td>
</tr>
<tr>
<td>16 mo.</td>
<td>1</td>
<td>Mouth pain</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>GI pain</td>
</tr>
<tr>
<td>2</td>
<td>Unknown</td>
<td>---</td>
</tr>
<tr>
<td>4.5</td>
<td>Unknown</td>
<td>GI pain</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>Swollen lip</td>
</tr>
</tbody>
</table>

- **No effect**
  - 73 ingestions
  - Median age 18 months
  - Range 1-13 years
  - 4 ages not recorded
  - Median quantity 1 berry
  - Range 1-6 berries

**Mild symptoms**
- 17 ingestions
  - unknown quantity

> 5 berries—consider ED if symptoms
Yew (\textit{Taxus brevifolia})

- \( \geq 6 \) seeds toxic
- red flesh is edible
- tea from leaves deadly
- seeds contain taxine alkaloids
  - Na+ blocker (\textit{NaHCO3} effective)
  - CCB (taxine B is calcium blocker)
- hard seed coat prevents toxicity when swallowed whole

32 yo male ate 12 cookies containing yew, paroxetine, brodifacoum, shellac. He vomited, then 3h later had cardiac arrest. EKG showed wide QRS complex.
Lily of the Valley

- Convallatoxin, convallarin
  - Cardiac glycosides
- 4 y.o. chewed 1 leaf
- 6 y.o. ate 1-2 flowers
- Tx: GI decon, MDC
  - Atropine, pacemaker
  - FAB- K+ > 5.5, cardiovascular collapse, rhythm disturbances (20 vials)
Holly (*Ilex aquifolium*)

- Saponins
- GI toxicity, CNS
  - vomiting x 6 hours,
  - diarrhea at 20 hours
- fluid/electrolyte
- Usually no symptoms
- 20-30 berries may be fatal in children
Nightshade: *Solanum species*

- Bitter, then sweet
  - hence “dulcamara”
  - Tastes like burning
- Unripe > 5 berries more toxic
- Solanine: Vomiting, diarrhea, headache, flushing, syncope
- Tropane alkaloids: AMS, hallucinations, delirium
- Tx: supportive
Susumber berries

- Severe poisoning has been described in 3 outbreaks of susumber berry (*Solanum torvum*) ingestion, from as little as one tablespoonful.

- Symptoms: facial paralysis, ataxia, slurred speech, blurred vision, disconjugate gaze, ptosis, muscle fasciculations, diaphoresis, urine incontinence, bronchoconstriction, excessive secretions, extremity numbness and weakness, respiratory paralysis, and altered mental status, but not gastrointestinal symptoms.
So What do you think Ralph ate?

- Pokeweed
- Elderberry
- Chokecherry
- Deadly nightshade
- English ivy
- Juniper
- Monkshood
- Some imaginary plant
Oleander (common and yellow)

- Potent cardiac glycosides
- Often fatal
- Requires very high doses of immune Fab
- Impact of a Proprietary Extract of Nerium Oleander on Symptoms and Mortality: A Feasibility Study
  - This is a proprietary extract of Nerium oleander that is 6.25 ug per 0.5 ml of suspension. It is administered sublingually every six hours for 5 days. The daily dose is 25 ug and the 5 day dose is 125 ug.
Poison Hemlock (*Coniine*)

- Greek execution: Socrates
- mistaken identity
- nicotine-like
- ascending paralysis
- terminal asphyxia
- seizures usually absent
Water hemlock (*Cicuta*)

- Wild carrot
- Most lethal indigenous poison
  - Cicutoxin
- Root is most toxic
  - Death with few cm
- Severe GI 15-90 min
- Status seizures
- 30% mortality
How do you tell them apart?

- Poison hemlock and Water hemlock are both members of the same plant family. They can be distinguished by the single taproot, purple spots, and mousy odor of poison hemlock, compared to the branched root system with lateral tuber, and absence of spots and odor with Water hemlock.
Why do we care?

- Cases of hemlock are very rare
- In disaster drill re anthrax, hemlock was mentioned as a lay treatment in place of antibiotics
  - There are homeopathic true poison hemlock pills
  - There is a non-toxic “hemlock” tree
    - Tsuga Canadensis
Poison Ivy (*Toxicodendron*)

- urushiol
  - antigenic catechols
  - not in blister fluid
- onset hrs to 5 days
- duration 1-3 wks
- linear streaks, vesicles
- soak clothes in bleach (1:5) 15 min
- Zanfel lotion or generic

*prednisone 1 mg/kg/day, taper over 2-3 wks
avoid “dosepaks”*
Another emerging dermatitis

Giant Hogweed
\((\text{Heracleum mantegazzianum})\)

- Furocumarins
- Phototoxicity
- Blisters with scarring
- blindness

“Queen Anne’s Lace on steroids”
Top Ten Most Dangerous Plants

- Autumn crocus
- Castor Bean
- Common oleander
- Glory lily
- Jequirity Bean/Rosary Pea
- Lily of the valley
- Monkshood
- Poison hemlock
- Water hemlock, water hemlock dropwort
- Yellow oleander