The Toxidrome Oriented Physical Examination

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Objectives

- Key components of tox physical exam
- Cases where visual clues were instrumental in diagnosis
- Describe the physical clues consistent with selected toxidromes

THE MIDAS TOUCH

- 26 y/o with weakness & ataxia.
- Alert but slow to answer
- VS: RR 22 HR 84 BP 116/74 afebrile
- Exam: nonspecific weakness, non-focal
LABORATORY
Tox Screens are not the Answer
- Lab turnaround time longer than critical time for decisions
- Screens are not comprehensive nor specific
- Many toxins do not have an absolute cutoff level for toxicity

Look at the Patient
- Eyes
- Skin
- Neurological
- Cardiopulmonary
Mad Hatter
- 18 year old presents combative, mumbling and incoherent after ingesting tea made from wild plants.
- Physical exam reveals agitated male
- VS: pulse 122, R 20, B/P 138/78, temp 102°F
- Pupils: dilated
- Skin: red, warm & dry

What is this toxidrome?
- Anticholinergic Poisoning
- Causes
  - Jimsonweed (Datura stomonum)
  - atropine
  - antihistamines
  - phenothiazines
  - amantadine
  - cyclobenzaprine
  - TCAs

What is the antidote?
- Treatment (try benzodiazepines & haloperidol 1st)
- Physostigmine 1-2 mg IV over 5 min
- Indications:
  - severe agitation
  - dysrhythmias
EYES

- Miosis
- Mydriasis
- Midpoint
- Nystagmus

Sedated Patient

Miosis

Differential Diagnosis

- C
- O
- P
- S

“There are only two kinds of cops – the quick and the dead!
Barney Fife
Miosis = COPS

Differential Diagnosis
- Cholinergic, clonidine
- Opiates, organophosphates
- Phenothiazines, pilocarpine, phencyclidine (PCP), pontine bleed
- Sedative hypnotics

CASE
- 16 y/o with decreased M.S.
  - Gen – intermittently agitated
  - P 120, BP 94/56 R 8 afebrile
  - PERRL at 1 mm
  - Skin dry
  - Excessive salivation

Olanzapine (Zyprexa®)
- Lethargy 76%
- Hypotension 10%
- Anticholinergic 43%
- Agitation 33%

O’Malley G: Olanzapine Overdose Mimicking Opioid Intoxication
AEM 1999;34:279-31
Weiner et al: J Tox Clin Tox 2003;41:742
Atypical Antipsychotic Abuse

- Clozapine
- Mellow Yellow


Atypical Antipsychotics

- Hypotension
  - Fluids
  - Bicarbonate
  - Pressors
- Seizures
  - Benzodiazepines
  - Barbiturates
- Torsades
  - Magnesium
  - Overdrive pacing
  - Lidocaine

Atypical Antipsychotic Abuse

- Opiate abusers
- Knock-out
- Robberies
- Munchausen syndrome by proxy

Case 3-20-1995

- 35 y/o collapses and has tonic-clonic contractions. Comes in mildly cyanotic and unresponsive with vomit.
- 45 5 90/40 afebrile
- Pupils 1.5 mm
- HEENT: secretions/vomit mouth & nose
- Lungs with rales and rhonchi
- Abd with increased bowel sounds
- Skin diaphoretic

Hatta K et al., Lancet 347:1343, 1996
OP Toxidrome = SLUDGE

- Salivation
- Lacrimation
- Urination
- Diarrhea
- Gastrointestinal distress
- Emesis

Sweating
- Seizures
- Muscle fasciculations
- Miosis
- Bradycardia
- Bronchoconstriction

Clinical Status of Patients Exposed to Sarin on March 21, 1995

<table>
<thead>
<tr>
<th>Status</th>
<th>Count</th>
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</thead>
<tbody>
<tr>
<td>Dead</td>
<td>8</td>
</tr>
<tr>
<td>Critical</td>
<td>17</td>
</tr>
<tr>
<td>Severe</td>
<td>37</td>
</tr>
<tr>
<td>Moderate</td>
<td>984</td>
</tr>
<tr>
<td>Outpatient</td>
<td>4,073</td>
</tr>
<tr>
<td>Unknown</td>
<td>391</td>
</tr>
<tr>
<td>Total</td>
<td>5,510</td>
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</table>
Sarin Attack Tokyo Subway

111 moderate-severe intoxicated survivors

<table>
<thead>
<tr>
<th>Sign/Symptom</th>
<th>%</th>
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<tbody>
<tr>
<td>Miosis</td>
<td>99.0</td>
</tr>
<tr>
<td>Headache</td>
<td>74.8</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>63.1</td>
</tr>
<tr>
<td>Nausea/Vomiting</td>
<td>60 / 37</td>
</tr>
<tr>
<td>Eye pain/blur/dim vision</td>
<td>45 / 40 / 38</td>
</tr>
</tbody>
</table>


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Question 2

What is the antidote?

- Atropine (to dry secretions)
  - Adults: 1-2 mg IV (minimum)
  - Peds: 0.05 mg/kg IV

- Pralidoxime (regenerate acetylcholinesterase)
  - Indications: muscle weakness, fasciculations
  - Initial bolus
  - Adult: 1-2 gm over 30 min
  - Peds: 20-40 mg/kg
**CASE**

- P 54 BP 107/54 R 6 T 97 GCS 13
- Pupils 5 mm and HR 54

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GAMMA HYDROXY BUTYRATE

- Context of use
- Body builders
- Date rape
- Rave parties
- Schedule I
  - GHB
  - 1,4-butanediol
  - Tetrahydrofuran
  - Gamma butyrolactone

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CLINICAL DATA in GHB ODs

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>Miro (n=104)</th>
<th>Chin (n=88)</th>
</tr>
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<tbody>
<tr>
<td>Coma (GCS 3)</td>
<td>17%</td>
<td>28%</td>
</tr>
<tr>
<td>MYDRIASIS</td>
<td>57%</td>
<td>N.A.</td>
</tr>
<tr>
<td>Vomiting</td>
<td>23%</td>
<td>30%</td>
</tr>
<tr>
<td>BRADYCARDIA</td>
<td>20%</td>
<td>36%</td>
</tr>
<tr>
<td>Seizures</td>
<td>3%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Chin et al: Clinical course of GHB OD. AEM 1998;31:716
GHB

Treatment

- Decontamination usually not useful
- Supportive
  - airway
  - rule out hypoglycemia
- Avoid flumazenil
- Withdrawal


Mydriasis (SAW)

- Sympathomimetics
- Anticholinergics
- Withdrawal

CASE

- Hallucinating combative male comes in after collapsing
- VS: 160 100/40 18 101.3°F
- PERRL 5-6 mm
- Diaphoretic
- Tremulous
**Defining Ecstasy**

*A derivative of amphetamine*

![Chemical Structure of 3,4-Methylenedioxymethamphetamine (MDMA)](image)

MDMA, XTC, E. essence, Adam

3,4-Methylenedioxymethamphetamine

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**Agitated Psychosis**

*Toxidrome Differential*

<table>
<thead>
<tr>
<th>EFFECT</th>
<th>Sympathetic</th>
<th>Anticholinergic</th>
<th>Withdrawal</th>
<th>Hallucinogen</th>
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</thead>
<tbody>
<tr>
<td>Pupils</td>
<td>↑</td>
<td>↑</td>
<td>↔</td>
<td>↑↑</td>
</tr>
<tr>
<td>HR</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↑ ↔</td>
</tr>
<tr>
<td>Temp</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↔</td>
</tr>
<tr>
<td>Skin</td>
<td>Wet</td>
<td>Dry</td>
<td>↔</td>
<td>↔</td>
</tr>
<tr>
<td>Speech</td>
<td>Clear</td>
<td>Mumble</td>
<td>↔</td>
<td>Clear</td>
</tr>
<tr>
<td>Picks</td>
<td>May</td>
<td>May</td>
<td>May</td>
<td>No</td>
</tr>
</tbody>
</table>

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Sympathomimetics

Treatment

- Benzodiazepines are your friend
- Possible role for haloperidol
- May need treatment for sympathomimetic sx\textsc{s}
- Diltiazem
- Phentolamine
- Fluids for rhabdomyolysis

EYES: SUMMARY

- Miosis
- Mydriasis
- Horizontal nystagmus
- Rotatory nystagmus
- COPS
- SAW
- Ethanol
- PCP/ketamine

SKIN
Allergic Reaction?

• 29 y/ female with pruritic erythematous rash, nausea and headache 2 hr after grilled tuna, salad, asparagus and mashed potatoes.
• Alert, in mild distress
• VS – normal
• Skin – diffuse urticaria in upper body
What is the toxin?
- Scombroid
  - Tuna
  - Bonito
  - Jack
  - Mackerel
  - Albacore
  - Mahi mahi
  - Bluefish
- Etiology
  - Histamine excess
  - Dark meat fish post bacterial decomposition

Treatment
- Diphenhydramine
- H2 blocker
  - Cimetidine
  - Ranitidine
Toxin-Induced Flushing

- Disulfiram-like reactions
- Anticholinergic syndrome
- MAO inhibitors + food
- Niacin
- Boric Acid
- MSG (Chinese restaurant syndrome)
- Scombroid

Smurf Syndrome?

- 37 yo woman presents with dyspnea and blue lips
- 114/106/75 28 92%
- No improvement with oxygen
Methemoglobinemia Treatment

- Causes:
  - Nitrites
  - Aniline dye
  - Benzocaine
  - Dapsone
  - Pyridium
  - Chlorates

- Give a purple person a blue liquid to make them pink again
  - Methylene blue
  - 1-2 mg/kg (0.1-0.2 ml/kg) of 1% over 5 min

Marital Bliss?

- 56 y/o presents with n/v/d since last night. Similar episode 3 mos ago
- Gen: moderately ill vomiting bile
- Abd: diffusely tender
- Rectal: watery stool, occult heme +
- Extrem: muscle wasting & weakness

Mees Lines

- Arsenic
- Thallium
- Selenium
What is the toxin?
- Arsenic Poisoning
- Clinical effects
  - Acute
    - abdominal pain, nausea, vomiting
    - Hypotension
  - Chronic or delayed
    - Skin – dermatitis, hair loss, Mee’s lines
    - Sensory motor distal polyneuropathy (late)
    - Anemia

What is the antidote?
- Dimercaprol (BAL) 3-5 mg/kg q 4-12 hours
- Succimer (DMSA) 10 mg/kg q 8 hr to start

SUMMARY
TOXIN INDUCED SKIN CHANGES
- Diaphoresis (SOAP)
  - Sympathomimetics
  - Organophosphates
  - Acetylsalicylic acid
- Dry skin
  - Anticholinergic
  - Mee’s lines
  - Arsenic
  - Thallium
  - Selenium
- Flushed
  - Anticholinergic
  - Niacin
  - Scombroid
- Cyanosis (methemoglobinemia)
  - Nitrites
  - Aniline dyes
  - Phenazopyridine
  - Dapsone
CASE

- 34 yo female paramedic bodybuilder complains of six months of increasing weakness, peripheral pain, weight loss, headaches, tremors, excessive sweating.
- Vital signs normal
- Neuro: weakness with mild sensory neuropathy, slight intention tremor
- Skin:

SKIN

- Erythematous papules
- Cheilitis

Elemental Mercury Poisoning

- Mercury levels
  - Blood 10 mcg/L
  - Urine 55 mcg/L
- Treatment
  - DMSA 10 mg/kg tid x 5 d then bid x 14 days
- Received two courses
- Outcome
  - Cured
  - Works as paramedic
  - Competing as bodybuilder
Neurological

- Bulbar palsies
- Neuropathy
- Movement disorders
- Seizures

Stiff Man

- 47 y/o male lying in bed mute and not eating for two days.
- PMH: schizophrenia and hypertension
- T 105° P 140 bpm BP 94 mmHg
- Diffuse lead-pipe rigidity
Neuroleptic Malignant Syndrome

- Gradual onset:
  - AMS
  - Rigidity
  - Increased CPK
  - Hyperthermia
  - Acidosis

- Treatment:
  - Lorazepam
  - Neuromuscular blockade
  - Avoid succinylcholine
  - Hydration

Question 4
What disease do you suspect immediately in a patient with blurred vision, dysphagia and dysarthria two days after eating barbequed whale?

Botulism (type E)

Outbreak of botulism E associated with eating a beached whale. MMWR 2003;52:24-6
Deadly, LD 50 is 0.001 mcg/kg (VX is 15)
chs, 2/12/2004
Vehicles Associated with Food borne Botulism

- Home-processed or canned foods with pH > 4.6
  - Vegetables
  - Meats
  - Fish
  - Relish
  - Chili peppers
  - Salsa
- Baked potatoes in aluminum foil
- Garlic/onions in oil
- Cheese sauce

Shapiro, R. L. et. al.
Ann Intern Med 1998;129:221-8

Botulinum: Clinical

- Early:
  - Dry mouth, weakness
  - Bulbar palsies: ptosis, diplopia, blurred vision, dysarthria, dysphonia, dysphagia
- Followed by:
  - Symmetrical descending flaccid paralysis
  - Respiratory failure

4 D’s – diplopia, dysarthria, dysphonia, dysphagia

NEUROLOGICAL SUMMARY

- Bulbar palsy
- Fasciculations
- Tremors
- Neuropathy
- Paresthesias
- Rigidity
- Botulism
- Organophosphates
- Lithium, theophylline
- Heavy metals
- Marine toxins
- Tetanus, strychnine, NMS, serotonin syndrome
Role of Laboratory in Toxicology

Patients
- Acetaminophen level
- Few clinical manifestations early
- Number needed to test is ~500 in unsuspected cases
- Electrolytes for acidosis
- Salicylates
- Toxic alcohols
- Lactate

Toxidromes
- Typical
  - Opiate
  - Anticholinergic
  - Sympathomimetic
  - Cholinergic
- Unusual constellation
  - Scombroid
  - Mercury
  - Botulism
  - Neuroleptic malignant syndrome
  - Mercury

SUMMARY
- Diagnosis of poisoning is not in the laboratory
- Look at the clues
  - Ocular
  - Dermal
  - Neurological
  - Cardiopulmonary
- Treat supportively based on findings