

CEN REVIEW

ENVIRONMENT & TOXICOLOGY EMERGENCIES

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ENVIRONMENTAL EMERGENCIES

Burns

Chemical exposure

(e.g., organophosphates, cleaning agents)

Electrical injuries

Radiation exposure

Envenomation emergencies

(e.g., spiders, snakes, aquatic organisms)

Parasite and fungal infestations

(e.g., giardia, ringworm, scabies)

Submersion injury

**Temperature-related
emergencies**

Vector borne illnesses:

a. Rabies

b. Tick-borne illness

(e.g., Lyme disease, Rocky Mountain
spotted fever)

TOXICOLOGY EMERGENCIES

Carbon monoxide

Cyanide

Overdose and ingestions

Withdrawal syndrome

BURNS: MECHANISM OF INJURY

- *Thermal:* Hot object, steam, smoke
- *Chemical:* Acid vs Alkali
- *Electrical:* AC or DC
- *Radiation:* Sunburn or cancer treatments

DEGREES OF BURNS

- 1st Degree : Superficial
- 2nd Degree:
 - Superficial Partial Thickness
 - Deep Partial Thickness
- 3rd Degree: Full Thickness
- 4th Degree

INITIAL TREATMENT

- | | |
|-----------------------------------|------------------------------------|
| • Stop the Burning Process | ABA Transfer Criteria |
| • Cool not Cold | > 10% |
| • Cover with Dry Sterile Sheet | > Face/Hands/Feet/Genitalia/Joints |
| • Remove all clothing and Jewelry | > Full Thickness Burns |
| • BLISTERS??? | > Electrical / Lightning |
| • Begin Fluid Resuscitation | > Chemical |
| | > Inhalation Injury |
| | > Pre-existing Medical Conditions |
| | > Burn + Trauma |
| | > Children |

RULE OF NINES PALM METHOD

30 Yr/Male ; Spilled hot cooking grease
Burns Location:
Perineum
Anterior surface of his Left thigh

What is the % of burn area?
Perineum.....1%
Anterior surface of his Left thigh.....4.8%
Total TBSA.....8.5%

1 Yr/Female ; Dipping injury

Burn Location:
Well defined line of demarcation at both knees
Burns do not include the soles of the feet which is approx.
the size of the child's Palm

What is the % of burn area?
Legs= 14%
Minus 2% for the non burned soles
Approximately 12%

PARKLAND FORMULA

$$\frac{4\text{ml LR} / \text{Wt in KG} / \text{TBSA}}{24 \text{ Hours}}$$

KEY:
First Half / 8 Hours
Second Half / 16 hours

$$\frac{2\text{ml LR} / \text{Wt in KG} / \text{TBSA}}{24 \text{ Hours}}$$

Monitor Urine output

$$\frac{3\text{ml} / \text{Wt in KG} / \text{TBSA}}{24 \text{ Hours}}$$

Plus Maintenance Fluids / Glucose

- Acids – Hydrofluoric, Carbonic, White phosphorus
- Alkalis- Anhydrous Ammonia, Cement, Hydrocarbons, Tar

• Major Factors to Burn Development

CHEMICAL EXPOSURE

- SAFETY
- DECON TRUMPS TRAUMA- Remove all clothing / Jewelry First
- Dry Chemicals
- How long do I irrigate
- Blisters???
- Tar / Asphalt
- Phenols
- Hydrofluoric Acid

ELECTRICAL INJURIES

- Alternating Current vs Direct Current
- Identify points of Contact
- Injuries- Effects all types of Tissue
- Fluid Resuscitation / Bicarb

RADIATION EXPOSURE

- Most common through Sun Exposure and Cancer Treatments
- Time, Distance and Shielding
- Large dose radiation can effect rapidly growing cells
 - Hematopoietic System
 - GI Tract

ENVENOMATION

The act of injecting a poisonous material (venom) by sting, spine, bite, or other venom apparatus

Snakes

Spiders

Jellyfish / Stingrays

Neurotoxins

Cytotoxins

Cardiotoxins

Hemotoxins

SNAKE BITES

- Not all snake bites are venomous 400/3000
- Dry Bites 25-50%
- Remove Constricting Items
- Td as needed
- Wound care
- Compartment Pressure and Fasciotomy
- Antitoxins as needed

DO NOT USE
Ice
Tourniquets
Cut & Suck

SPIDER BITES

Initially Painless

8-Hours
Pain
Itching
Redness

Pinprick
Immediate skin
reaction

Painless
15 minutes= Pain
1hr- Red
8 Hr Hard/Swollen
24-Black

Bee Sting
Warm / Red

JELLYFISH

- Rinse the area with vinegar.
- Carefully pluck visible tentacles with a fine tweezers.
- Soak the skin in hot water. Use water that's 110 to 113 F (43 to 45 C)
- Keep the affected skin immersed or in a hot shower for 20 to 45 minutes.

Antihistamines
Corticosteroids
Antivenom (Box Jellyfish)
Oral pain Meds

STINGRAYS

Envenomation = Defense mechanism

Treatment

- Basic Wound care
- Td as needed
- Hot water immersion: 30 – 90 minutes
- OTC pain Meds

PARASITES AND FUNGAL INFESTATIONS

Giardia

Ringworm

Scabies

GIARDIA

Worldwide microscopic parasite
Sign appear 1-3 weeks after ingestion
Common RX with Metronidazole

RINGWORM : TINEA CORPORIS

Fungal Infection
Usually spread through human to human contact

Treatment
OTC MEDS:
May require stronger antifungals

SCABIES

Microscopic
Mite

Symptoms 4-6 weeks or 1-4 days
Scabies spread through prolonged contact

Lifespan
Treatment: Scabicides / Antibiotics

SUBMERSION INJURY

Utstein definition: "a process resulting in primary respiratory impairment from submersion or immersion in a liquid medium"

- Fatal Drowning
- Nonfatal drowning with injury
- Nonfatal drowning without injury

**No longer defined
as wet, dry, or
near drowning**

TEMPERATURE RELATED EMERGENCIES

- Hypothermia
- Frostbite
- Heat Exhaustion
- Heat Stroke

HYPOTHERMIA

Of the following, where does hypothermia start?

- 98.6 (36.8) Normal
- 95.0 (35.1) Mild Hypothermia
- 89.6 (32.0) Moderate Hypothermia
- 82.4 (28.0) Severe Hypothermia

Responses to Hypothermia
Metabolic / CNS / Cardiovascular

- Radiation
- Respiration
- Evaporation
- Convection
- Conduction

Caution on rewarming to fast-
Moderate
Severe

FROSTBITE

- Frostnip
- Superficial Frostbite
- Deep Frostbite

- Rewarming-
- Rapid but no friction
- Water Temp 104-110F (40-43C)
- Extract Fluid from clear blisters
- Aspirin / TPA

HEAT EMERGENCIES

Heat Cramps Normal

Heat Exhaustion .. 98.6-104.9

Heat Stroke..... >104.9 w/ CNS dysfunction

Mortality rate = 70%

VECTOR BORNE ILLNESS LYMES DISEASE

Bacterial Infection spread through
the bite of black legged ticks

Black
Legged
Deer
tick

Common Sx:

If untreated spreads to the Joints, Heart, and CNS

Treated with
doxycycline, amoxicillin, or cefuroxime

ROCKY MTN SPOTTED FEVER

Caused by Bacteria (R. Rickettsii)

Signs / Rash : Non Specific

RX: Doxy

Wood tick

Dog tick

VECTOR BORNE ILLNESS RABIES

Virus spread through Saliva or Nervous system tissue

Symptoms:

Initial RX: irrigation with Saline or dilute iodine solution

Immunoglobulin

Vaccine

CARBON MONOXIDE

By product of burning fossil fuels

Flu like SX

Balance, Coordination, Memory

00-03%: Normal Non Smoker

00-15%: Normal smoker

25-35%: Toxic

>60%: LETHAL

Treatment ????

CYANIDE

Prevents mitochondria from using O₂

Where does it come from?

Exposure

Small amount = Dizziness, HA, N/V, Tachycardia and tachypnea
Large amount = Convulsion, LOC, Bradycardia, Hypotension.

LABS:

Cyanide Level

ABG

Lactate

Anion Gap

Antidote:

Cyanokit: Hydroxycobalamine 5G/IV

Or

NaNitrite and Na Thiosulfate

OVERDOSE / INGESTIONS

- Sedative / Hypnotics
- Anticholinergics
- Cholinergics
- Opioids

SEDATIVE / HYPNOTICS

Barbituates:

Amytal, Seconal, Phenobarbital

Benzodiazepines:

Ativan, Valium, Xanax, Rohypnol

Treatment:

ABC's

Prevention of absorption

Elimination: Alkalinize urine

Reversal: Flumazenil

BP	Low
HR	Vent Arrhythmias
RR	Low / Normal
Skin	Normal / Cool
Temp	Low
Pupils	? Enlarged
Mental Status	Coma
NOTES	

CHOLINERGICS / ANTICHOLINERGICS



- Stimulus
- Cholinesterase (ACh)
- Anticholinesterase (AChE)

CHOLINERGICS



Pesticides, Organophosphates, Sarin
Physostigmine, Certain mushrooms

Overstimulates the System
S.L.U.D.G.E.

Treatment
Atropine
Pralidoxime
Benzodiazepines

BP	Usually low
HR	Low
RR	Elevated
Skin	Moist / Vasodilated
Temp	Normal
Pupils	Miosis (Constricted)
Mental Status	Depressed
NOTES	SLUDGE

ANTI-CHOLINERGICS

Atropine
Scopolamine
Ipratropium Bromide

Treatment
Sedation with Benzos
Physostigmine
(Cholinergic Agent)
Baseline EKG

BP	Increase / Decreased	
HR	Elevated	Heart runs alone
RR	Elevated	
Skin	Red / Hot / Dry	Red as a Beet Dry as a Bone
Temp	Elevated	Hotter than Hades
Pupils	Mydriasis	Blind as a BAT
Mental Status	Confused / Sz / Hallucinations	Mad as a Hatter
NOTES	Dry mouth, Urine retention, Ileus	Bowel and Bladder lose their tone

OPIATES

Endogenous opioid; Endorphins
Morphine, Codeine, Oxycotin,
Oxycodone, Heroin, etc.....

Respiratory Suppression
CNS Depression
Miosis

Treatment
Naloxone (Narcan) 0.04-0.4mg q2-3min
Max- 10 mg

Narcan Half-Life is shorter than opiates

BP	Decreased
HR	Increase / Decrease
RR	Decreased
Skin	Pruritis
Temp	Low
Pupils	Miosis
Mental Status	Depressed / Coma
NOTES	

HALLUCINOGENS / DISSOCIATIVE

- Hallucinogens: can effect all 5 senses.
- Dissociative:
Hallucinations + Feeling disassociated from the body

- There are potential medical uses
- Medical Effects
- Treatments
 - Safety
 - Benzodiazepines
 - Ketamine

INHALANTS

Category	Chemicals
Aerosols	Spray paint, Hair / deodorant spray, vegetable oil spray,
Solvents	Paint thinners / removers, Dry cleaning fluids, gasoline, lighter fluid Correction fluid, felt tipped markers, electronic contact cleaners, Glue
Gases	Butane, Propane, whipped cream aerosols Ether, Chloroform, Nitrous oxide
Nitrites (Amyl Nitrite)	Video head cleaner, room deodorizer, leather cleaner, liquid aroma

Sniffing Huffing Bagging

INHALANTS

Clinical Manifestations	Treatment
CNS Cardiac Respiratory Musculoskeletal Integumentary Organ Damage	Intubation Albuterol / Steroids Catecholamines Benzos / Haldol K, Ca, Phosp

ALCOHOLS

Methanol	Ethanol	Isopropyl	Ethylene Glycol
Windshield Wiper Fluid Sterno, Paint Removers	The Stuff You Drink	Rubbing Alcohol	Antifreeze

Treatment:
Intubation / Ventilation
Hemodialysis
Which alcohol is used to treat the other?

Ethanol and Fomepazole
IV for toxic
Methanol and Ethylene Glycol

ETOH RX
IVF, Monitor Glucose, Thiamine, MVI

WERNICKE KORSAKOFF SYNDROME

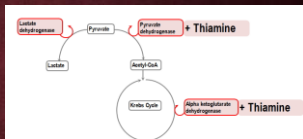
Thiamine

BeriBeri : Thiamine Deficiency

Wet vs Dry

Wernicke's Encephalopathy

Korsakoff Syndrome



HEAVY METALS

accumulation of heavy metals, in toxic amounts, in the soft tissues of the body
How does the exposure occur?

Sign and Symptoms

Lead: HTN and Reproductive problems, Pallor, Fatigue, HA,
Loss of recently aquired skills

Mercury: Memory Loss, Ataxia, confusion, abnormal involuntary movements

Arsenic: headaches, drowsiness, confusion, seizures, encephalopathy),
peripheral neuropathy

Cadmium: Fatigue, HA, N/V, pulmonary edema, tachycardia, anemia

Iron: Bloody diarrhea, Hypotense, Metabolic Acidosis, Liver Failure

HEAVY METALS



Heavy Metal	Chelating Agent
Lead	Edetate Calcium Dositidium (EDTA)
Mercury, Arsenic, Gold	BAL (dimercaprol) (British Anti-Lewisite)
Iron	Deferoxamine
Mercury	D-Penicillamine

BETA BLOCKER

Adrenergic Receptors: α alpha, β beta

β_1 = Heart

Actions: increases cardiac output

Agonist- Epinephrine, Dobutamine

Antagonist- Metoprolol, Esmolol, Toprol, Lopressor

β_2 = Lungs

Actions: Smooth Muscle relaxation

Agonist: Albuterol, Ventolin

Antagonist: Not specifically defined



BETA BLOCKER OD

- Toxic Effects-
 - Bradycardia, Hypotension, Hypoglycemia,
 - Arrhythmias: 1st Degree, Wide QRS, Prolonged QT
-
- Treatment:
 - Fluid Bolus
 - Vasopressors
 - Glucagon
 - Calcium
 - Lipid Emulsion

Atenolol
Metoprolol
Esmolol
Breviblock
Propranolol

SALICYLATES

Aspirin, Oil of Wintergreen, Bismuth Subsalicylate

ACUTE / Chronic

Prevent Cellular respiration and
decreases ATP production

Respiratory Alkalosis / Metabolic Acidosis

Ketosis, Low cerebral glucose

Dehydration

TREATMENT

Activated charcoal

Alkaline Diuresis

Hemodialysis

Glucose

Benzos for Sz

TRICYCLIC ANTIDEPRESSANTS

Block the reuptake of Serotonin and Norepi in the brain

4 main toxic effects

Signs:

Coma

Convulsions

Cardiac arrhythmias

Acidosis

Hypotension	Fluid Bolus/ Epi-NoxEpi
Seizures	Benzodiazepines
Alkalinization	Na Bicarb 1meq/kg pH - 7.50-7.55
Torsades	1-2 grams

Amitriptyline
Amoxapine
Desipramine
Doxepin
Imipramine
Nortriptyline
Protriptyline
Trimipramine

ALCOHOL WITHDRAWAL



Starting 6-12 hours after cessation

Mild

Moderate

Severe

Seizures

DT's

Decrease Stimulation / Safety

Fluids

Vitamin (Thiamine)
Monitor Glucose

Benzodiazepines

SEDATIVE / HYPNOTIC WITHDRAWAL



- Benzos / Barbituate
- Long acting benzodiazepine or phenobarbital, in a maintenance dose for a few days followed by a gradually decreasing dose over 2-3 weeks

GHB WITHDRAWAL

- Similar to ETOH withdrawal : Delerium occurs earlier
- Treatment with high dose benzodiazepines

OPIATE WITHDRAWAL



- Resemble Flu Like Symptoms
- Half Life determines onset and duration
 - Heroin
 - Methadone

Antiemetics

Antispasmodics

Clonidine Autonomic Components

Buprenorphine / 72 hours

- Watch for other Differential DX with IVDA

STIMULANT WITHDRAWAL

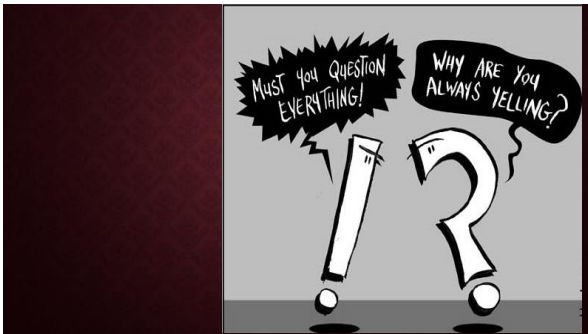


AKA- WASHOUT SYNDROME from COCAINE / AMPETAMINES

Typical Deep Sleep

Depression, Mood and Anxiety

NO SPECIFIC TREATMENT



High altitude illness is a collection of symptoms usually caused by which of the following?

- A. Skydiving from greater than 10,000 feet
- B. Flying in an unpressurized aircraft to 8,000 feet
- C. Rapid ascent of an unacclimated person to 8,000 feet or higher from an altitude below 5,000 feet
- D. Rapid decompression of an aircraft above 15,000 feet

A patient experiences facial edema, stridor and urticaria after an insect sting, Appropriate interventions include all of the following EXCEPT

What is the question asking?

- A. Administration of IV Atropine (Atropine Sulfate)**
- B. Securing the airway and providing supplemental O2**
- C. Administration of IM epinephrine (Adrenaline)**
- D. Administration of IV diphenhydramine (Benadryl)**

In addition to LOC and respiratory depression, inhaling chlorofluorocarbon (Freon) can result in which clinical finding?

- A. Nausea and Vomiting**
- B. Skin Rash**
- C. Thermal Burns**
- D. Blood in Urine**
