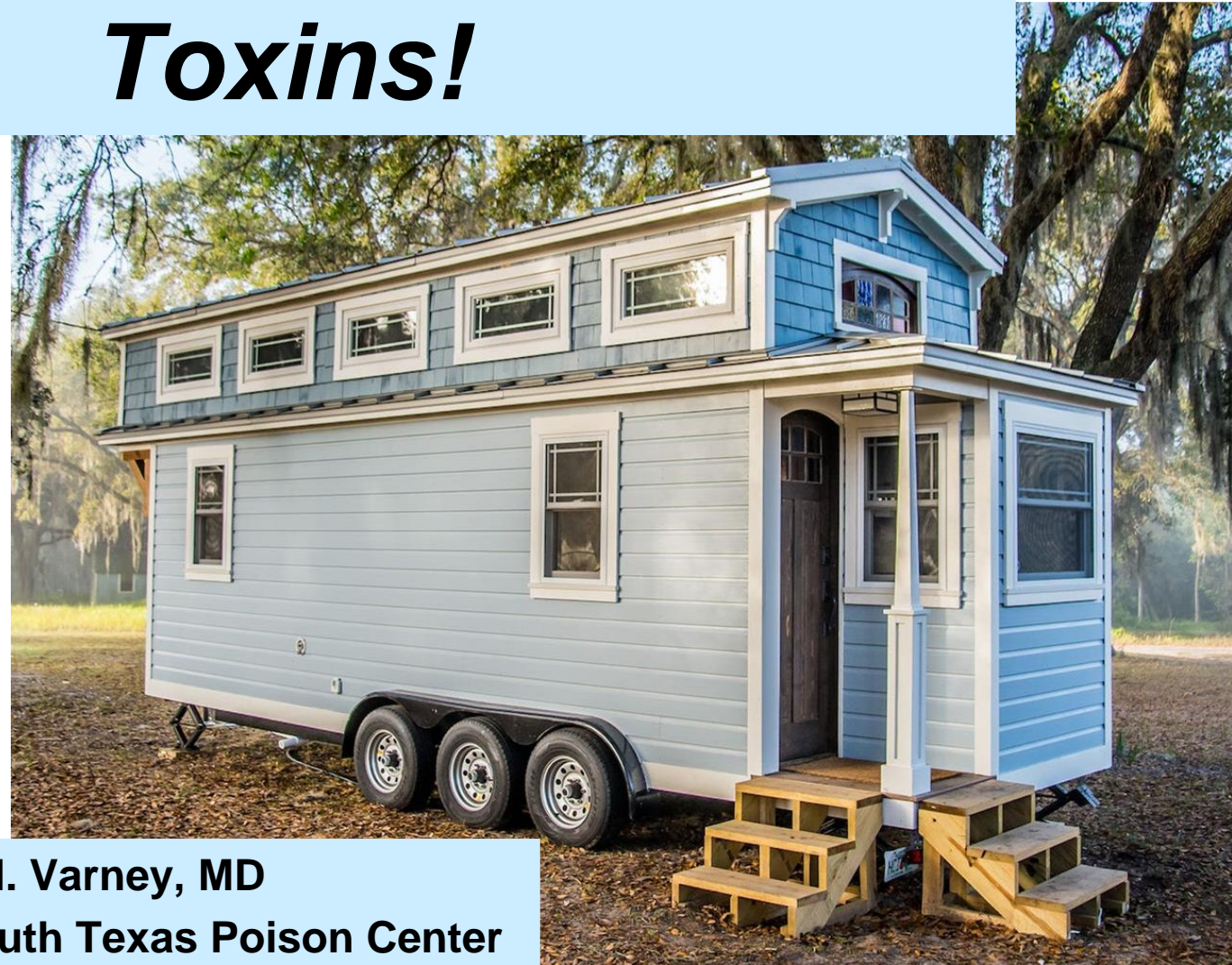


Tiny House, Not-So-Tiny Toxins!



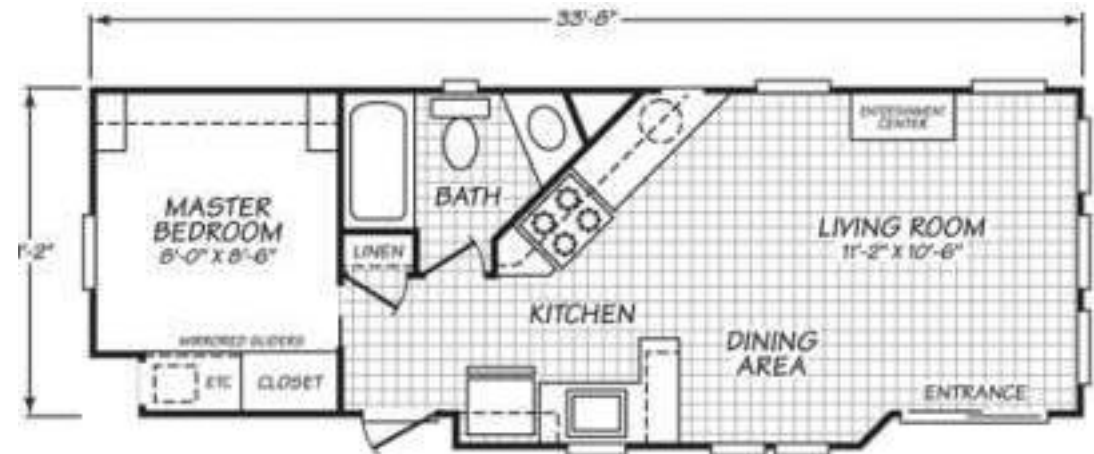
Shawn M. Varney, MD
Medical Director, South Texas Poison Center
UTHSA
214 February 2025

NO DISCLOSURES



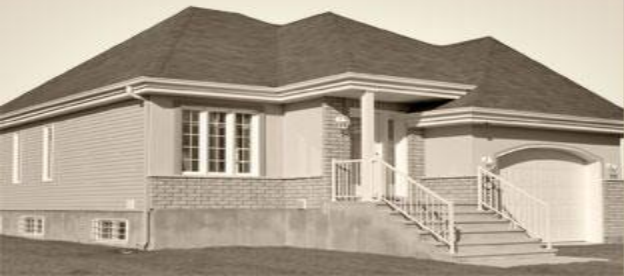
Lecture Floorplan

- Kitchen
- Bathroom

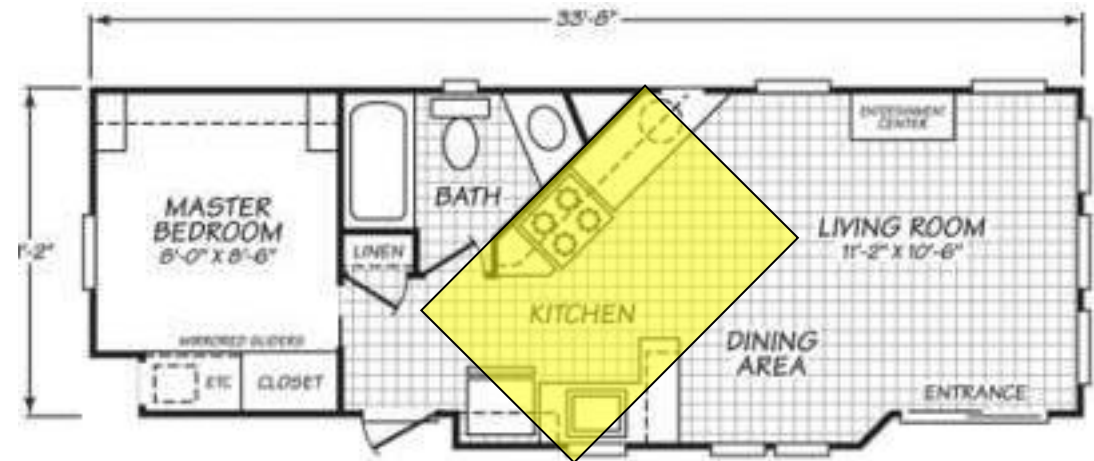


Lecture Objectives

- Identify household toxins...
- Discuss mechanism, clinical presentation, & treatment

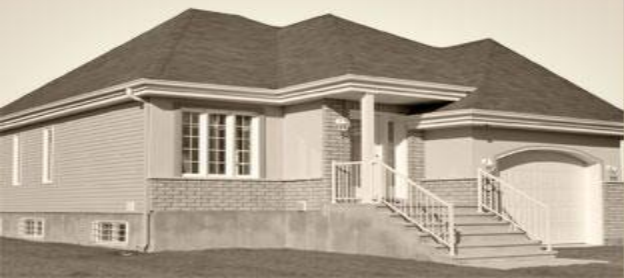


Floorplan-Kitchen



Kitchen

- 2yo boy chugging a 4-oz bottle of pure vanilla extract
Bottle is empty...
- Worried?
- Do you send him in?



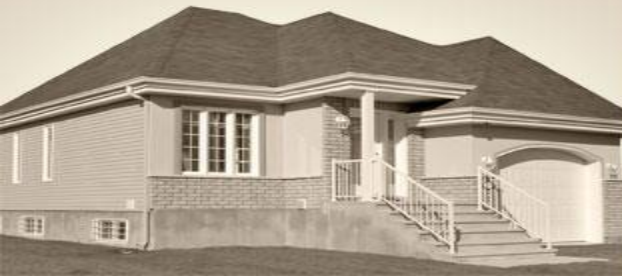
Kitchen-Vanilla Extract

- What is in it?

Vanilla Extract Pure MSDS

Section 1: Chemical Product and Company Identification	
Product Name: Vanilla Extract Pure	Contact Information:
Catalog Codes: SLV1150	Sciencelab.com, Inc. 14025 Smith Rd. Houston, Texas 77396
CAS#: Mixture.	US Sales: 1-800-901-7247 International Sales: 1-281-441-4400
RTECS: Not applicable.	Order Online: ScienceLab.com
TSCA: TSCA 8(b) inventory: Ethyl alcohol 200 Proof	CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300
CI#: Not applicable.	International CHEMTREC, call: 1-703-527-3887
Synonym: Vanilla Extract Pure	For non-emergency assistance, call: 1-281-441-4400
Chemical Name: Not applicable.	
Chemical Formula: Not applicable.	

Section 2: Composition and Information on Ingredients		
Composition:		
Name	CAS #	% by Weight
Ethyl alcohol 200 Proof	64-17-5	35
Toxicological Data on Ingredients: Ethyl alcohol 200 Proof: ORAL (LD50): Acute: 7060 mg/kg [Rat], 3450 mg/kg [Mouse]. VAPOR (LC50): Acute: 20000 ppm 8 hours [Rat], 39000 mg/m 4 hours [Mouse].		



What Is “Proof” Alcohol?

- 18th Century British Navy
- Payments included rations of rum



“Proof” Alcohol



- To ensure that the rum had not been watered down, it was “proofed” by dousing gunpowder in it, then testing to see if the gunpowder would ignite

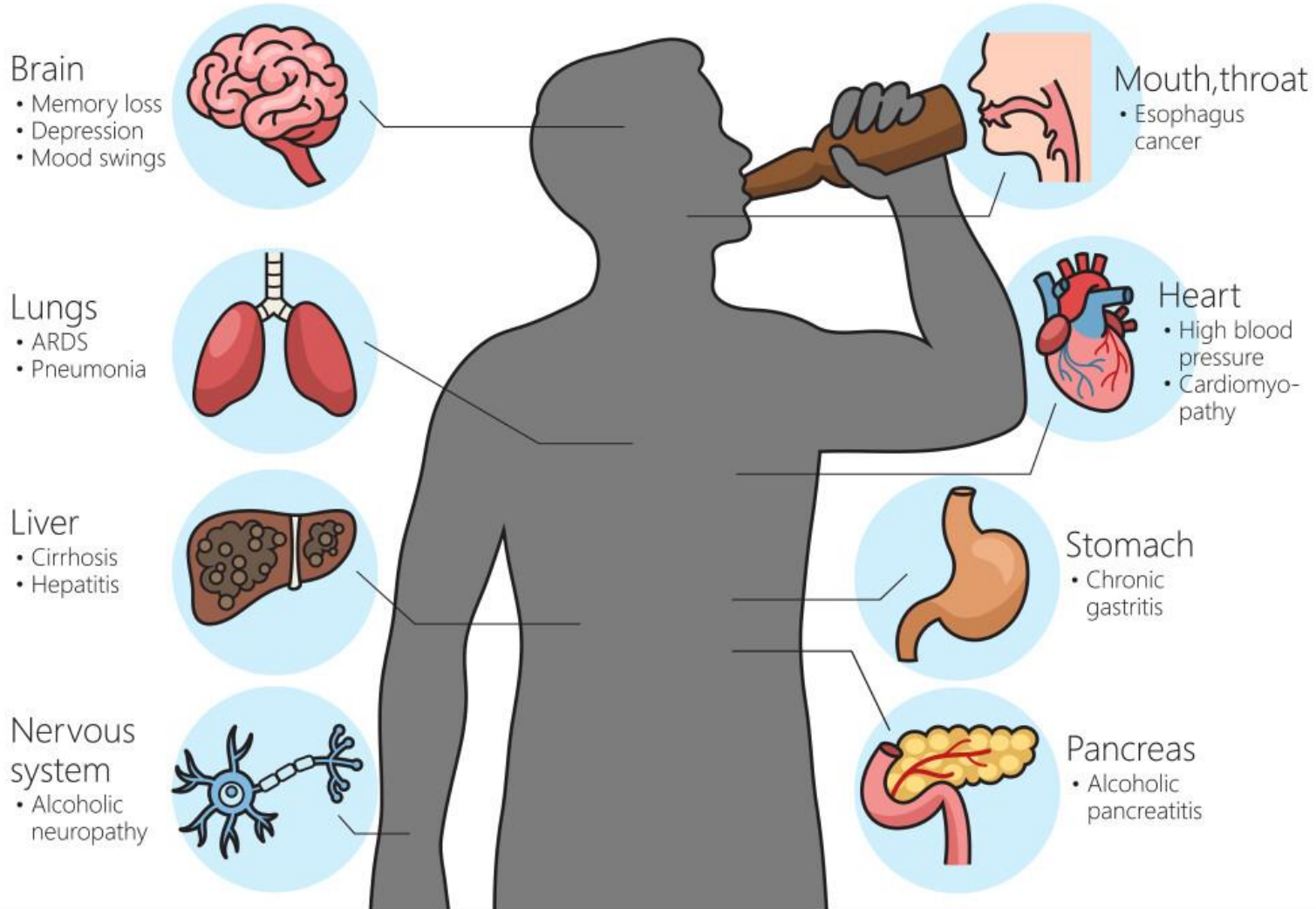


- No burn = dilute rum = “under proof”

“Proven” Sample of Rum

- 100 degrees proof = 57.15% alcohol by volume (ABV)
 - ~4:7 ratio of alcohol : total amt liquid
 - $(4/7) \times 175 = 100$ degrees proof spirit (dps)
- So, 100% EtOH = $(7/7) \times 175 = 175$ dps
- In US, proof to ABV is 1:2 ratio
 - So, 100% EtOH = 200 proof

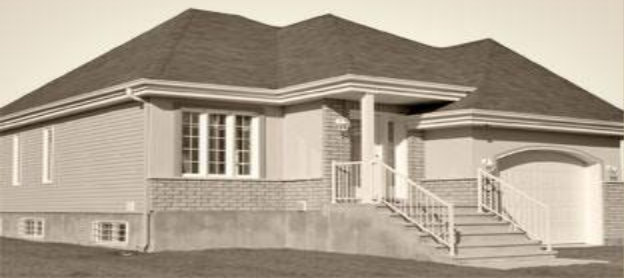
Damaging effects of Alcoholism



Biggest worry in this 2yo?

Kitchen-Vanilla Extract

- CNS & airway depression
 - ↑ GABA, ↓ Glutamate
- Dangerous amount EtOH in 12kg Pt?
 - Assume got all 4 oz
 - 1 oz = 30mL, so 120 mL total
 - **What is 35%?**
 - 35% = 35gm/100mL
- If child ingested all 42 gm
 - **[blood] = (mg X bioavail) / (Vd X weight)**
= 42,000mgX1 / (.64L/kg X 12 kg) = 5833mg/L
- Estimated **peak BAL= 583.3 mg/dL**



Kitchen-Vanilla Extract

- Clinical
 - CNS ↓
 - Respiratory ↓
 - Hypotension, hypothermia
 - Coma
 - CV collapse/death
- Treatment
 - ABCs
 - Supportive



Smells Good But Don't Drink it!

Other Sources of EtOH



60-90%



21.6-26.9%



10%



DIFFERENT SCENARIO – COVID-19

Kitchen-Hand Sanitizer

- 2yo (12kg) boy ingesting a 1-oz container of hand sanitizer.
Now empty...
- Worried?
- Dangerous amount?
- What do you do next?



Kitchen-Hand Sanitizer

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous ingredients

Chemical Name	CAS-No.	Concentration (%)
Ethanol	64-17-5	≥ 50 - < 70
Propan-2-ol	67-63-0	≥ 1 - < 5

Ethanol
50-70%



Kitchen-Hand Sanitizer

- Dangerous amount EtOH in 12kg Pt?
 - Assume got full oz, **50% EtOH**
 - 1 oz = 30mL
 - 50% = 50gm/100mL
 - (50,000mg/100mL)x30mL = 15,000mg
- If child ingested full 1 oz
 - **[blood] = (mg X bioavail) / (Vd X weight)**
= 15,000mgX1 / (.64L/kg X 12 kg) = **1953mg/L**
- Estimated **peak BAL= 195 mg/dL**
- **If 70% EtOH →**
 - (70,000mg/100mL) x 30mL = 21,000mg
 - **Peak BAL = 273 mg/dL → PICU**



Foolish Marketing: Hand Sanitizers



Contaminated Hand Sanitizer...

FDA NEWS RELEASE

Coronavirus (COVID-19) Update: FDA Takes Action to Warn, Protect Consumers from Dangerous Alcohol-Based Hand Sanitizers Containing Methanol

2 July 2020

[WEBMD HEALTH NEWS]

Toxic Methanol in Hand Sanitizers: Poisonings Continue

By Kathleen Doheny

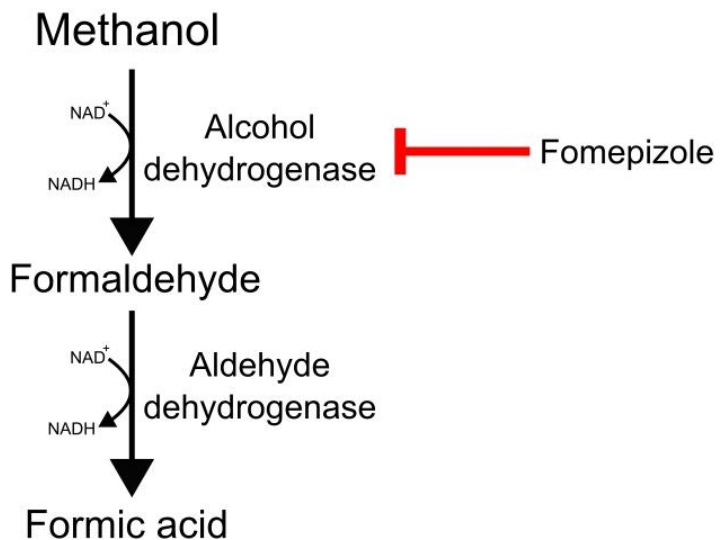
27 Aug 2020



Hundreds die in Iran over false belief drinking methanol cures coronavirus

Posted Tue 28 Apr 2020 at 1:14am

- 728 deaths (20 Feb – 7 Apr 20)
- Even children...
- Methanol → metabolic acidosis, blindness, death
- Treat with Fomepizole



COMPANY ANNOUNCEMENT

4e Brands North America Issues Nationwide Voluntary Recall of Hand Sanitizer Due to Potential Presence of Undeclared Methanol (Wood Alcohol)

Summary

Company Announcement Date: July 11, 2020

FDA Publish Date: July 13, 2020

Company Name: 4e Brands North America

Brand Name: Blumen

Product Description: Hand Sanitizer



Company Announcement

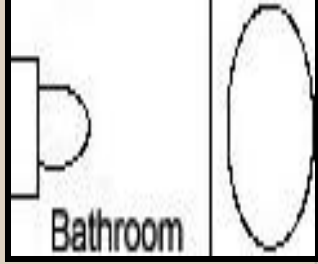
San Antonio, Texas, 4e Brands North America is voluntarily recalling ten (10) bottle sizes of Hand Sanitizers to the consumer level. The products are being recalled due to the potential presence of methanol (wood alcohol).





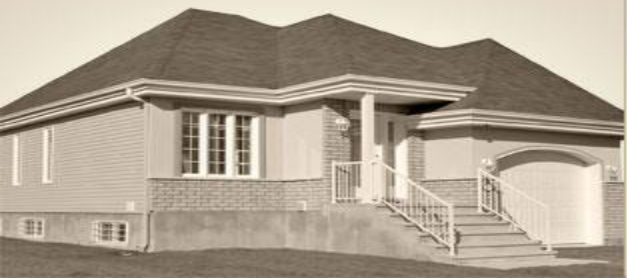
Floorplan-Bathroom

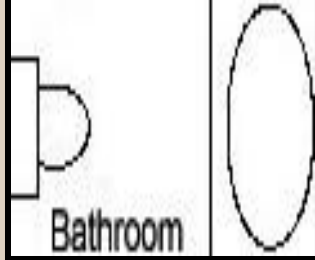




Bathroom-Drain Cleaner

- 4yo M unintentionally swallows a few sips of Drano from a cup
- C/o mouth pain & is hoarse
- Worried?
- What do you do?





Bathroom-Drano

MATERIAL SAFETY DATA SHEET

Page 1 of 4

MSDS # 126038005

DRANO® CLOG REMOVER (LIQUID)

Date Issued: 16Jan2007

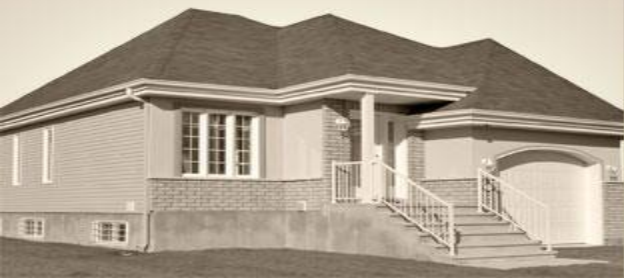
Supersedes: 07Sep2004

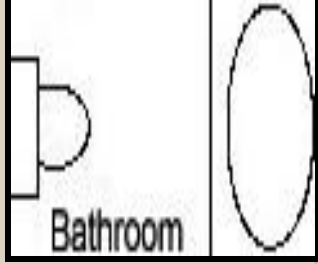
----- SECTION 2 - INGREDIENT INFORMATION -----

INGREDIENT	WEIGHT%	EXPOSURE LIMIT/TOXICITY
Water (CAS# 7732-18-5).....	60-100	NOT ESTABLISHED
Sodium hypochlorite (CAS# 7681-52-9).....	3-7	0.5 ppm ACGIH/OSHA TWA , 1 ppm ACGIH/OSHA STEL (CHLORINE)
Sodium hydroxide (CAS# 1310-73-2).....	1-5	2 mg/m ³ ACGIH/OSHA CEILING
Sodium silicate (CAS# 1344-09-8).....	1-5	NOT ESTABLISHED

----- SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES -----

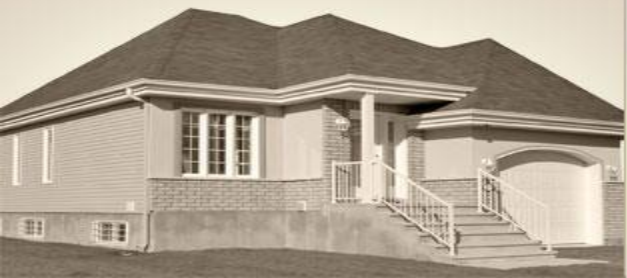
COLOR..... Clear to Straw-colored
PRODUCT STATE..... Liquid.
ODOR..... Bleach
pH..... 11.5-13.4
ODOR THRESHOLD..... Not available.
SOLUBILITY IN WATER..... Complete
SPECIFIC GRAVITY..... 1.104
(H₂O=1)
VAPOR DENSITY (AIR=1).. Same as water.
EVAPORATION RATE (BUTYL ACETATE=1) Not available.
VAPOR PRESSURE (mm HG). Same as water.
BOILING POINT..... > 93°C (> 199°F)

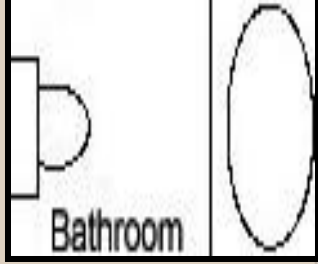




Bathroom-Acids/Alkalis

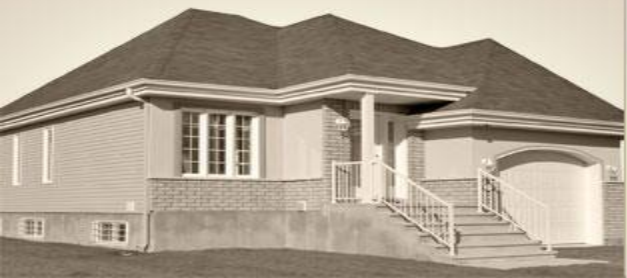
- Background
 - Caustics damage on contact
 - Examples
 - Acids & alkalis
 - Oxidizing agents
 - Exothermic agents
 - Some hydrocarbons

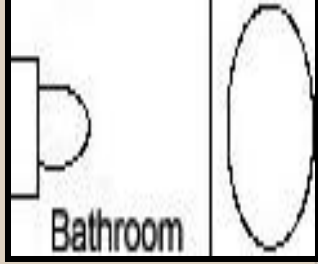




Bathroom-Acids/Alkalis

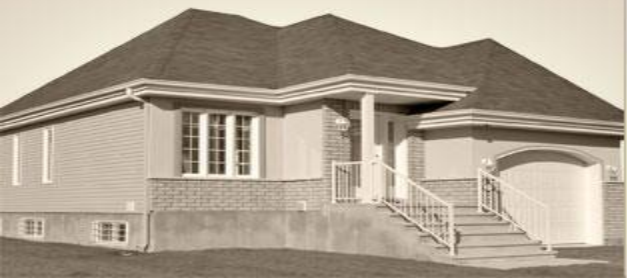
- Determinants of injury
 - Contact time
 - Concentration
 - pH (<3 or >11)
- 2 types of necrosis
 - Acids
 - Coagulative necrosis (eschar)
 - Alkalis
 - **Liquefactive** necrosis (higher risk of perforation & complications)

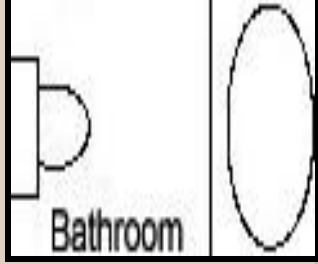




Bathroom-Acids/Alkalis

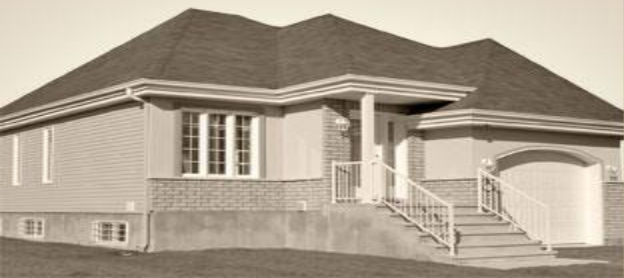
- Clinical Sx by exposure route
 - Inhalation
 - Respiratory tract irritation & injury
 - Ingestion
 - Pain & swelling of upper airway, chest, abd
 - Respiratory compromise from edema
 - Abd pain/CP indicate burns or perforation
 - Systemic
 - Specific to agent
 - Dermal/Ocular
 - Pain, blistering & burns





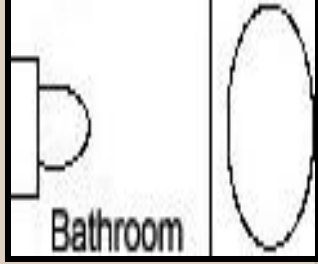
Acids/Alkalis

- Treatment (Ingestion)
 - ABCs (smaller ETT)
 - No AC; dilution?
 - Supportive care
 - Imaging (H₂O-soluble contrast) & labs
 - Endoscopy for
 - Intentional ingestions
 - Pain, V, stridor, drooling, po intolerant
 - Avoid 48-72h p ingestion (↑perforation risk)
 - Grades of injury (mucosal to deep)



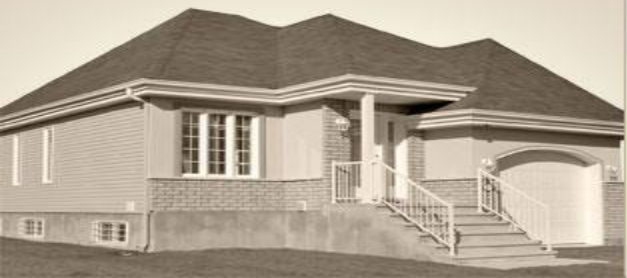
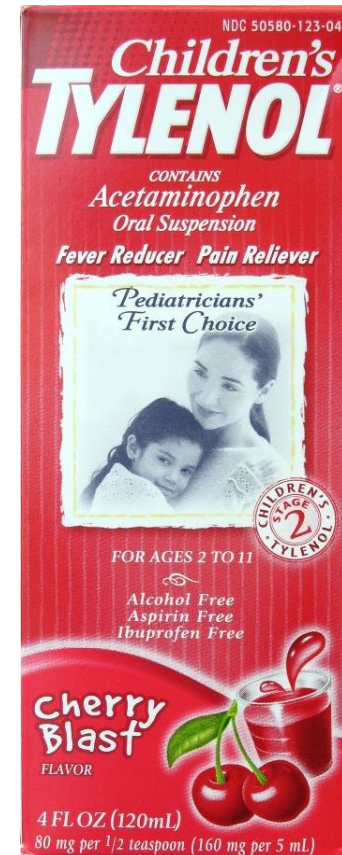
Suicide by Lysol Ingestion

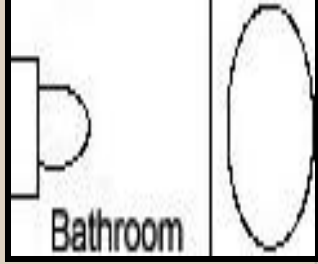




Bathroom-Acetaminophen

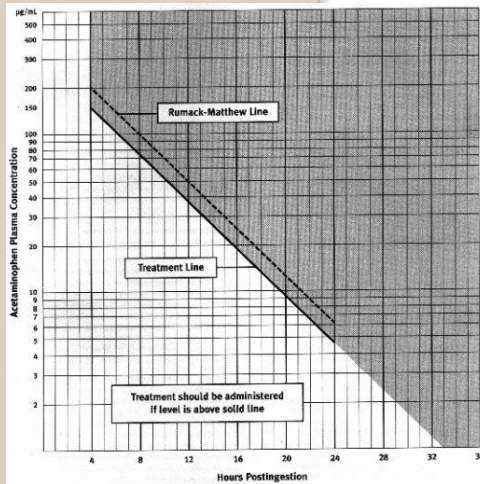
- 2yo drinks full 4oz bottle of children's acetaminophen
 - 160mg/5mL
- Worried?
- What do you do?

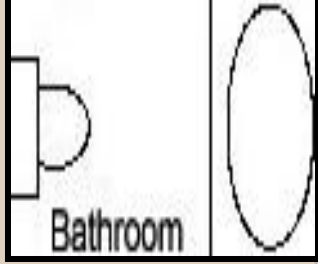




Bathroom-Acetaminophen

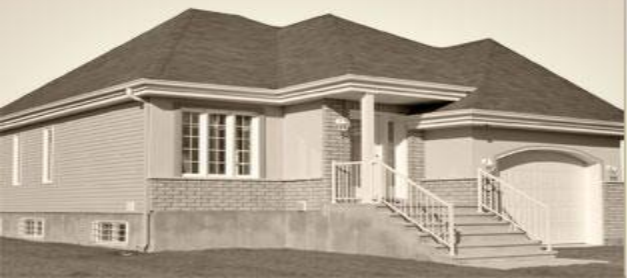
- MOT
 - Toxic metabolite – NAPQI
 - → Centrilobular necrosis
- Dangerous amount in 12 kg Pt?
 - $(4 \text{ oz})(30 \text{ mL/oz})(160 \text{ mg/5 mL}) =$
 - $3840 \text{ mg}/12 \text{ kg} = \underline{\underline{320 \text{ mg/kg}}}$
 - Toxic if $>200 \text{ mg/kg}$ in Peds
 - Check 4hr APAP level
 - **No hepatotoxicity if $> 20 \text{ kg}$!**





Bathroom-Acetaminophen

- Clinical
 - Asx initially, then N/V/abd pain
 - ↑LFTs, acute liver failure
- Treatment
 - N-acetylcysteine (NAC)

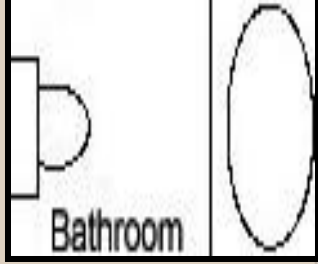


ASKED FOR DILAUDID



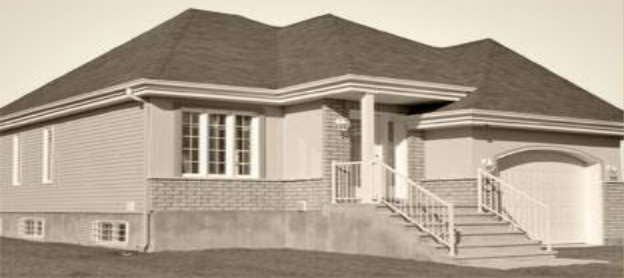
GAVE TYLENOL INSTEAD

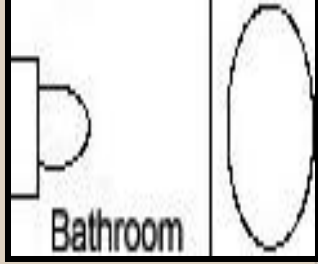
meme-generator.net



Bathroom-Bengay®

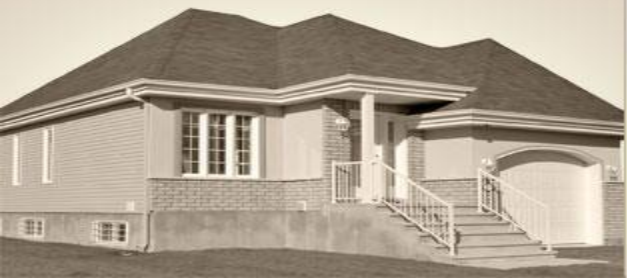
- 16yo M presents to ED w/ CP, polydipsia, SOB for 1 day
- Applied entire 60 gm tube of Bengay® to sore legs
- Worried?
- What do you do?





Bathroom-Bengay®

- Background (topical rubiefacient)
 - 5 gm methyl salicylate = 7.5 gm of salicylate
- MOT (150 mg/kg mild intoxication)
 - Stimulation of respiratory center
 - Uncouples oxidative phosphorylation
 - Interrupts glucose & fatty acid metab
→ metabolic acidosis
 - Alters platelet function
 - Mech of cerebral & pulmonary edema
unclear - capillary integrity?

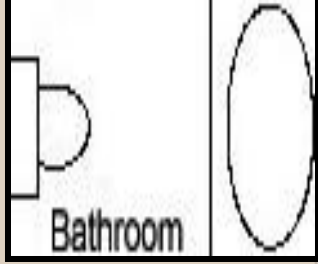


Salicylates

Amount	Symptoms
<150 mg/kg	No systemic to
150-300 mg/kg	Mild-mod toxic (hyperpnea, le excitability)
301-500 mg/kg	Serious toxicity
>500 mg/kg	Severe hyperp Sz

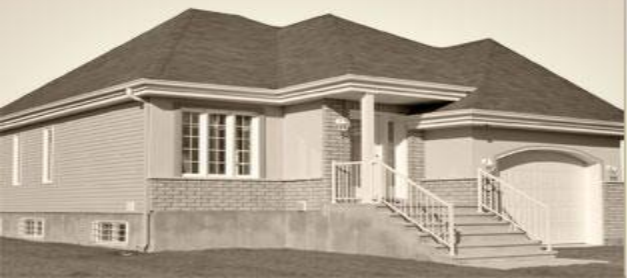


	75 kg	85 kg	100 kg
150 mg/kg	35 tabs	40 tabs	45 tabs
300 mg/kg	70	80	90
500 mg/kg	115	130	150



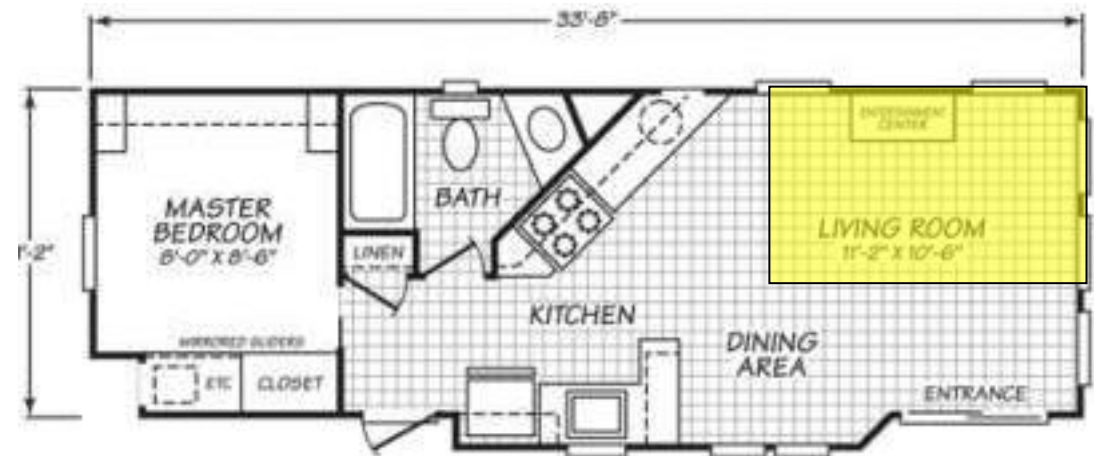
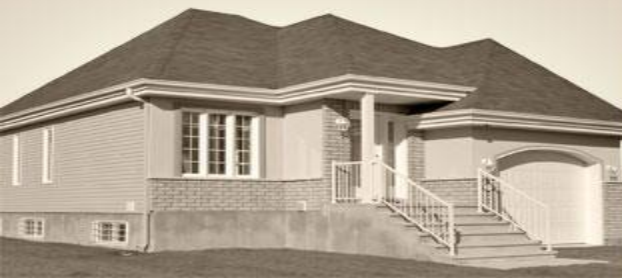
Bathroom-Bengay®

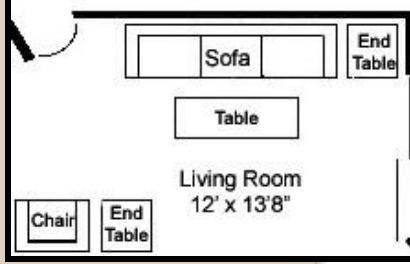
- Clinical
 - Nausea & vomiting
 - Hyperpnea, tachypnea, hypoxia, diaphoresis
 - Tinnitus
 - Lethargy, seizures, coma
- Treatment
 - ABCs (maintain RR if intubate)
 - **Decon (wipe off skin);** Charcoal ...
 - Follow levels, VBG, & BMP closely
 - **Bicarbonate gtt & K⁺**
 - **Hemodialysis**





Living Room



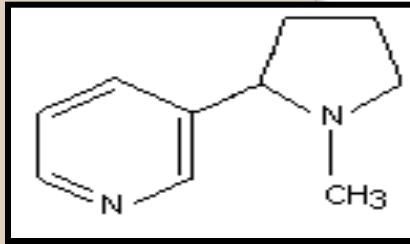
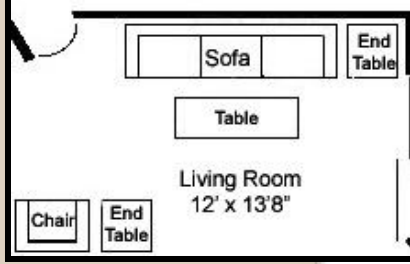


Living Room



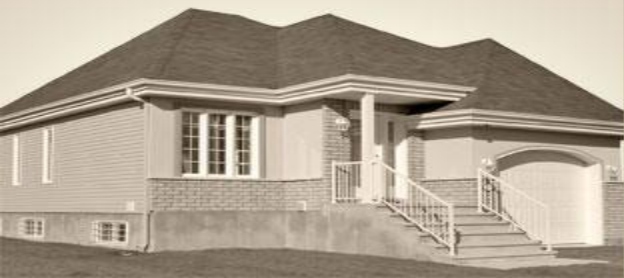
- 2yo F presents 30 min after ingesting 1-2 droppers of vaping liquid
- Vitals: 37.5 190 130/80 14 94%
- Exam: Vomiting, diaphoretic, & tachycardic
- Worried?
- Toxin?

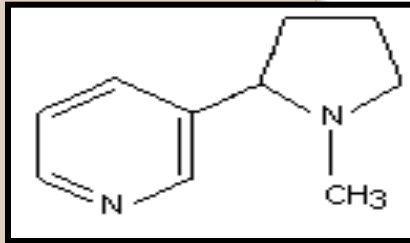
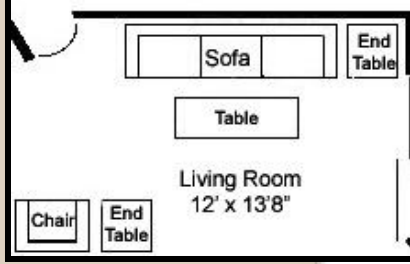




Living Room-Nicotine

- Mechanism
 - Initially binds to nicotinic cholinergic receptors, causing sympathetic stimulation
 - Later, with higher doses parasympathetic Sxs predominate
 - NM blockade → resp arrest
 - Directly emetogenic
 - Seizures

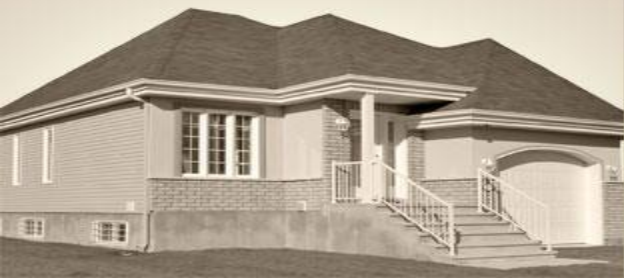
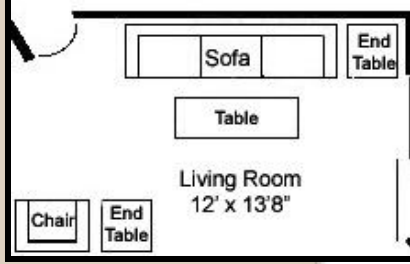


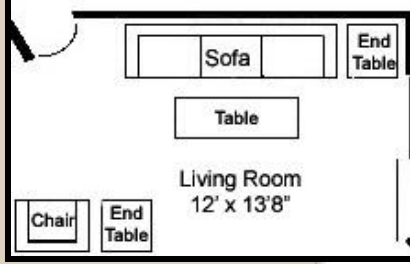


Nicotine Toxicity...

- MTWThF Mnemonic
- M – Mydriasis, **Muscle cramps**
- T – Tachycardia
- W – **Weakness**
- T – **Twitching**
- H – HTN, Hyperglycemia
- F – **Fasciculations**

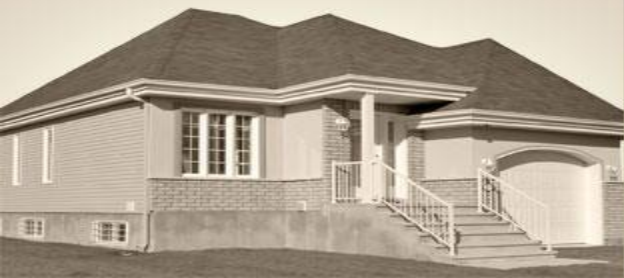


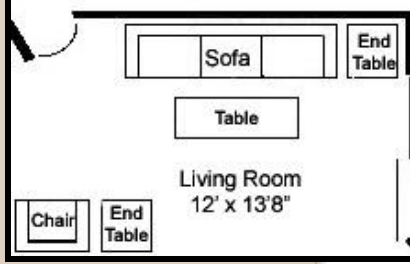




Living Room-Nicotine

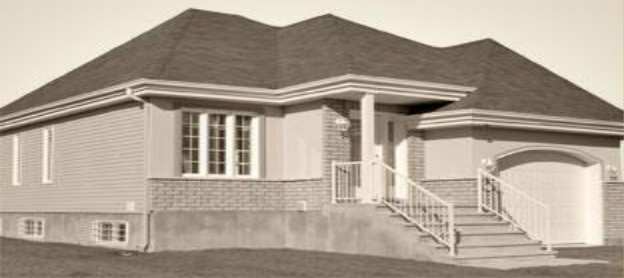
- Treatment
 - ABCs
 - Activated Charcoal
 - Labs: BMP, CK, ECG, monitor
 - Obs for at least 6h
 - Tx HTN, hypotension, & Sz
 - Atropine for muscarinic Sxs
 - Avoid H₂ blockers or PPI
 - ↑ nicotine absorption in alkaline env





Living Room-Nicotine

Formulation	Nicotine Content (mg)
Cigarette	10 mg (only 1-2 mg vaporized nicotine)
Nasal spray	1 mg / spray
Gum / Lozenge	2-4
Water	2-4 mg / 8 oz
Cigarette filter tip	3-5
Pouch (bandits)	3-14
Patch (transdermal)	5-21
Inhalation	10 mg / puff
Chew	450 mg / tin
E-cig nicotine	3-18 mg/mL, up to 42; 5mL ~lethal for child





**WE ENGINEERING STUDENTS
STICK TO THE THREE MAJOR
FOOD GROUPS**

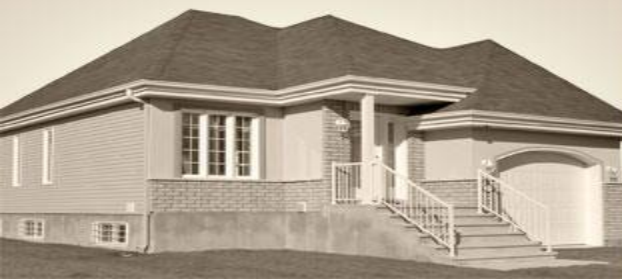
**CAFFEINE NICOTINE,
AND AMPHETAMINES.**

Floorplan-Bedroom

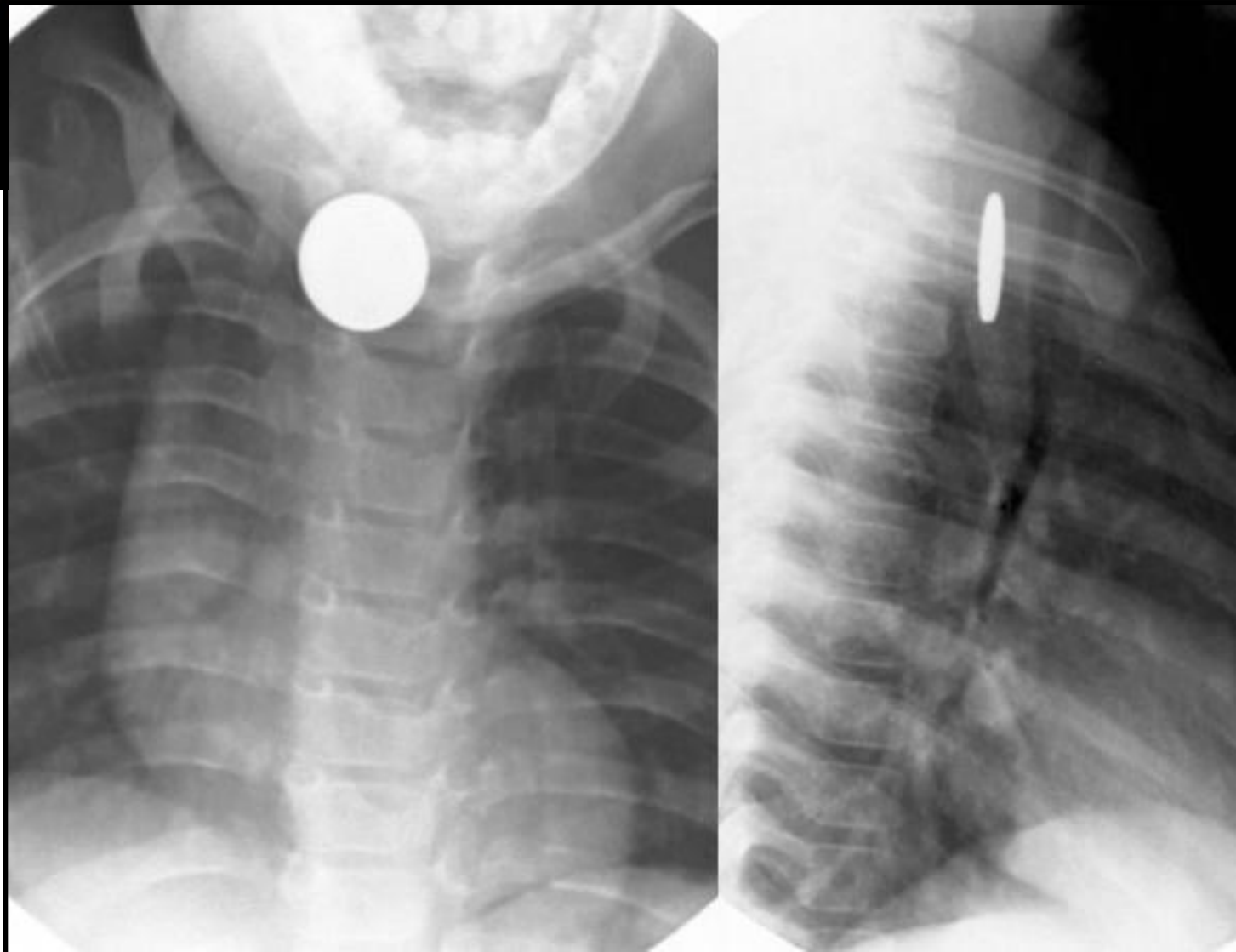
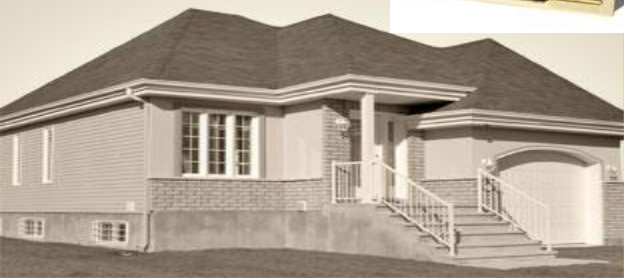
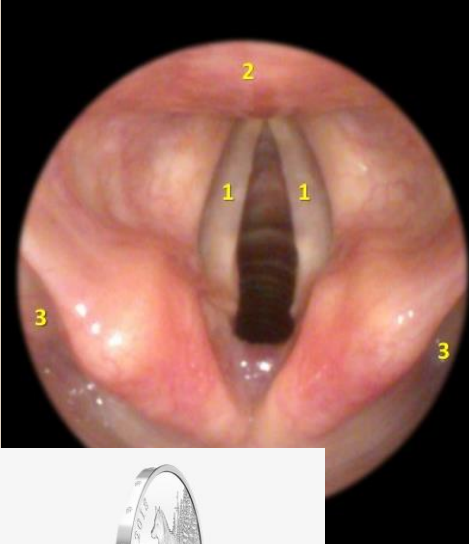


Bedroom-Disc Battery

- 3yo ingested a lithium disc battery from Dad's watch
- Vitals: WNL
- Exam: unremarkable
- What do you do?

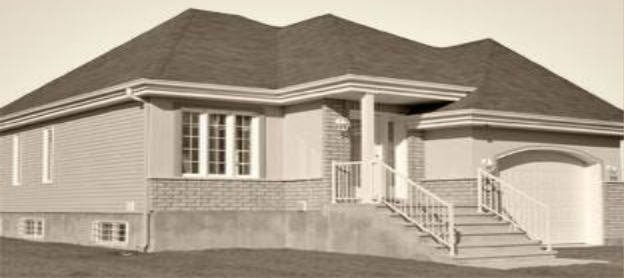


Bedroom-Disc Battery

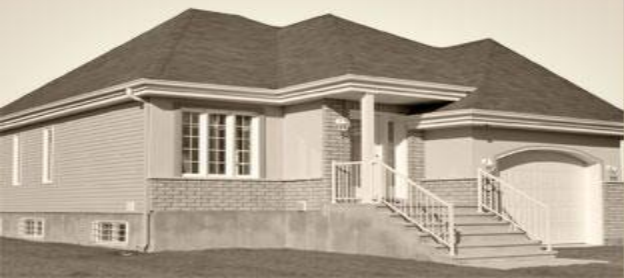
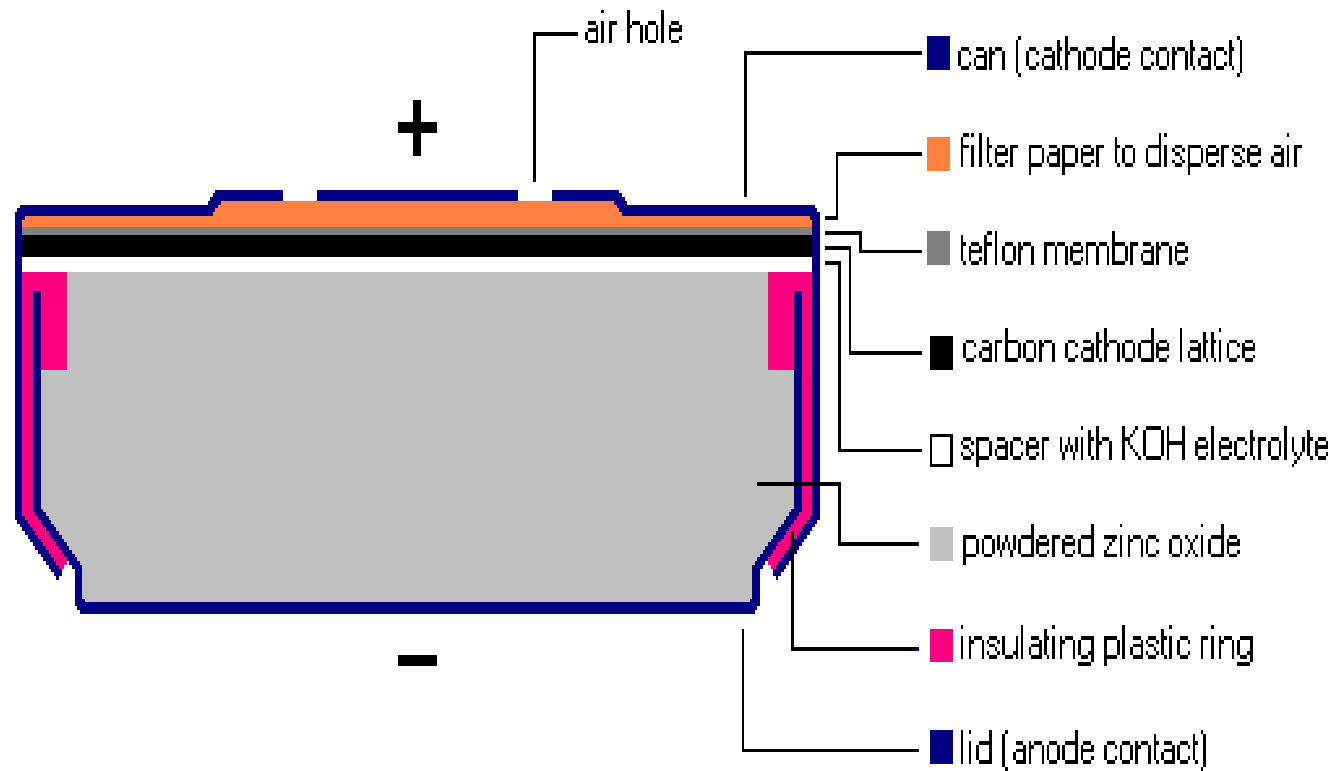


Bedroom-Disc Battery

- AKA... button battery
- APC 2022 Annual Report
 - 3464 cases, 3 death, 29 major outcomes (Li worst)
- Battery 6.8-25 mm (dime 10mm)
 - Negative terminal (anode) & positive terminal (cathode)
 - Separated by an internal electrolyte-coated membrane & external plastic seal

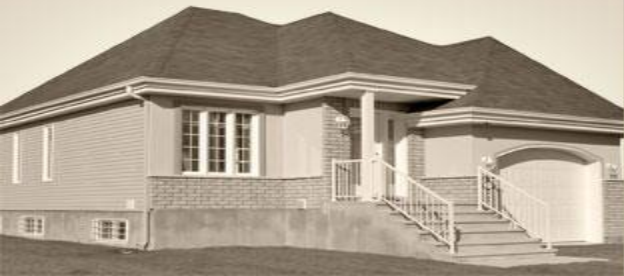
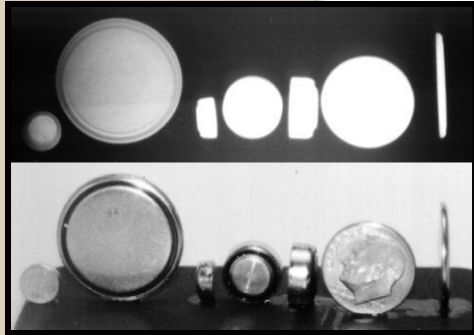


Bedroom-Disc Battery



Bedroom-Disc Battery

- MOT
 - Pressure necrosis
 - Corrosive when plastic ring ruptures
 - Caustic species
 - Cadmium oxide, **lithium hydroxide**, **mercuric oxide**, NiOH, NaOH, MnO₂, KOH, AgO, ZnO
 - **Generates electrical current**
 - Most severe injury along anode side (along plastic seal)

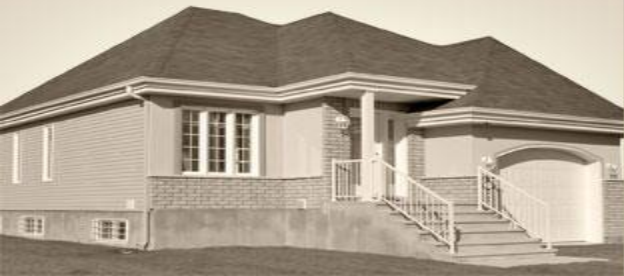
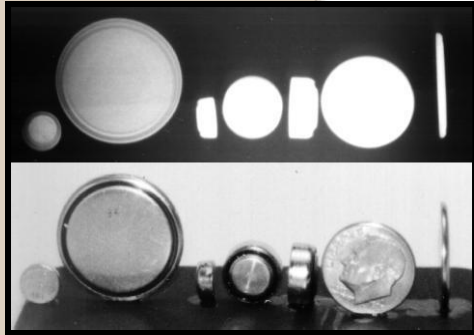




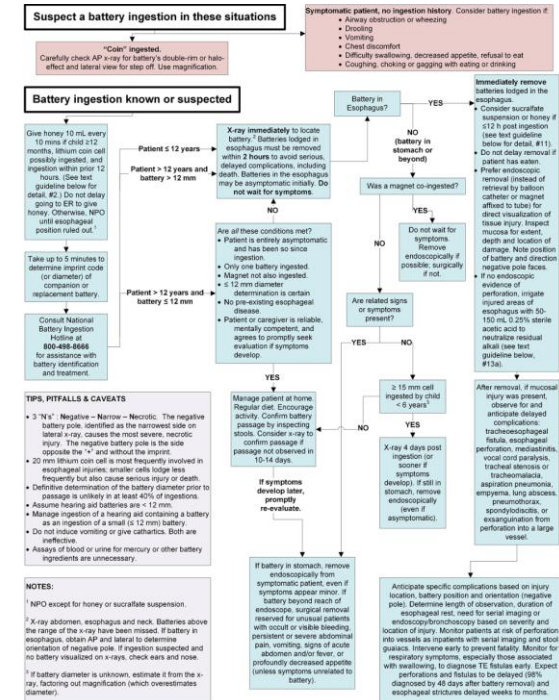
- Button battery placed in a hot dog x 2 hrs
- What if this were a toddler's esophagus?

Bedroom-Disc Battery

- Clinical: high risk if ↓age and ↑size
 - Airway or GI obstruction
 - Mild superficial injury (2-4h)
 - Transmural necrosis
 - Perforation (6h)
 - Stricture
 - Death
 - Systemic
 - Elevated urine mercury documented after rupture in 2yo; treated with dimercaprol
 - Did not develop toxicity



National Capital Poison Center Button Battery Ingestion Triage & Treatment Guideline

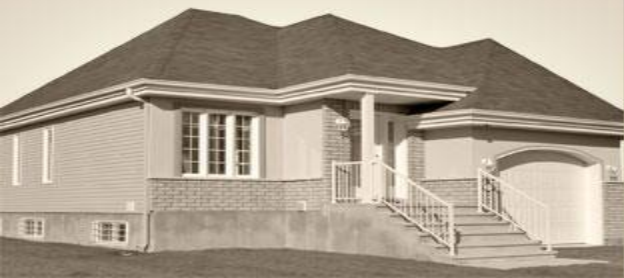
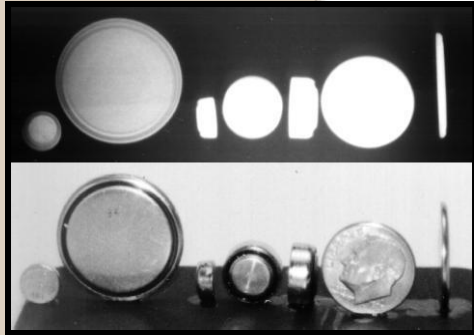


<https://www.poisson.org/battery/guideline>



Disc Battery - Treatment

- **Home:** Honey 10mL q10 min if >12 mon
- **ED:**
 - AP & lateral CXR now
 - **If ≤ 12 yo, or if >12 mm** – if lodged in esophagus, **must remove in 2hrs**
 - If in airway, nose or ear – endoscopy!
 - If in stomach & patient <6 yo & >15 mm
 - Repeat x-ray **4 days** post ingestion
 - If not past pylorus, remove endoscopically
 - If past pylorus, follow stools; if not recovered, repeat x-ray 7 days or if symptomatic
 - If in stomach & patient >6 yo & <15 mm
 - Monitor stools for passage; x-ray 10-14 days



Tips, Pitfalls, & Caveats

- 3 "N's": Negative - Narrow – Necrotic
 - (-) battery pole, narrower side on lat x-ray, causes most severe necrotic injury
 - No imprint
- 20 mm Li disc most frequently involved in esophageal injuries
- Definitive determination of battery diameter prior to passage is unlikely in at least 40% of ingestions
- Assume hearing aid batteries < 12 mm
- Do not induce vomiting or give cathartics - ineffective
- Assays of blood or urine for mercury or other battery ingredients are unnecessary

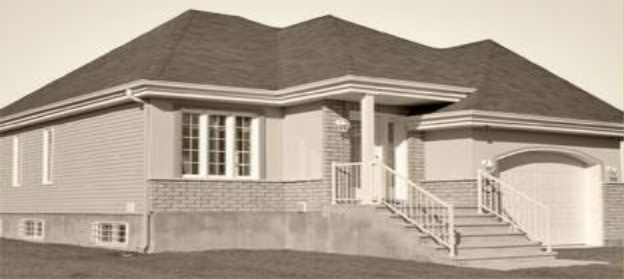
Bedroom-Disc Battery



**What
you
see**



**What
a 3-year-old
sees**

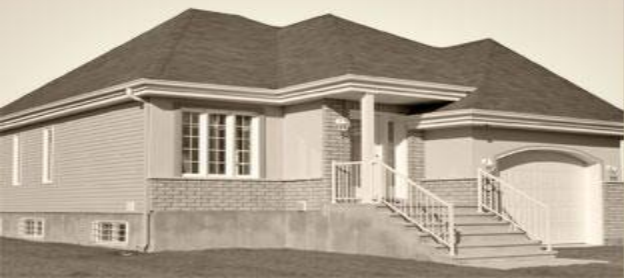


Take



Points

- Many household toxic compounds
- Use your sources
- Know dangerous substances in home
- Few antidotes
- **Supportive Care**
 - **Call Poison Center**
800-222-1222



Tiny House, Not-So-Tiny Toxins!



THANK YOU!

