



Improving Access to Quality Medical Care Webinar Series

Presented by

The Southwest Telehealth Resource Center, Arizona Telemedicine Program, and the University of Arizona, College of Medicine -Tucson

Land Acknowledgement

We respectfully acknowledge the University of Arizona is on the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally recognized tribes, with Tucson being home to the O'odham and the Yaqui. Committed to diversity and inclusion, the University strives to build sustainable relationships with sovereign Native Nations and Indigenous communities through education offerings, partnerships, and community service.



Welcome

SWTRC region
Fellow HRSA Grantees
All other participants

The Arizona Telemedicine Program, Southwest Telehealth Resource Center, and The University of Arizona College of Medicine – Tucson welcome you to this free webinar series.

The practice & deliver of healthcare is changing, with an emphasis on **improving quality, safety, efficiency,** & access to care.

Telemedicine can help you achieve these goals!







Webinar Tips & Notes

- When you joined the webinar your phone &/or computer microphone was muted
- Time is reserved at the end for Q&A, please use the **Chat function** to ask questions
- Please fill out the post-webinar survey
- Webinar is being recorded
- Recordings will be posted on the ATP website
 - <u>http://telemedicine.arizona.edu/webinars/previous</u>









Disclaimer

• The opinions expressed in this presentation and on the following slides are solely those of the presenter and not necessarily those of the organizations sponsoring this webinar. The organizations do not guarantee the accuracy or reliability of the information provided herein.







Poisoning from Liquid Social Lubricants other than Ethanol



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Methanol

- Through a process called "destructive distillation," wood chips and slabs of wood were put into a closed container and heated to at least 400° F (204° C).
- The natural liquids in the wood vaporized as the wood cooked into charcoal. The vapor was then distilled into a murky and unpleasant-smelling soup containing methyl alcohol, acetone, acetic acid, and various impurities. A second distillation could separate the pure methanol.

Methanol Vats



DJ Lanska; MedLink Neurology

- Canadian-American Ophthalmologist Casey Wood describes blindness
- 1904: reports 122 deaths and 154 cases of blindness
- Methanol untaxed 50 cents/gallon; ethanol taxed, \$2.60/gallon



10 mL a lethal dose?

• The acidosis takes time to develop, sometimes up to 16-24 h for methanol. Thus, the absence of an initial anion gap raised after described methanol consumption does not exclude the diagnosis. A potential early replacement sign of methanol poisoning is an elevated osmolar gap.



Frugivorous bats



- Olfaction is an important sense for fruit-eating bats in both families, and several studies suggest that both groups use odors emitted from fruits to locate and evaluate their palatability
- Neither ethanol nor methanol are determinative with respect to feeding

Pectin demethylase

- Low level of methanol normal for humans
- Low level of methanol in fruits due to enzyme or plant cells
- Used to repair plant following injury
- Analysis of the emissions of volatile organic compounds from leaves has revealed that most plants emit methanol, especially during early stages of leaf expansion — it is probably produced as a by-product of pectin metabolism during cell wall synthesis, and a fraction of this pool is then emitted through stomata during transpiration.



Lower epidermis

Typically, most of the stomata (thousands per square centimeter) are located in the lower epidermis.

Poisoning from, Liquid Social Lubricants, other than Ethanol

Mazda Shirazi MD, PhD





Conflict of interest:

- None
- I am a medical director of a poison center and medical toxicologist.





Methanol uses:

- Solvent
- Varnish
- Anti freeze
- Alternative fuel













Isopropyl Alcohol Uses:

- Solvent
- Hand Sanitizer











Ethylene glycol uses:

- Antifreeze
- Polyester resin
- lubricant









Route of exposure:

Routes of Exposure

- Ingestion:
- Dermal/ Eye:
- Inhalation:



American Conference of Governmental Industrial Hygienist (ACGIH):TLV, Occupational Safety & Health Administration(OSHA): PEL National Institute of Occupational Safety & Health (NIOSH): REL





Drunkenness potential:



 Ethylene glycol > Ethanol> Isopropyl> Methanol





Zero order kinetics:



- Rate of drug elimination proportional to drug plasma concentration
- Rate of drug elimination independent of drug plasma concentration 53





- Lungs ~10-20 % unchanged exhaled
- Kidneys ~3%-10% unchanged in urine
- Oxidative metabolism ~ 60-80 %
 - Catalase
 - Cytosolic Alcohol Dehydrogenase
 - CYP2EI
- Non-oxidative metabolism ~5-15%





Where does the oxidative metabolism of alcohols start in the body?

- Stomach Alcohol Dehydrogenase;
 - Is responsible for 10-20 % metabolism if alcohols







Alcohol metabolism:

Metabolic Pathways of Toxic Alcohols





N Engl J Med 2018;378:270-80.



Oxidative metabolic pathways:



Methanol

- Catalase 1%
- Cytosolic Alcohol Dehydrogenase 90%
 - Liver ADH1 70%
 - Non-ADHI 30%
- CYP2EI I-9%



Physiol Rev • VOL 95 • APRIL 2015







History of methanol toxicity:

 Humans have long suffered from the accidental consumption of methanol. Toxicity has been described as far back as the late 1800s



Methanol, Isopropyl toxicity and death during the covid-19 pandemic:

- Public Health Emergency declared 1/31/2020.
- Lack of availability of ethanol
- Supply chain disruption.
 - Shortage of hand sanitizers
 with Isopropyl and ethanol
 - Shortage of drinkable spirit containing ethanol.
- Misleading suggestion for treatment of covid-19.







• During those 14 year it is thought that thousands died from methanol poisoning.

 New York City and its more than 30,000 speakeasies served as ground zero to <u>the soaring number of</u> <u>poisonings</u>, as "1,200 were sickened by poisonous alcohol; 400 died" in 1926, and 700 died the following year.

Methanol:The Forgotten Killer of Prohibition-Era Alcohol By Jim Vorel Paste magazine | June 26, 2020





In 2020:





















Largest out break in history 2020:

• Iran: The Iranian methanol poisoning outbreak in adults involved 5876 hospitalizations and about 800 deaths



Serious Adverse Health Events, Including Death, Associated with Ingesting Alcohol-Based Hand Sanitizers Containing Methanol — Arizona and New Mexico

Between May Ist to June 20th, 2020,

15 adult patients met the case definition, including persons who were American Indian/Alaska Native (AI/AN).

All had ingested an alcohol-based hand sanitizer and were subsequently admitted to a hospital.

Four patients died and three were discharged with vision impairment.

(MMWR) August 14, 2020 / 69(32);1070–1073

Death by hand sanitizer: syndemic methanol poisoning in the age of COVID-19

• The advent of COVID-19 increased attention to hand hygiene in prevention of disease transmission. To meet the increased demand for hand sanitizer during the pandemic, the US FDA issued an Emergency Use Authorization allowing new manufacturers and importers to enter the market. Some of the newly introduced hand sanitizer products contained methanol in lieu of ethanol or isopropanol.

Clinical Toxicology, Volume 59, Issue 11, 2021











Diagnosis and Treatment:

- DX: History: Suspected history and dry county
 - IVF 30ml/kg
 - PO 6-12 mg/kg Cimetidine (young, adult non-Asian)
 - May start IV Fomepizole 15 mg/kg or IV ethanol (loading dose: 4-8 mL/kg of a 10% ethanol solution, maintenance dose of 0.5-1 mL/kg/h of 10% ethanol solution) goal is BAL 150mg/dl

DX: coma or any neurologic problems CT, MRI

Drug Safety. 1994 Apr;10(4):271-80. Annals of Medicine and Surgery 66 (2021) 102445 <u>Critical Care Toxicology, 2nd edition, 2017 pp 1769-1786</u>



Diagnosis & Treatment:

- DX: labs: Visual acuity, VBG or ABG, CMP, CBC, lipase, acetone, EtOH level, Lactate, levels methanol
- PX: pH< 7.3, or Bicarb<14, or Osom gap >25, or visual disturbance + History
- RX:
 - IV Fomepizole 15 mg/kg or IV ethanol (loading dose: 4-8 mL/kg of a 10% ethanol solution, maintenance dose of 0.5-1 mL/kg/h of 10% ethanol solution) goal is BAL 150mg/dl
 - Bolus Bicarb I to 2 mEq/kg sodium bicarbonate
 - $^\circ~$ Bicarb maintenance infusion 150 mEq of sodium bicarbonate in 1 L of D5 at 150 to 250 mL/h
 - Leucovorin (folinic acid) 50 mg IV q4h
 - Mag Igram IV
 - BI2 I00 mg
 - B6 100 mg

Drug Safety. 1994 Apr;10(4):271-80. Annals of Medicine and Surgery 66 (2021) 102445 <u>Critical Care Toxicology, 2nd edition, 2017 pp 1769-1786</u>





Anion gap vs Osmolar gap:

Time Course of Changes in the Osmolal and Anion Gaps







Need for dialysis, if any one of the following hold true?

- I.pH <7.25, high anion gap metabolic acidosis
- 2. Evidence of end organ damage (eg, ocular)
- 3. Deteriorating vital signs despite intensive care
- 4. Renal failure, bicarbonate <15 mEq/L
- Significant electrolyte disturbances
- nonresponsive to conventional therapy or level>50 mg/dl





Hemodialysis:



Critical Care Toxicology, 2nd edition , 2017 pp 1769-1786





Prognosis & special knowledge:

- Predictor of death :
 - \circ Hyperglycemia is associated with higher risk of death~ 6X.
 - pH< 6.74 as compare pH>7predictor of death ~5X
 - Coma ~ X3
 - Delayed presentation
- Predictor of significant optic neuritis and blindness.
 pH,7.2 at presentation

Annals of Medicine and Surgery 66 (2021) 102445 Critical Care Toxicology, 2nd edition, 2017 pp 1769-1786





Other potential sequala:

- Parkinson's disease:
 - ~50% of survivors
- Peripheral Polyneuropathy
 - ~36 % sensorimotor



 Predictors Neurotoxicity: older, chronic Etoh use, lower BI, diabetics, moderate toxicity(Higher pH, lower Metoh, higher Etoh)

Annals of Medicine and Surgery 66 (2021) 102445

Neurotoxicology 2020 Jul;79:67-74.



Improving Access to Quality Medical Care Webinar Series

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https://www.surveymonkey.com/r/2022Webinar-SWTRC-ATP

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