

Alcohol-based

Hand Sanitizers

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Outline

Alcohol-based Hand Sanitizers (AbHS):

Poison Center Statistics

COVID-related issues

**Kinetics and Clinical Effects
(ethanol and methanol)**

**American Association of Poison
Control Centers Annual Data**

National Poisoning Data System

Website: aapcc.org



Clinical Toxicology

2019 NPDS Report

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2019 Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 37th Annual Report

David D. Gummin, James B. Mowry, Michael C. Beuhler, Daniel A. Spyker, Daniel E. Brooks, Katherine W. Dibert, Laura J. Rivers, Nathaniel P. T. Pham & Mark L. Ryan

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NPDS 2019 Data

“Alcohols” 3rd largest category associated with deaths

One of the fastest growing cause of serious outcomes

(~ 935 more cases/year)

<u>AGENT</u>	<u>DEATHS</u>
Methanol	21*

* reporting bias/limitations

NPDS 2019 Ethanol Data

Ethanol involved in ~ 7% of all reported deaths

Ethanol results in ~ 75,000 calls to US PCCs

Hand sanitizers involved in ~ 22,000 calls

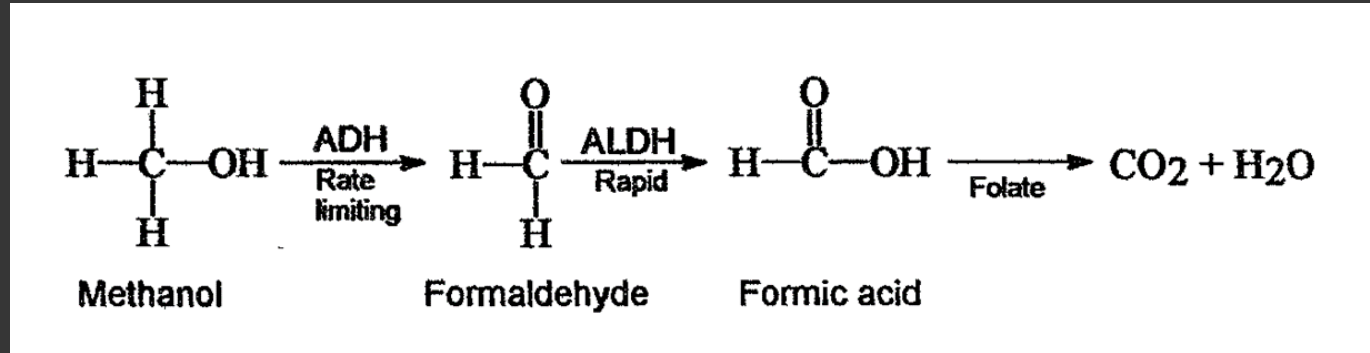
Alcohol-based Hand Sanitizers

AbHS:

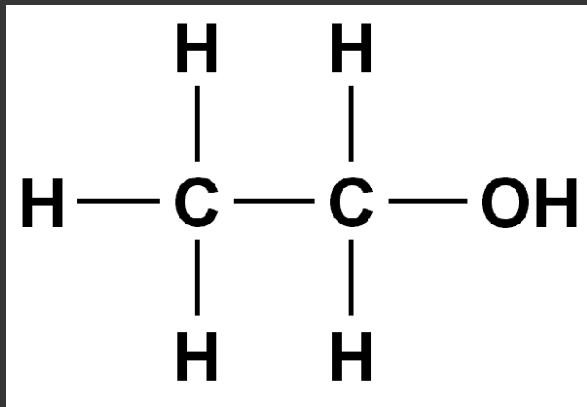
- common disinfectant in hospitals / public spaces**
- liquid, foam or gel**
- typically contain 60-95% alcohol
(ethanol or isopropanol)**
- use greatly increased during COVID response**
- increased need resulted in production/sales of
illicit products, some of which contained methanol**

Alcohol-based Hand Sanitizers

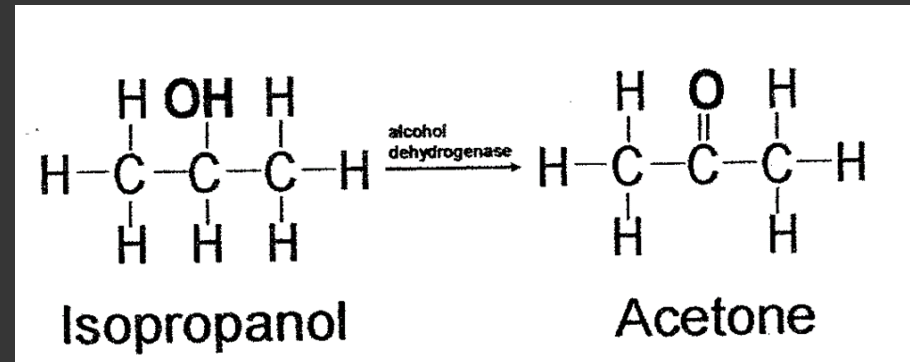
Methanol



Ethanol



Isopropanol



Alcohol-based Hand Sanitizers



Purell® - AbHS and non-alcohol (benzalkonium chloride)

<https://rental.unifirst.com/products/purell-sf607tm-hand-sanitizer-foam-non-alcohol-formula1200-ml>

A 37-year-old man with a history of ethanol abuse, ethanol withdrawal seizures and bipolar disorder called into our PCC after ingesting Purell®

Serum ethanol concentration (SEC) was 323 mg/dL

Several months later: another ingestion resulted in a SEC of 295 mg/dL

Review of PCC records found 12 ED visits related to AbHS

The average SEC = 239 mg/dL (range: 58-418)



NPDS 2020 Emerging Data

2020 Preview – Methanol Containing Hand Sanitizers

The Food and Drug Administration's Center for Drug Evaluation and Research (FDA CDER) initiated contact with the AAPCC, NPDS emergency codes were generated on June 23, 2020 and a Special Report (available under NPDS Enterprise Reports) was developed to provide case

epidemiology (Figure 8). To provide the earliest and strongest signal, the epidemiology curve includes exposure and non-exposure contacts, open and closed cases, and single and multiple substance reports. Of the 2,467 cases received, beginning on May 7 (start date of first report) through September 6, 2020: 87.7% were exposures, 39.0% were chronic, 15.9% were unknown age ≥ 20 years, 49.8% were female, 74.7% were dermal exposures, 30.0% were not followed with minimal clinical effects possible 72% were

managed on site (non-health care facility). The COVID-19 product code was reported along with the sanitizer in 10.0% of the cases. During this period, FDA released 25 Recalls, Market Withdrawals, & Safety Alerts (<https://www.fda.gov/safety/recalls-market-withdrawals-safety-alerts>) concerning methanol contaminated hand sanitizers.

Poison Centers in Arizona and New Mexico collaborated with the CDC and published a report of 15 severe poisonings including 4 deaths [13].

Methanol-containing Hand Sanitizer

Calls to US PCCs

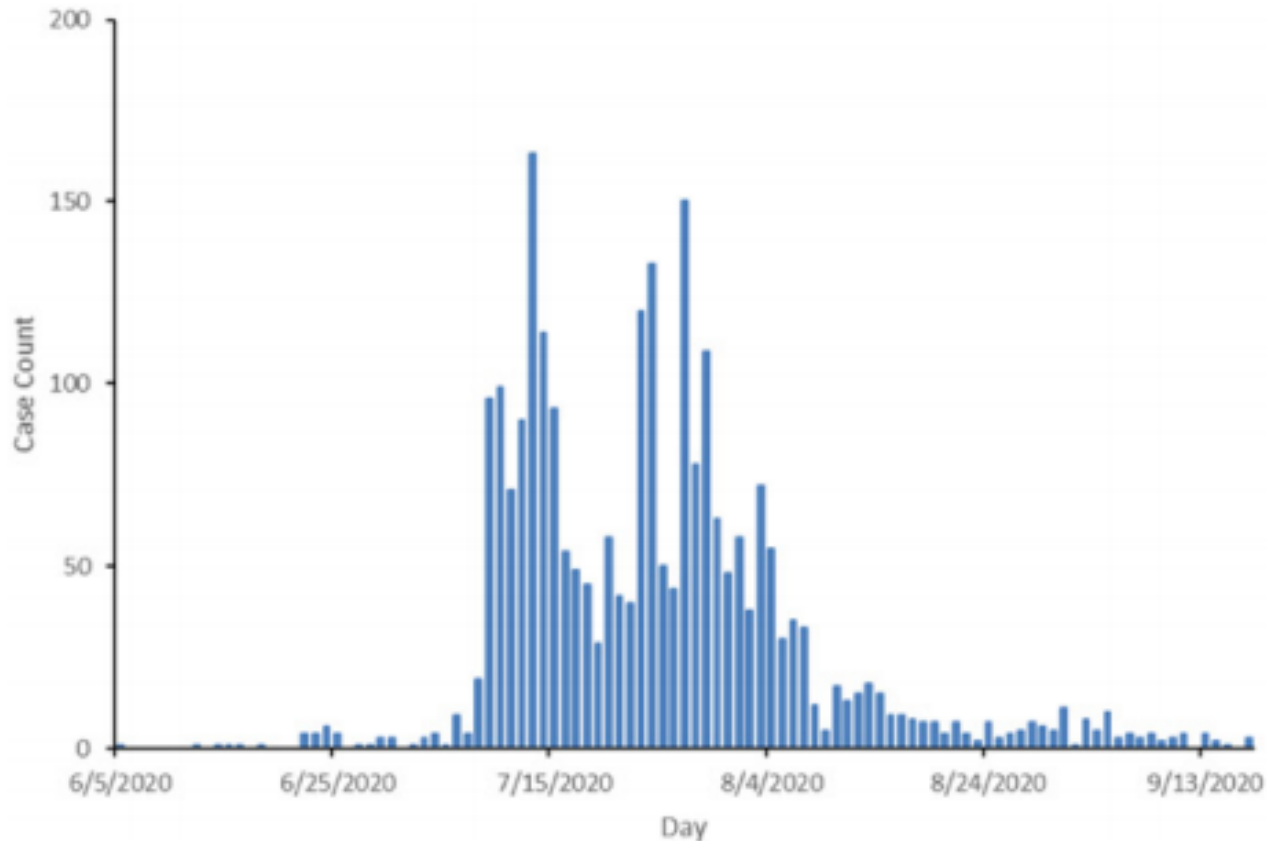


Figure 8. Exposures per Day – All methanol-containing hand sanitizer cases, June 1, 2020 through September 17, 2020. The figure shows the frequency of methanol-containing hand sanitizers human exposure cases by day.

CDC Warning about Methanol

Centers for Disease Control and Prevention

MMWR

Morbidity and Mortality Weekly Report

Early Release / Vol. 69

August 5, 2020

Serious Adverse Health Events, Including Death, Associated with Ingesting Alcohol-Based Hand Sanitizers Containing Methanol — Arizona and New Mexico, May–June 2020

Luke Yip, MD¹; Danae Bixler, MD¹; Daniel E. Brooks, MD²; Kevin R. Clarke, MD¹; S. Deblina Datta, MD¹; Steven Dudley Jr., PharmD³; Kenneth K. Komatsu⁴; Jennifer N. Lind, PharmD¹; Annaliese Mayette, PhD⁵; Michael Melgar, MD¹; Talia Pindyck, MD¹; Kristine M. Schmit, MD¹; Steven A. Seifert, MD⁶; Farshad Mazda Shirazi, MD, PhD³; Susan C. Smolinske, PharmD⁷; Brandon J. Warrick, MD⁶; Arthur Chang, MD¹

CDC Warning about Methanol

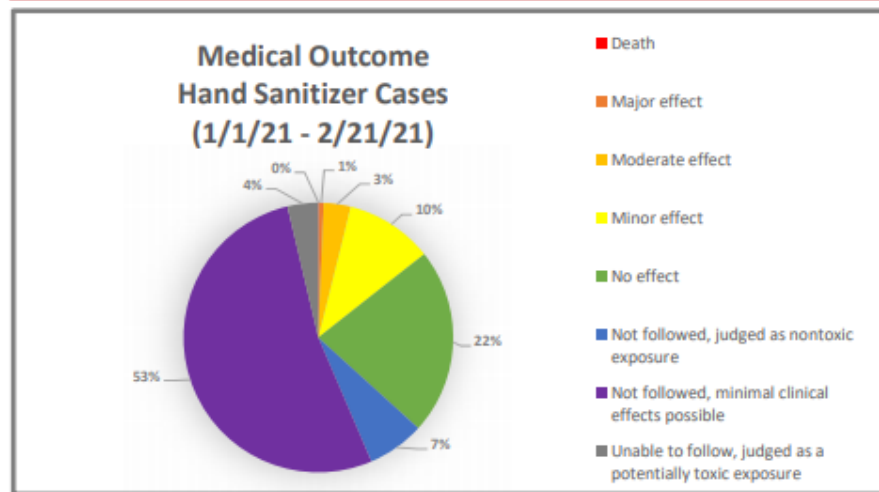
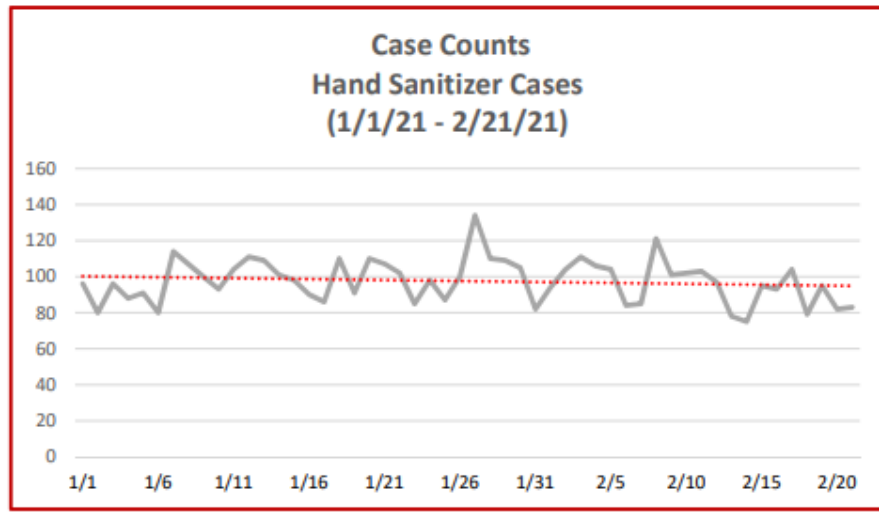
Age (yrs)	Sex	Chief complaint(s)*	Serum methanol concentration (mg/dL)	Anion gap [†] (mEq/L)	Serum bicarbonate [‡] concentration (mEq/L)	Blood pH [§]	Treatment	Outcome
21	M	Gastrointestinal	44	30	6	7.15	4MP	D/C, no sequelae
30	M	Visual disturbance	35	43	11	N/A	4MP	D/C, no sequelae
35	M	Unresponsive, seizures	198	49	<5	6.87	4MP	Died
36	M	Decreased responsiveness	>500	42	7	7.23	4MP, HD	Remains hospitalized**
38	M	Gastrointestinal	131	35	<5	6.81	4MP, HD, CRRT	D/C, no sequelae
38	F	N/A	21 ^{††}	N/A	N/A	N/A	4MP	Died
39	M	Seizures, unconscious	278	23	11	N/A	4MP, HD	Died
40	M	Dog bite	319	35	<5	7.00	4MP, CRRT	Remains hospitalized**
44	M	Visual disturbance, seizures	97	32	<6	7.09	4MP, HD	D/C with visual impairment
47	M	Headache, visual disturbance	43	34	8	7.25	4MP, HD	D/C with visual impairment
50	M	Visual disturbance	410	22	9	6.70	4MP, CRRT	Remains hospitalized**
51	F	Dyspnea	42	23	6.2	7.14	4MP	D/C with visual impairment
54	M	Media alert ^{§§}	56	17	13	N/A	4MP	D/C, no sequelae
63	M	Altered mental status	548	30	11	7.12	4MP, HD	Remains hospitalized**
65	M	Unresponsive, seizures, cardiac arrest	308	31	<5	N/A	4MP, HD, CRRT	Died



National Poison Data System (NPDS) Bulletin COVID-19 (Hand Sanitizer)

**Hand Sanitizer Case Counts
2020 vs. 2021
(January 1 - February 21)**

Month	2020	2021
Jan.	2,031	3,074
Feb.	1,510	1,996
TOTAL	3,541	5,070



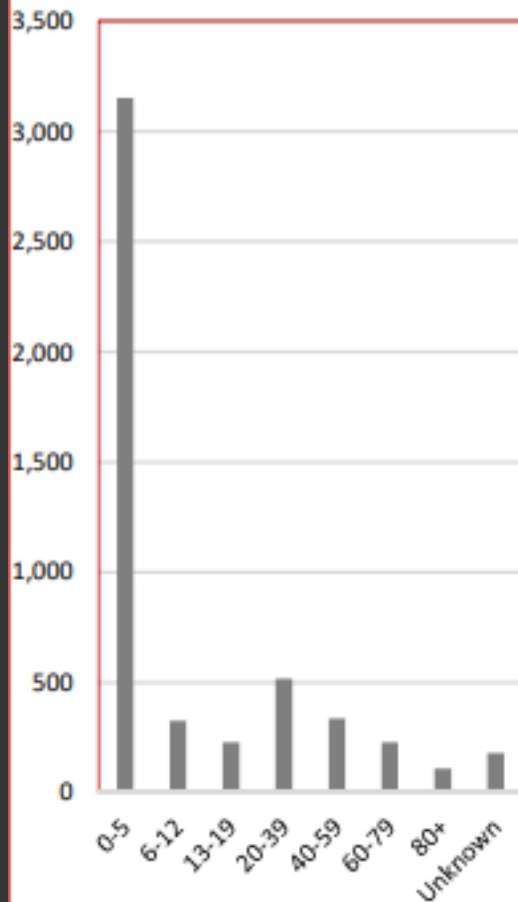
* Confirmed nonexposure and Unrelated effect cases are not included in this pie chart
 * Single and multiple exposure cases included; additional NPDS data is required to correlate cases with outcomes.
<https://aapcc.org/data-system>

Gender Distribution Hand Sanitizer Cases (1/1/21 - 2/21/21)

Male	2,668	52.6%
Female	2,387	47.1%
Unknown	15	0.3%

COVID-19 and AbHS

**Age Distribution
Hand Sanitizer Cases
(1/1/21 - 2/21/21)**



Gender Distribution Hand Sanitizer Cases (1/1/21 - 2/21/21)

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COVID-19 and AbHS

Prevention >> Treatment

Masks

Social Distancing

Quarantine

Hand Hygiene



844-542-8201

Highlighted Infectious Diseases for Arizona

ADHS Home / Public Health Preparedness / Epidemiology & Disease Control / Infectious Disease Services
/ Highlighted Infectious Diseases for Arizona - Coronavirus Disease 2019 (COVID-19) - Coronavirus Home

Home

Coronavirus Disease 2019

- Home
- General Public
- Frequently Asked Questions (FAQs)
- EMS and 9-1-1 Resources
- Local Health Resources

Coronavirus Home



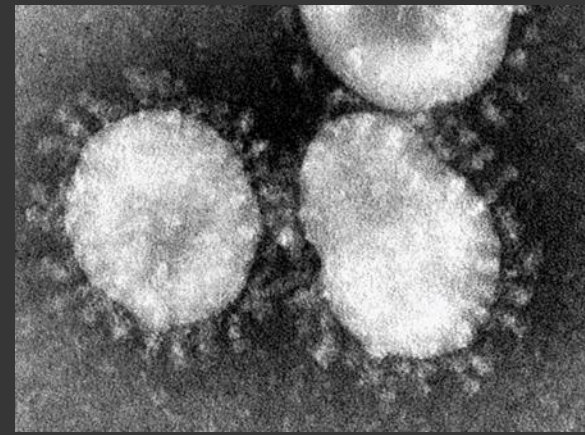
Coronavirus Disease 2019 (COVID-19)

- The Arizona Poison Control System is available to answer questions about COVID-19 from Arizona providers (for testing and patient guidance) and the general public (for testing, isolation, and quarantine guidance) at 1-844-542-8201
- The President's Coronavirus Guidelines for America -- 15 Days to Slow the Spread of Coronavirus (2020) is available at [Whitehouse.gov](https://www.whitehouse.gov)
- Governor Ducey's [Executive Order](#) released March 19, 2020.

2020 Calls = 98,555

Many calls about Treatment and Prevention

COVID-19 and AbHS



CORONAVIRUS

Man dies after ingesting chloroquine in an attempt to prevent coronavirus

The man and his wife thought the ingredient, used to treat sick fish, could prevent the disease.

COVID-19 and AbHS

Based on:

Local Poison Center Calls

Patients transferred to our service

Regional Cases

CDC Analysis (MMWR)

Intentional misuse of AbHS

Intentional misuse of AbHS

Ingestion

(not dermal absorption)

Trying to get inebriated

(alcohol substitute)

Attempting to prevent COVID

(rare events)

Pharmacokinetics and

Clinical Effects

Ethanol and Methanol

Ethanol Intoxication

Each 'drink' contains about 14.4g of ethanol

12 oz beer (5%)

1.25 oz liquor (40%)

5 oz 12% wine



For an average person (70 kg) this results in
a serum concentration of ~ 25 mg/dL

Ethanol Metabolism

Average Rate for EtOH Metabolism:

~ 20 mg/dL/hr (9 - 29 mg/dL/hr; 95% CI)

Units: 100 mg/dL = 1g/L = 100 mg% = .100 %

Medical units = mg/dL in **plasma**

Legal units = mg/dL (%) **whole blood**

Plasma EtOH : BAC (whole blood) = 1.16 to 1

Plasma [EtOH] 80 mg/dL ~ whole blood EtOH of 68mg/dL

Acute Ethanol Intoxication

Intoxication best described by clinical effects
(do not correlate well with alcohol concentration)

Inebriating at low doses

CNS and Respiratory depressant at higher doses

“Uncouples” cortex from integrated control
(dis-inhibition)

Underlying personality defects

Acute Ethanol Intoxication

Poor decision-making → Risky Behaviors

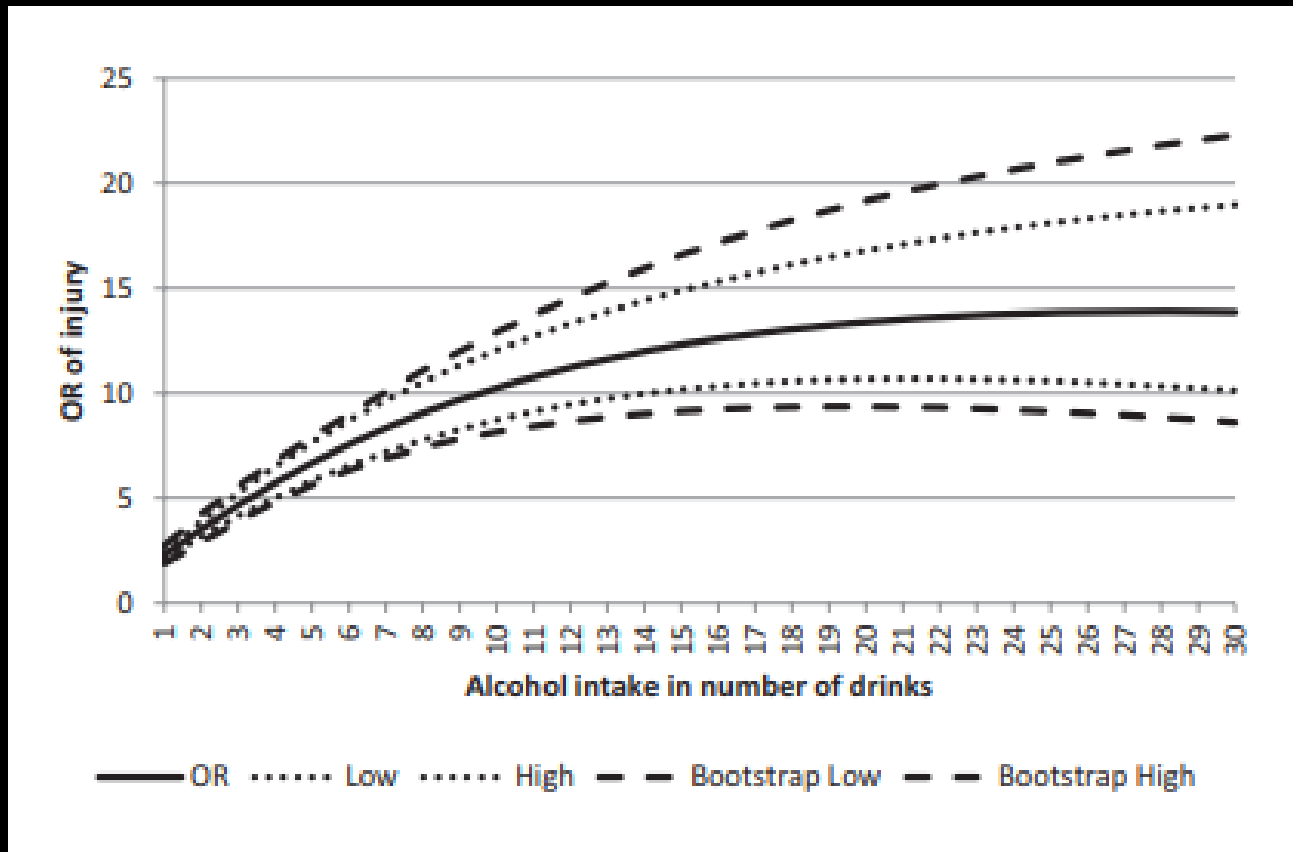
Impaired motor skills

Impaired perception (memory formation)

Delayed reaction time

Ethanol Abuse and Trauma

Cherpitel CJ et al: 2014, Addiction Research Report



Ethanol Abuse and Trauma

Ronald V. Maier *Surgical Infection Vol2(2):2001*

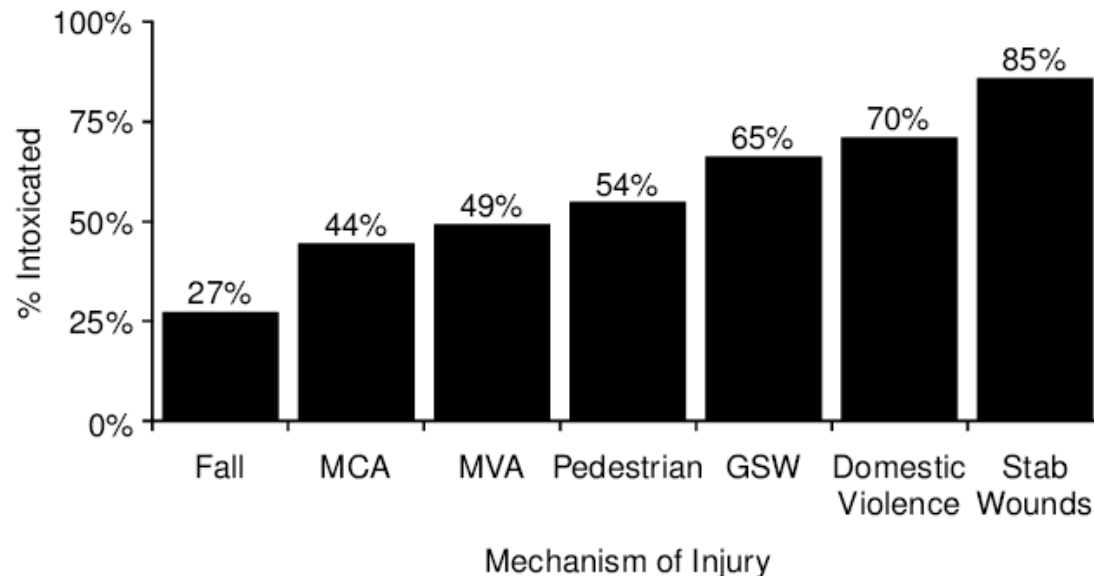


FIG. 2. Alcohol-associated injury. The incidence of associated alcohol intoxication varies for selected mechanisms of injuries. MCA, motorcycle accident; MVA, motor vehicle accident; GSW, gunshot wound.

Alcohol-Related Trauma Recidivism

**Studies show approximately 15%
of trauma patients have a previous hospital
admission for alcohol-related injuries**

246 pts with alcohol-related trauma injuries

44% readmitted within 5 years

20% of these pts died

Methanol

Clear, flammable liquid

AKA: Methyl alcohol, Wood alcohol, Carbinol

Sources:

Bootleg whiskey adulterant

Window washers

Carburetor cleaners

Embalming fluids

Anti-knock agent

Deicers

Paint removers

Model fuels

Methanol

Rapid absorption (oral, dermal, inhalational)

Lethal Dose < 1 mL/kg of 100% solution

Blindness reported after 4 mL ingestion

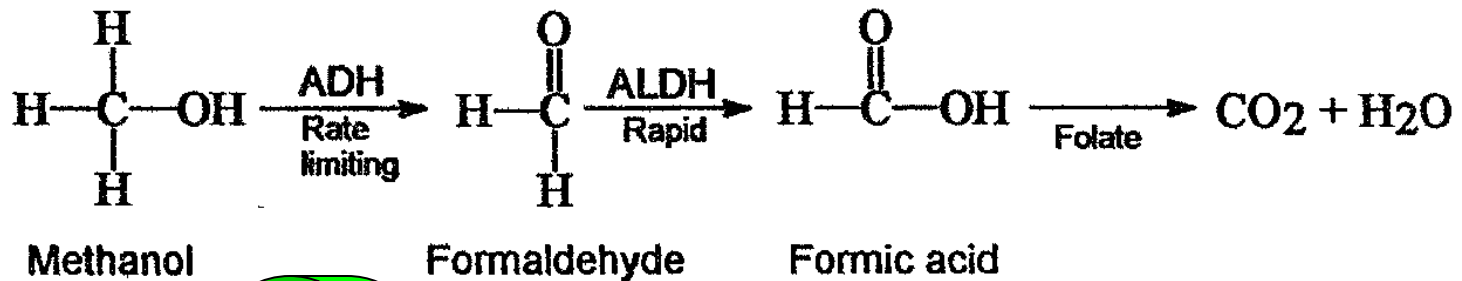
Peak blood concentration within 60 minutes

Metabolism:

Alcohol Dehydrogenase and Aldehyde Dehydrogenase

10% excreted unchanged, 5 % via ventilation

Methanol - Metabolism



NAD

NADH + H⁺

Methanol - Clinical Effects

Inebriating
(CNS depressant)

Metabolic Acidosis
(Anion and Osmolal Gaps)

Ocular Toxicity
(Formaldehyde formation)

Methanol - Clinical Effects

Toxicity greatest in organs with high metabolic demand (e.g. CNS, kidney, optic nerve)

Ocular Toxicity

Inhibition of energy (ATP) production

Causes axonal swelling / optic nerve demyelination

Hemorrhagic stroke also possible

Take Home Points

Alcohol-based Hand Sanitizers

Should contain ethanol or isopropanol

Illicit products contain methanol

Risk for toxicity (poisoning) with misuse

Take Home Points

CVOID and AbHS

Typical Scenario: Intentional Ingestion

Reason: Alcohol Substitute

(ethanol containing AbHS ~ 'cheap vodka')

Methanol used in Illicit Manufacturing

Take Home Points

Ethanol

Inebriation and CNS Depression

Synergistic Respiratory Depression

Hypoglycemia, Dehydration, Malnutrition

Trauma and Withdrawal

Take Home Points

Isopropanol

Significant CNS depression

Severe Gastritis

Ketosis (Acetone) without Acidosis

Supportive (Ventilatory) Support

Methanol - Take Home Points

Methanol

CNS and Ocular Toxicity

Metabolic Acidosis

Stroke

Alcohol / 4-MP and Hemodialysis

Folate

US Poison Control Centers

Never Hesitate to Call Us

800-222-1222

www.aapcc.org



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