Alcohols

- beverage alcohol = ethanol or ethyl alcohol
- rubbing alcohol = isopropyl alcohol (also in antiseptics, aftershave, window washer fluid)
- methanol or methyl alcohol - common industrial/chemical form of alcohol (antifreeze, Sterno, solvents)
- All are toxic but latter 2 extremely so.

Ethanol

- Produced by the action of yeast on a sugary mixture ("fermentation")
- Also can come from starches by stimulating their conversion to sugar
- Fermentation yields a max of a 15% alcoholic beverage
- Distillation must be used to produce stronger spirits
- "Proof" = 2 x %

A Sampling of Concentrations

Alcohol Absorption

- Fat & water soluble molecule easily gets into all tissues; no digestion necessary
- Alcohol provides calories but no nutrients
- ~20% absorbed from stomach, 80% from intestines
- Stomach contents, alcohol concentration, carbonation, gender, drug interactions (e.g. aspirin, anti-ulcer) all affect absorption
- Other factors influencing intoxication: Speed of consumption, speed of gastric emptying, individual sensitivity, expectancy effects
- We are terrible judges of our impairment.

Alcohol Expectancy Effects

(balanced placebo design)

- In separate studies, males who expected to receive alcohol showed:
  - if you expect to get drunk you act drunker
  - more subjective arousal & sexual disinhibition whether or not they got alcohol
  - more aggressive behavior whether or not they actually received alcohol
- So not only does alcohol disinhibit behavior but just the expectation of alcohol does as well
Typical Acute Effects of Alcohol Associated With Different Alcohol Blood Concentrations (BAC)

<table>
<thead>
<tr>
<th>BAC (%)</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01 – 0.02</td>
<td>Slight changes in feeling, aware of warmth and well-being.</td>
</tr>
<tr>
<td>0.02 – 0.03</td>
<td>Feeling of elevation, slight intoxication, happiness, skin may feel warm, slight impairment in vision.</td>
</tr>
<tr>
<td>0.03 – 0.05</td>
<td>Effect of memory is noticeable. More exaggerated changes in mood, impaired judgment, and lowered inhibitions. Coordination may be affected. Reaction time increased. Minor coordination impairment. Sensory feelings of body are increased.</td>
</tr>
<tr>
<td>0.05 – 0.07</td>
<td>Weakness, dizziness, disorientation, difficulty walking, impaired vision, difficulty drinking or swallowing, vertigo, unconsciousness. Moderate impairment in balance and movement. Large increase in reaction time. Impaired judgment and perception. Difficulty maintaining conversation. Loss of memory during conversation. Difficulty staying awake. Lack of concentration. Difficulty standing or walking, difficulty keeping balance.</td>
</tr>
<tr>
<td>0.08 – 0.09</td>
<td>Confusion and disorientation. Difficulty comprehending what is going on, possibility of consequences appearing.</td>
</tr>
<tr>
<td>0.05 – 0.10</td>
<td>Typically causes unconsciousness and loss of memory of the drink. Alcohol level may remain at 0.05.</td>
</tr>
<tr>
<td>0.11 – 0.15</td>
<td>Coordination and voluntary functions may become totally depressed. LD 50 (LD 50) of alcohol.</td>
</tr>
</tbody>
</table>

Typical Effects on the Body

- Dilution of blood vessels in skin leading a warm surface flush (but drop in core body temp)
- Decreased Anti-diuretic Hormone (ADH) leading to increased urination & dehydration
- In moderate doses, increased HDLs (good) and lowered LDLs (bad) except in smokers
- Gastric irritation

Actions of Alcohol on the Brain—multiple actions

- Produces most depressant actions by enhancing the inhibitory effects of GABA
- (A drug (RO 15 4513) which keeps alcohol from binding to GABA receptor acts as a “sober-up” drug)
- Alcohol also blocks excitatory effect of glutamate so is “extra-depressant” in its effects
- These actions, in turn, lead to the release of SHT, DA, endorphin and anandamide producing rewarding/mood elevating effects

Impairment of Driving

- Impairs attention, judgment, reaction time, alertness, coordination
- 41% of traffic fatalities involve someone legally intoxicated (60% of teen fatalities)
- Even a BAC of .02 - .04 ➔ 40% increase in accidents
- .05 - .08 BAC - 4x greater risk than sober
- .10 - .14 BAC - 6 - 7x greater risk
- .15 BAC - 25x greater risk
- >100 countries have set legal limit at .05 & the National Traffic Safety Board is campaigning that the US do the same

Loss of Judgment & Self-Control

- Cognitive inhibition + disinhibition of behavioral/emotional control is a dangerous combo!
- Alcohol is involved in
  - 50% of police arrests
  - 50-60 % of murders
  - 40% males committing sexual assault
  - 60-70% males committing domestic abuse
  - 60% of child molestation & abuse
  - 35% of suicides

Metabolism

- In males ~15% of alcohol can be metabolized in stomach before its even absorbed; women may have half as much metabolized here.
- The rest is metabolized in liver - ~1 standard drink/hr by a healthy liver
- Alcohol dehydrogenase converts alcohol into acetaldehyde
- Aldehyde dehydrogenase breaks down acetaldehyde into acetic acid
- Acetic acid is oxidized into oxygen, carbon dioxide, and calories
On Average One “Drink Equivalent” Metabolized per Hour

- One 12 oz can 5% beer
- One-half can of 8-10% microbrew
- 4 oz. 12% wine
- 1 oz. of 40% (80 proof) hard liquor

Why Do We Experience Hangovers?

- Mini-withdrawal from alcohol (rebound hyperexcitability)
- Toxic reaction to congeners
- Toxic reaction to alcohol & its byproduct acetaldehyde
- Fatigue, dehydration, hypoglycemia, loss of vitamins, etc. due to partying

Congeners:

- other alcohols, oils, and organic substances added or formed during the production of an alcoholic beverage
- Congeners give these beverages their distinctive color, odor and taste
- Congeners are 1 of the factors influencing hangover
- Highest in congeners: bourbon, scotch, brandy, tequila, red wine, dark beers

Health Risks of Chronic Heavy Drinking

- Nervous system dysfunction & brain damage (Korsakoff’s syndrome) affecting memory, motor function; alcohol dementia
- Fatty liver; alcoholic hepatitis; cirrhosis (7th leading cause of death in US & responsible for 75% of deaths attributable to alcohol)
- Impaired reproductive functioning
- Gastritis, pancreatitis
- Co-carcinogen increasing risk of oral, throat, stomach, intestinal, liver and possibly breast cancers. Increases cancer risks of smoking.
- Impaired immune function
Psychological Disorders Associated With Alcohol Abuse

- ~30-50% depression & risk of suicide
- ~33% co-existing anxiety disorder
- ~36% have additional substance dependencies
- ~30-50% have other psychiatric disorders

Fetal Alcohol Spectrum Disorders

- ~ 2 FAS/1000 births & perhaps 6/1000 milder cases (ARND, ARBD) ~ 2,500,000 US babies/yr!
- May be subtle or severe depending on degree & timing of exposure
- 3rd most common cause of birth defects, retardation and learning disabilities (& the most preventable)
- Seen in 30-50% babies born to alcoholic mothers, but symptoms may also be seen with as little as 2 drinks twice a week.
- Binge drinking particularly damaging

Symptoms:

- Reduced growth (75% of FAS babies are less than 5 lbs). This low birth weight is associated with increased infant mortality.
- Physical abnormalities (small head & brain, distinctive facial features; hand, eye, ear, heart & organ abnormalities)
- CNS abnormalities causing mental retardation, poor motor skills, a variety of learning/behavioral disabilities
- Developmental & behavioral problems even in the absence of physical symptoms
- Partial symptoms = FAE or ARND

Alcohol Poisoning/Overdose

- Symptoms:
  - Stuporous or unconscious; can’t be roused
  - Cool or damp skin; pale or bluish skin
  - Shallow slow or irregular breathing <8/min
  - Vomiting while unconscious
  - Weak rapid pulse
  - Can be fatal or cause brain damage – call 911
  - 30,000 college students/yr treated for alc. overdose – untreated, many die
  - http://www.youtube.com/watch?v=iVoX2Pw81eY
  - http://www.youtube.com/watch?v=N5ncbXUVZZE

Alcohol Withdrawal

- Without the depressant you are overstimulated by the “hyperexcitability rebound”
  - tremors (“the shakes”)
  - agitation, anxiety (“the jitters”)
  - insomnia: if you do sleep, vivid nightmares
  - sweating, nausea, vomiting
  - increased HR & BP
  - alcoholic hallucinosis
  - grand mal seizures in about 10%, usually 12-48 hrs after last drink but may be sooner if susceptible
  - For some, these early symptoms worsen

Alcohol Withdrawal- the “DT’s” Delirium tremens

- Usually begins 2-4 days after last drink and lasts 1-7 days
- Disorientation, agitation, confusion, terrifying hallucinations, delusions, as well as nightmares, violent behavior
- more extreme bodily stimulation & autonomic instability (sweating, high fever, risk of heart failure as well as seizures) – death in 5%
Pharmacological Aids to Treatment

During detox:
- Use of another depressant (benzodiazepine like Librium, Ativan or Valium or another anticonvulsant) to gradually withdraw individual & try to avoid seizures.

After Detox

- Anti-relapse:
  - Alcohol-Sensitizer - Antabuse (disulfiram);
  - Various anti-craving drugs:
    - Opioid antagonists: Revia (naltrexone) blocks opiate receptors – both oral & extended release injection available
    - Campral (acamprosate): a GABA agonist & glutamate blocker (like alcohol)
    - Antidepressants (most often SSRI) - antidepressant, anti-anxiety effects
    - Zofran (ondansetron)
    - Anticonvulsant mood stabilizers (topiramate, valproate, gabapentin) are looking promising

- These should be combined with meetings and/or cognitive-behavioral psych interventions