C81ADD Psychology of Addiction

Alcohol

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Ethyl alcohol (ethanol)

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• Relevance of alcohol to individual and society: alcohol-associated harms

• Psychopharmacology of alcohol
  - Primary neuropharmacological targets of alcohol
  - Acute psychological effects of alcohol
  - Psychological effects of chronic (excessive) alcohol consumption
Alcohol 'more harmful than heroin or crack'

Lancet study reopens debate on drug classification and curbs on drinking
Harms associated with drugs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>To users</th>
<th>To others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical harm</td>
<td>One: Acute</td>
<td>Seven: Intoxication</td>
</tr>
<tr>
<td></td>
<td>Two: Chronic</td>
<td></td>
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<tr>
<td></td>
<td>Three: Intravenous harm</td>
<td></td>
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<tr>
<td>Dependence</td>
<td>Four: Intensity of pleasure</td>
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<td>Five: Psychological dependence</td>
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<tr>
<td></td>
<td>Six: Physical dependence</td>
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</tr>
<tr>
<td>Social harms</td>
<td>Seven: Intoxication</td>
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<tr>
<td></td>
<td>Eight: Other social harms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nine: Health-care costs</td>
<td></td>
</tr>
</tbody>
</table>

Development of drug harm scale:
- Experts assign score (0-3) for each parameter
- Parameters are averaged to yield overall harm score

Nutt et al. (2007) Lancet 369:1047
Harmfulness of different drugs

Nutt et al. (2007) Lancet 369:1047
Harms associated with drugs: Improved criteria and weighting

- 16 criteria (9 in 2007 study)
- Scores from 0-100 (0-3 in 2007 study)
- Differential weighting of criteria to indicate their different importance

Harmfulness of different drugs

Alcohol

Nutt et al. (2010) Lancet 376:1558
The suggestion that alcohol is more harmful than crack is based on:

a) an expert assessment of drug harms to users.

b) an expert assessment of drug harms to others (i.e., society).

c) both a) and b).

d) none of the above.
“On the basis of these data it is clear that the present UK drug classification system is not simply based on consideration of harm.”

“They also [support] that aggressively targeting alcohol harms is a valid and necessary public health strategy.”
Profile: Professor David Nutt

By Dominic Casciani
BBC News, Home Affairs

Professor David Nutt has been sacked as the government's top drugs adviser after a rollercoaster of a relationship with two home secretaries over the last 12 months.

David Nutt: Scientist who clashed with policy
Psychological effects of alcohol

“If recreational drugs were tools, alcohol would be a sledgehammer. Few cognitive functions or behaviors escape the impact of alcohol . . .”

Selected aspects of the psychopharmacology of alcohol (ethanol)

• Primary neuropharmacological targets of alcohol

• Acute psychological effects of alcohol
  - Decreased tension/anxiety (anxiolysis)
  - Impaired memory (amnesia, ‘black out’)
  - Directly ‘rewarding’ effects of alcohol?

• Psychological effects of chronic (excessive) alcohol consumption
  - Neuropharmacological adaptations, withdrawal symptoms and alcohol dependence
  - Severe and chronic cognitive deficits due to brain shrinkage (Wernicke-Korsakoff Syndrome)
Primary neuropharmacological targets of alcohol

First hit
• Neurotransmitter receptors (NMDA, GABA-A, Glycine, 5-HT3, nACh)
• Voltage-gated ion channels (L-type Ca2+ channels, GIRKs)

Complex neuropharmacology
• Nonspecific effects – interactions with lipid bilayer; mainly at higher concentrations
• Specific effects – interaction with ligand-gated ion channels (i.e., neurotransmitter receptors) and voltage-gated ion channels; at concentrations within range achieved by common alcohol consumption

Psychological effects of alcohol depend on complex interactions between many variables

VARIABLES AFFECTING THE EFFECTS OF ETHANOL IN HUMANS

- Environmental variables (social cues)
- Cognitive Set (expectancy) (see boxes 9.2 and 9.3 in textbook)
- Mood, arousal, personality factors
- Age and sex of subjects
- Exposure to other drugs (coffee, nicotine, etc.) and nutritional state of the subjects
- Variables related to ethanol ingestion:
  - Dose
  - Rate of ingestion
  - Time of testing post ingestion; time of day
  - Type of beverage ingested (role of congeners)

### TABLE 9.2 Blood Alcohol Concentration and Effects on Behavior

<table>
<thead>
<tr>
<th>BAC</th>
<th>Effects on behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>.02–.03</td>
<td>Minimal effects; slight relaxation; mild mood elevation</td>
</tr>
<tr>
<td>.05–.06</td>
<td>Decreased alertness; relaxed inhibitions; mildly impaired judgment</td>
</tr>
<tr>
<td>.08*–.10</td>
<td>Loss of motor coordination; slower reaction times; less caution</td>
</tr>
<tr>
<td>.14–.16</td>
<td>Major impairment of mental and physical control; slurred speech; exaggerated emotions; blurred vision; serious loss of judgment; large increases in reaction time</td>
</tr>
<tr>
<td>.20–.25</td>
<td>Staggering; inability to walk or dress without help; tears or rage with little provocation; mental confusion; double vision</td>
</tr>
<tr>
<td>.30</td>
<td>Conscious but in a stupor; unaware of surroundings</td>
</tr>
<tr>
<td>.45</td>
<td>Coma; lethal for 50% of the population</td>
</tr>
</tbody>
</table>

*Legal driving limit in UK, except for Scotland, where the limit is 0.05*
Alcohol-induced reduction in tension and anxiety

• View that alcohol reduces tension and anxiety – and that this effect is a major contributor to alcohol consumption and abuse – is widely held, even though studies on human subjects have reported variable effects on measures of anxiety (e.g., self report, autonomic arousal) (Wilson, 1988, BehavResTher 26:369; Kushner et al., 2000, ClinPsycholRev 20:149).

• Similar to classical anxiolytics, such as benzodiazepines, alcohol acts as indirect agonist at GABA-A receptors, i.e. enhances the response of the major inhibitory neurotransmitter GABA (Harris & Mihic, 2004, PNAS 101:2).


• Alcohol relatively consistently reduces measures of anxiety in rodents (e.g., Blanchard et al., 1993, ProgNeuropsychopharmacol&BiolPsychiat 17:171 and next slide).
Beer drinking in rats reduces anxiety

Cat odour avoidance test

Elevated plus maze test
Anxiety predicts ethanol self-administration in rats

Anxious and non-anxious rats (elevated plus maze behaviour)

Higher alcohol self-administration in anxious rats

Spanagel et al. (1995) Psychopharmacology 122:369
Which of the following supports the hypothesis that alcohol decreases anxiety?

a) Alcohol causes rats to spend less time on the open arms on the elevated plus maze.

b) Alcohol acts as indirect agonist at GABA-A receptors, i.e. enhances the response of the major inhibitory neurotransmitter GABA.

c) Alcohol causes rats to spend more time on the open arms on the elevated plus maze test.

d) b) and c).
Selected aspects of the psychopharmacology of alcohol (ethanol)

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Next lecture!
Selected reading – Alcohol 1

Textbook chapter:
Chpt. 9, Alcohol – for general overview

Selected overviews of topics discussed today:


All articles, as well as all references given in lecture, are available online via Nottingham University access.
Some questions for revision

• Is alcohol harmful? Which criteria do we need to consider?

• What are the neuropharmacological targets of alcohol?

• What evidence is there to suggest that alcohol reduces anxiety?

The MCQs related to alcohol will all be based on the material dealt with in my two lectures on the psychological effects of alcohol. If you understand the material, so that you can answer the revision questions well, you should have no difficulties with the MCQs.