

## Introduction :

### How Does it get to the brain?

- Alcohol is ready for absorption upon consumption, no digestive breakdown going on
- start in logical order : mouth, stomach, small intestine, enters portal venous bloodstream -> to heart -> distributes blood to brain (quick)
- alcohol low molecular weight, so it can move rapidly through the entire system

### What does it do in the brain? (Cellular)

#### Short review:

- action potential of a neuron reaches axon terminal
- neurotransmitters are released
  - excitatory cause depolarization of postsynaptic membrane
  - inhibitory cause hyperpolarization
- neurotransmitters bind to receptor molecules

#### Low Levels of Alcohol:

- decreases the excitation threshold, b/c of a slight depolarization -> lower threshold for stimulation
- Neurotransmitters:
  - increases Dopamine concentrations (triggers your pleasure centers)
  - decreases Serotonin activity (causes mood swings, impulsive emotions)
  - endorphines are released by the brain when exposed to alcohol

#### Higher Levels of Alcohol:

- Alcohol diminishes the resting potential of nerve & muscle fibers
- Probably due to increase in membrane permeability to Na ions
- Neurotransmitter:
  - increased GABA (gamma-amino-butyric-acid) one of the most common inhibitors in the brain (leads decreased sensory & motory activity)
  - decreased glutamate receptor functions ( glutamate = major excitatory neurotransmitters) (causes cognitive impairment, inability to learn new information)

#### Even Higher Levels:

- decrease of the resting potential to a level which depresses the excitability
- progressively diminishes the action potential until blockage

How does Alcohol influence neurotransmitters?

- November last year, researcher discovered Alcohol-sensitive membrane channels (GIRKS, a subtype of Potassium channels – they conclude alcohol enhances or exaggerates the effect of normal neurotransmitter action)

Short summary so far: alcohol inhibits neuron activity & communication

Integrative Functions of CNS:

- First tissues to be influenced seem to be prefrontal lobes of the cerebral cortex (judgement, self-control, inhibitions)
  - Due to the depressant function of alcohol, a person may become loud, believe to be stronger or smarter)
- parietal lobe (slower reaction time)
- temporal lobe (affects speech & hearing) depresses a reflex of the middle ear muscles. A sound stimuli triggers the reflex to protect the inner ear from loud sounds
- occipital lobe (slower response to visual stimuli, tunnel vision)
- cerebellum (muscle coordination, balance)
- lower brain : vital function

Two general rules :

1. Neural centers become more and more depressed as alcohol increases.
  2. Higher centers first, if drinking continues moves down to primitive brain.
- if sufficient alcohol is taken, essential centers such as respiration & cardiac control can be depressed.
  - Deaths are rare, but can happen up to 16 hrs after the last drink was consumed.
  - Generally, person becomes unconscious and/or vomits to get rid of excess alcohol
  - 1997, almost 20,000 alcohol-induced deaths in the US

Is that all there's to it?

- Alcohol dehydrates & inflames a brain
- Alcohol decreases the level of DHA, a specialized fatty acid, which is essential to healthy cell membranes. Low levels of DHA result in loss of nervous system function
- It also blocks an enzyme called D6D, which could produce DHA from fats

- Unfortunately, D6D is part of a sequence to produce a crucial anti-inflammatory called PGE1
- In the liver, alcohol gets broken down to acetaldehyde (neurotoxin, 30x more toxic than alcohol), then into acetic acid, enters Krebs Cycle, oxidized into CO<sub>2</sub> & H<sub>2</sub>O
- During break-down the production of free-radicals increases, they can damage brain cell membranes strength & fluidity
- Some drugs can block breakdown of acetaldehyde, violently ill
- Acetaldehyde destroys vitamin B1, which is crucial to brain function & can lead to memory loss
- Vitamin B5 help in detoxification but can become depleted, may cause headache, nausea & fatigue
- Some studies started in the 1980s show that alcohol temporarily deactivates the protective capabilities, which makes brain cells more vulnerable to toxic substances

Conclusion: What does this all mean to you?

One study has shown that

- 65% sexually aggressive were drunk(no inhibitions, think they're stronger&better)
- 50% of victimized women were under the influence of alcohol
- next time.. you hear of a guy who kills a mother and a child walking down a sidewalk because he thought he HAD hit the BRAKES and not the gas – we could have told him
- next time.. you hear of a girl who has a fatal head—on collision with a semi-truck b/c she thought she was still green.. we could have told her
- next time.. you hear about a group of friends who got out to a club and three end up paralyzed b/c their drunken driver wanted to show them what a top gun he is.. we could have told'em
- next time.. you are out drinking.. are you gonna remember that the first area affected is your judgment, and that you think you CAN drive home, when you probably shouldn't?