

# ALCOHOL CONSUMPTION

*RESEARCH PRESENTATION THREE*

**GROUP 4 | Miguel Cardoso, Shara Chowdhury,  
Sabrina Musto, Harpreet Pabla, Ojan Yarkhani**

LIFESCI 4M03 | Research Seminar  
Instructor | Dr. Daniel Yang



# CASE STUDY

## *When Miguel met Ojan,*

Still devastated over his breakup with Miley Cyrus, Miguel turned to his good friend Ojan. They hadn't talked in a few years, but Miguel knew that when it came to a good time he had to call up Ojan. Upon meeting at Snooty's, Ojan recommended that Miguel **have a few drinks** and just let the **memory of Miley fade away**. And so the night began...



1

# WHAT IS ALCOHOL?

*What is it and the prevalence of its consumption*



# WHAT IS ALCOHOL?

- Beer, wine and spirits → Alcohol / ethanol / ethyl alcohol



WINE



CIDER



BEER



VODKA

- Alcohol content is affected by **how long it's fermented**

(What is alcohol, 2018)

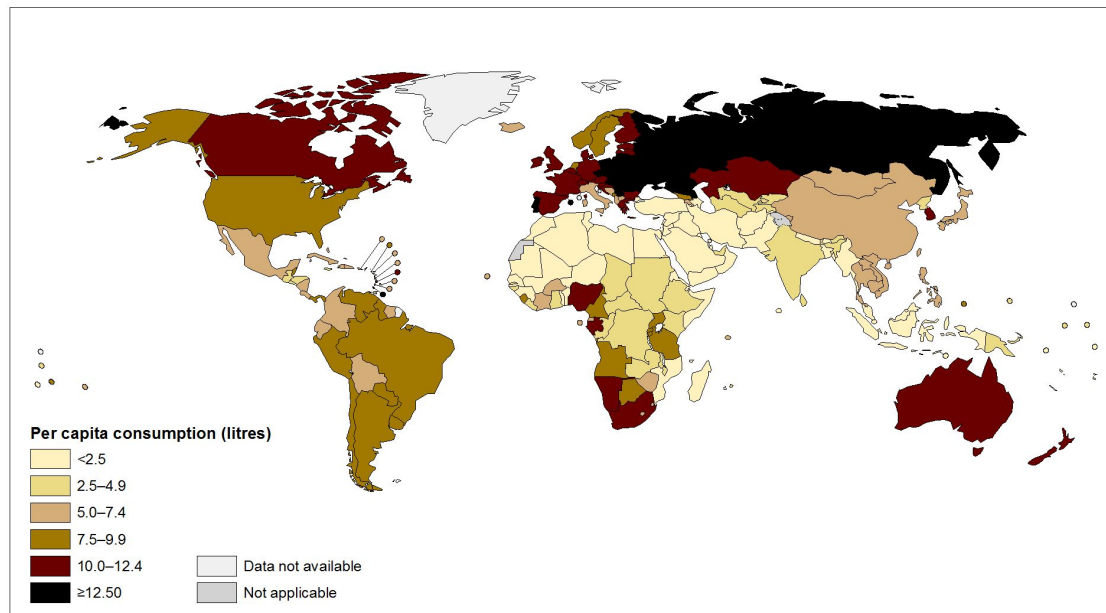
# A STANDARD DRINK



(Gould & Loria, 2017)

# PREVALENCE OF ALCOHOL

Total alcohol per capita (15+ years) consumption, in litres of pure alcohol, 2010



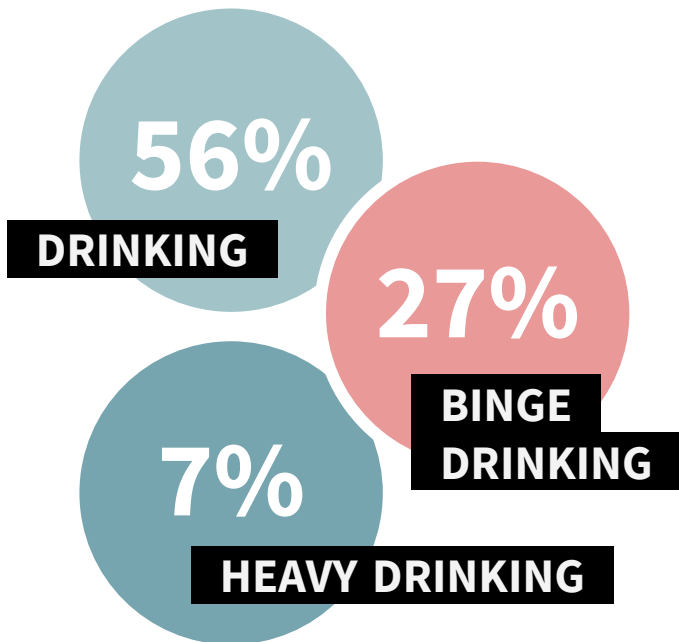
The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization  
Map Production: Health Statistics and  
Information Systems (HSI)  
World Health Organization



World Health  
Organization

© WHO 2014. All rights reserved.



(WHO, 2014) (Alcohol facts..., 2017)

# MEN & WOMEN ON ALCOHOL

2



Men



Women



1



(Boseley 2016)

2

# “DRUNK” PHASE

*Losing control of one’s faculties & behaviour*

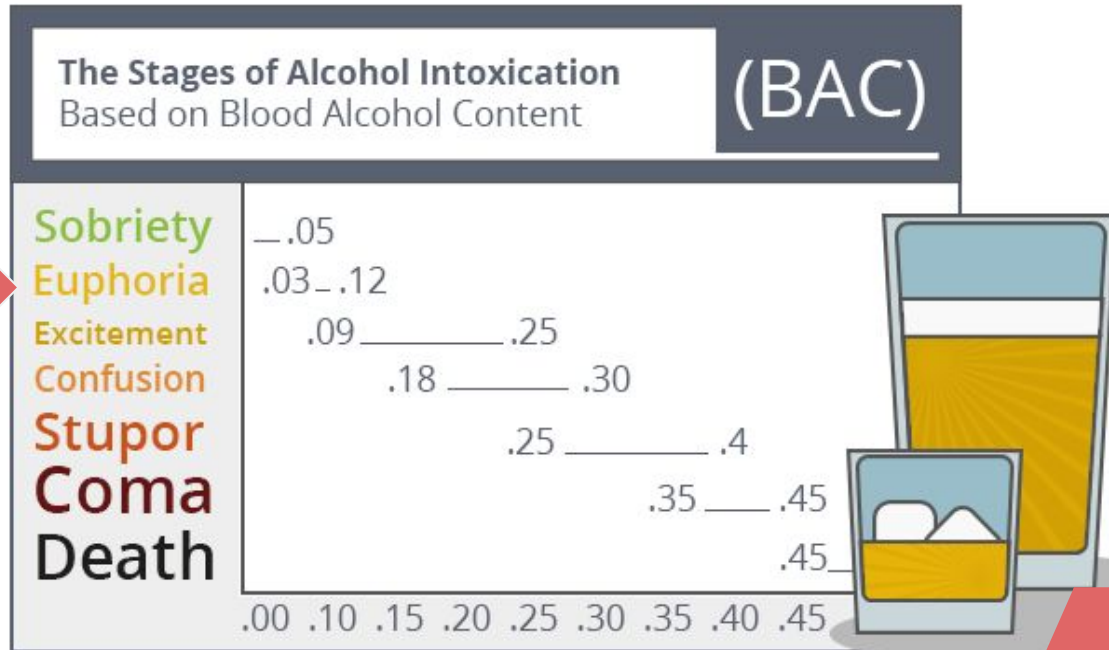




# DRUNK | DEFINED

- **Blood Alcohol Concentration (BAC)** → rep. % of your blood concentrated with alcohol

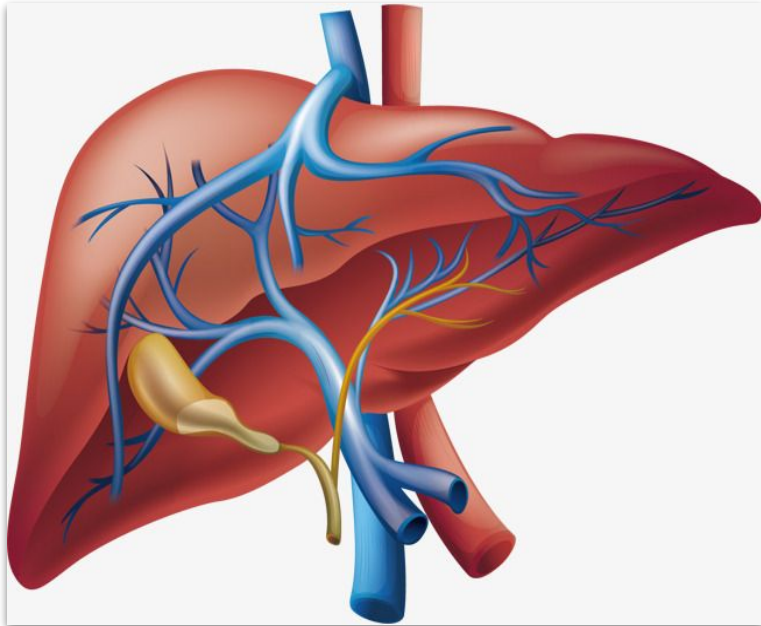
**LEGALLY  
DRUNK  
(0.08-0.12)**



(What are the..., 2018)

# DRUNK | PHYSIOLOGY

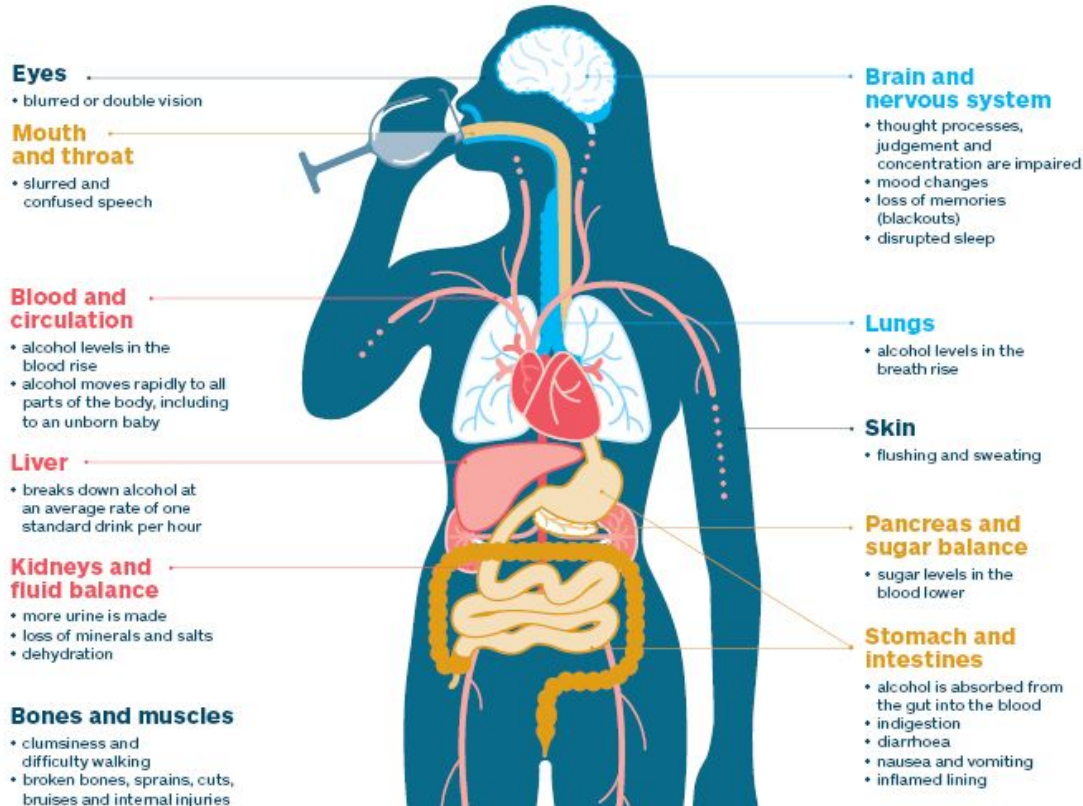
## LIVER



- Alcohol **FIRST processed here**
- **Detoxifies & removes**
- **Absorption & metabolism varies**
  - Standard drink metabolized → every **60-90 mins**
- CNS depressed when liver unable to keep up
  - unmetabolized → other organs

(Brooks et al., 2009) (What happens..., 2018)

# DRUNK | PHYSIOLOGY



## MAJOR EFFECTS

- **Eyes:** blurred vision
- **Body:** red, sweating
- **Thoughts:** impaired
- **Speech:** slurred
- **Movement:** imbalance
- **Kidneys:** dehydration
- **Volatile:** vomiting, nausea, shallow breathing

(Brooks et al., 2009) (What happens..., 2018)

# DRUNK

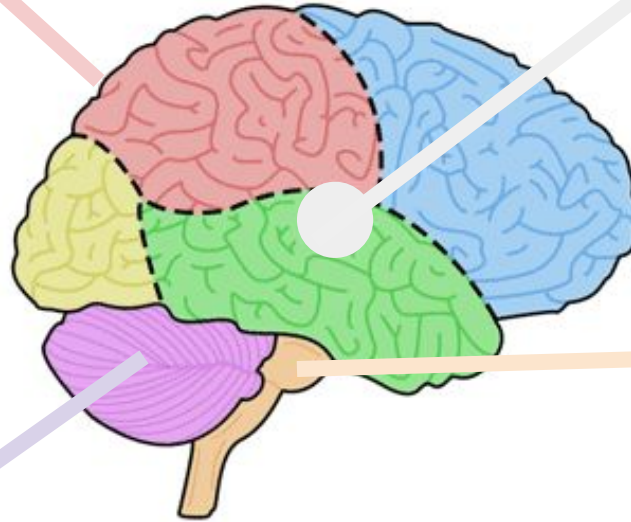
# BRAIN REGIONS

## CEREBRAL CORTEX

- Behavioral inhibitory centers depressed
- Slow processing of information
- Thought process inhibited

## CEREBELLUM

- Affects movement & overall balance



## HYPOTHALAMUS & PITUITARY GLAND

- Depress nerve centers controlling sexual arousal & performance

## MEDULLA

- Induces sleepiness
- Slow breathing
- Low body temperature

# DRUNK | NEUROCHEMISTRY

## 1 Excitatory Neurotransmitter

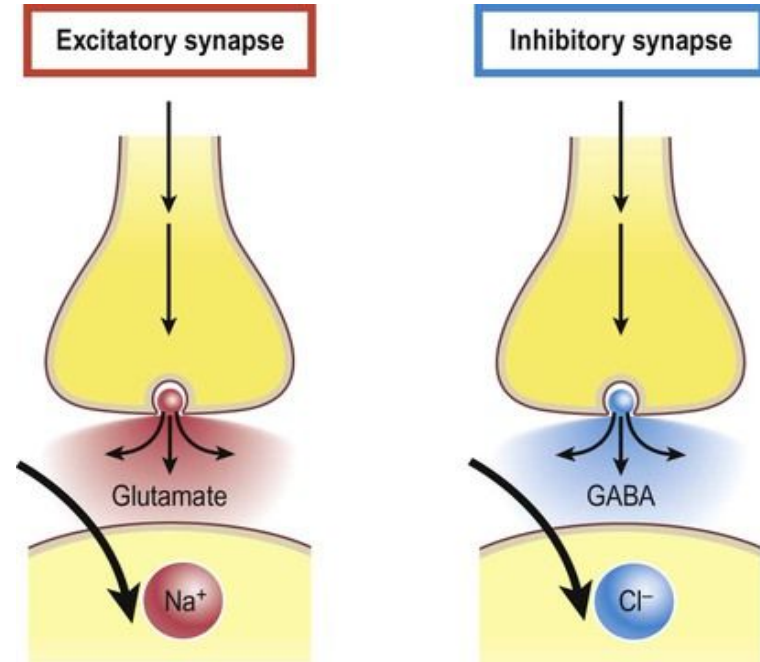
- **Ex. Glutamate**
- Function → Inc. Brain activity & energy levels
- With alcohol → Suppresses glutamate

## 2 Inhibitory Neurotransmitter

- **Ex. GABA**
- Function → Reduce energy level & calming effect
- With alcohol → Increases GABA

### ● As a Result

- Thought, speech, movements slow down
- Clumsier, more falls and stumbling

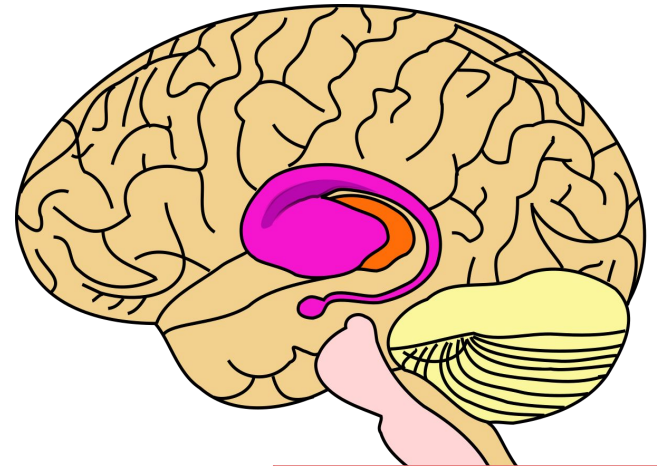


(Valenzuela, 1997)

# DRUNK | NEUROCHEMISTRY

## DOPAMINE

- Released by the reward center → **Ventral Striatum**
- Euphoric feeling
  - Feel great and better
  - “Buzzed” feeling
- Activates memory circuits
  - Remembering pleasant experiences
  - Leaving you thirsty for more



(Valenzuela, 1997)

# CASE STUDY CON'T

## *When Miguel met Ojan,*

The night was still young, ojan was nowhere to be found and Miguel could faintly remember who Miley was. Upset by the thought of her, he decided it was time to have one more drink. What Miguel didn't know was that with this last drink he had entered the **blackout phase**....



3

# “BLACKOUT” PHASE

*Severe consequence when overdrinking*





# BLACKOUT | FACTS

## What is a blackout?

- Alcohol consumption → Impacts memory

## Who black's out?

- Alcoholics & social drinkers
- Females > Males
- Individuals with lower GPA



(Blacking Out vs. Passing Out, 2018)

# BLACKOUT | TYPES OF BLACKOUT'S

## 1 Complete Blackout (En Bloc)

- Individual cannot remember anything from the night

## 2 Partial Blackout (Fragmentary)

- Memory recall can occur with cueing

# BLACKOUT | BLACKOUT TRIGGER'S

**BINGE  
DRINKING**

**GENETIC  
FACTORS**

**ALTERED  
FUNCTIONING**

(Lee, Roh, & Kim, 2009)

# BLACKOUT | PHYSIOLOGY

## Effects of Alcohol on the Brain

- Alcohol interferes with NMDA receptors in the brain
- Creation of steroids that inhibit long-term potentiation (LPT)
- NMDA receptors found in hippocampus, impacting brain's synaptic plasticity and ability to make memories



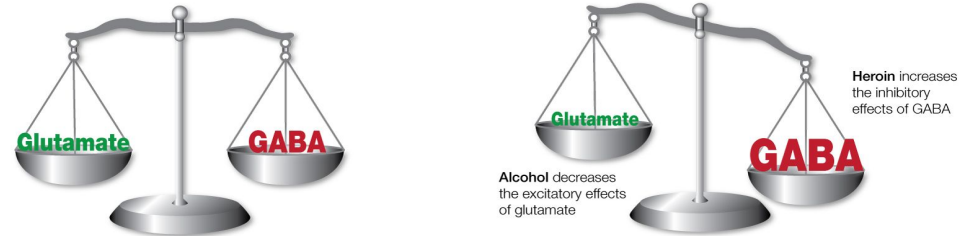
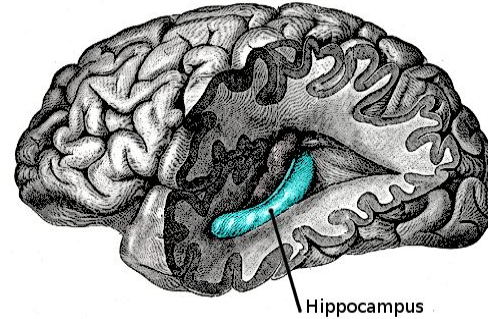
(Dryden, 2011)

# BLACKOUT | BRAIN

## Suppression of hippocampal CA1 pyramidal cells

### Main Neurotransmitters activated;

- Dopamine
- Gamma-aminobutyric acid (GABA)
- Glutamate



# BLACKOUT | THE MECHANISM

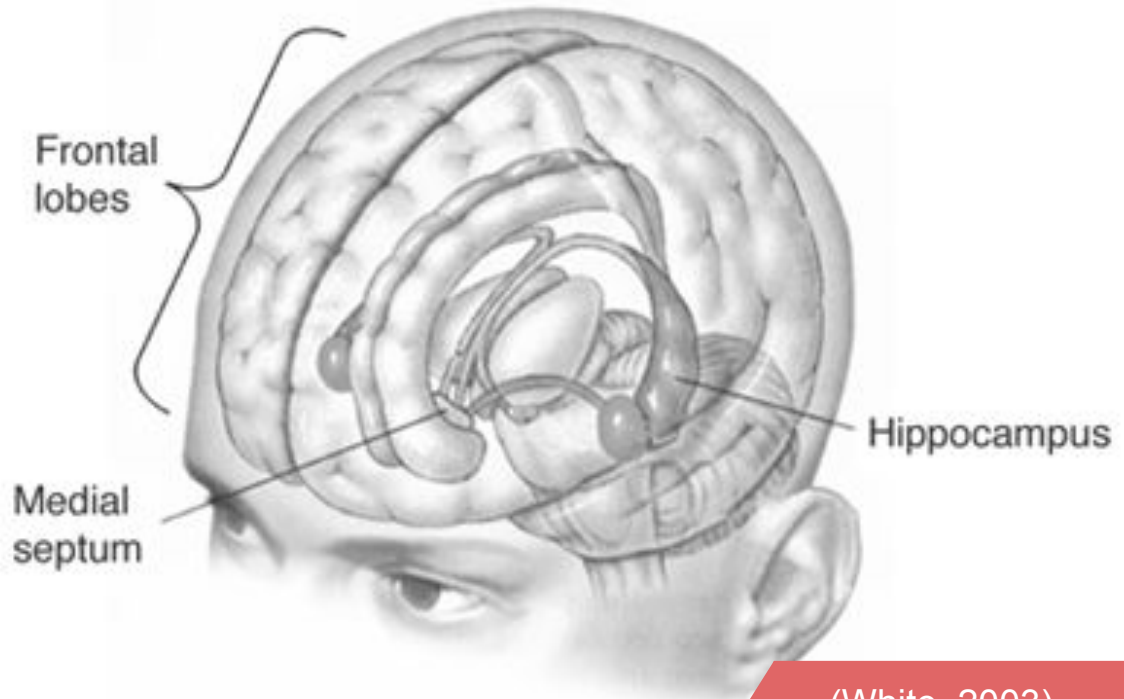


(Clapp et al., 2008)

# BLACKOUT | OTHER BRAIN REGIONS

1 Medial Septum & Theta Rhythm

2 Frontal Lobe & Thought Processing



(White, 2003)

# CASE STUDY CON'T

## *When Miguel met Ojan,*

Around 2pm the **next day**, Miguel woke up. Pouring a cup of coffee Ojan said, “Dude last night got crazy I can’t believe you did that”. Miguel however, had no idea what he had done all he knew was that his head was pounding and he was in for the **hangover** of his life.





4

# “HANGOVER” PHASE

*A result after drinking excess amounts of alcohol*



# HANGOVER | DEFINED

- **Morning after side effects:**
  - when BAC return to zero
- **Symptoms include**
  - Weakness
  - Excessive Thirst
  - Headaches/Muscle Aches
  - Vomiting, Dizziness
  - Increased Sensitivity to Light

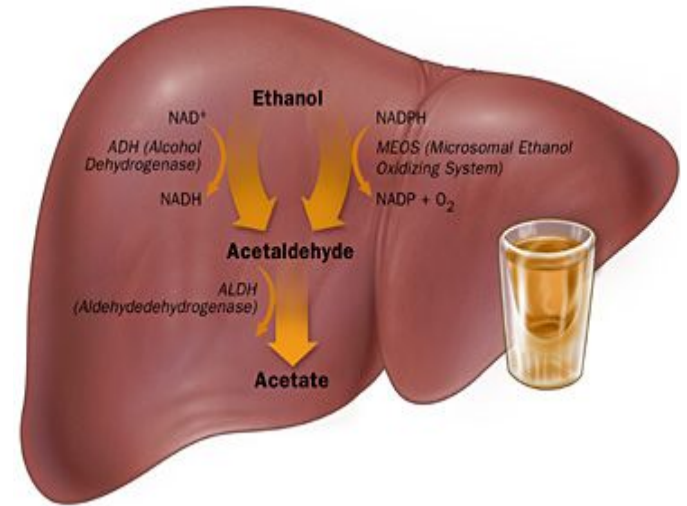
# HANGOVER | DEFINED

Factors that lead to hangover symptoms include:

- 1 Alcohol causes body to produce more urine**
  - Leads to dehydration
- 2 Alcohol causes blood sugar levels to fall**
  - Leads to weakness
- 3 Alcohol causes the expansion of blood vessels**
  - Leads to headaches

# HANGOVER | Physiology

- **Uncertain of Mechanism**
  - After effects... or direct or combination
- **The Acetaldehyde Hypothesis**
  - Product of alcohol metabolism → **Acetaldehyde**
  - Attacked by acetaldehyde dehydrogenase and glutathione → forms non-toxic **acetate**
  - **Large amounts of alcohol** → **Liver runs out of glutathione** → **buildup of acetaldehyde in body** → **leads to headaches, vomiting**



(Swift & Davidson, 1998)

# HANGOVER | Physiology

## The Direct Effects Hypothesis

- **Gastrointestinal Disturbances**
  - Stomach & intestines irritation → inflammation
  - Results → Upper abdominal pain, nausea, vomiting
- **Low blood sugar**
  - Alterations in metabolic state of liver and organs
  - Buildup of intermediate product → inhibiting glucose production
  - Results → Fatigue, weakness, mood disturbances



(Swift & Davidson, 1998)

# HANGOVER | Physiology

## The Direct Effects Hypothesis

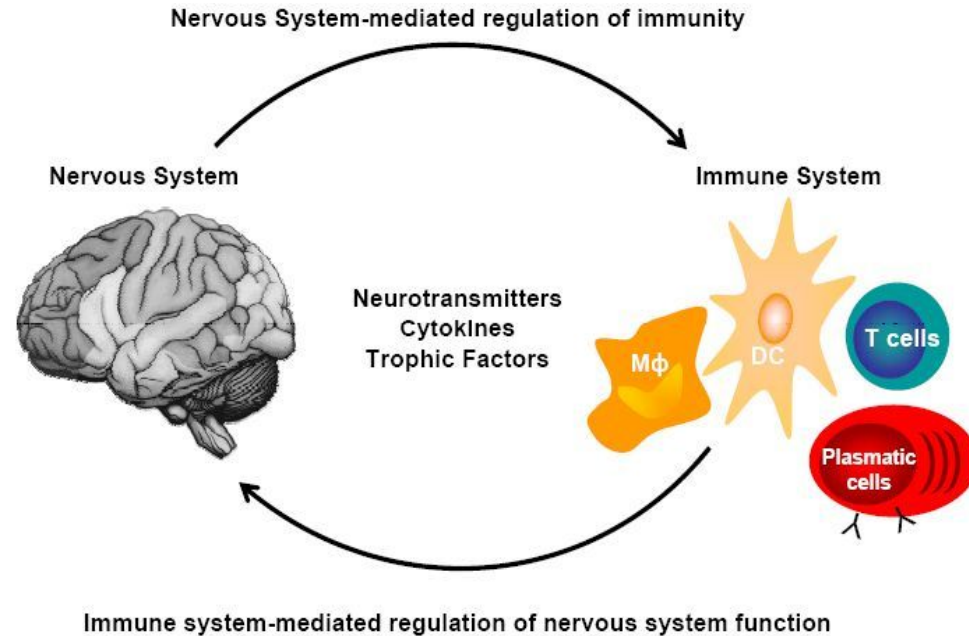
- **Disruption of Sleep & other biological rhythms**
  - Alcohol has sedative effects
  - Results → poor quality sleep, insomnia, fatigue
- **Headaches**
  - Alcohols results in vasodilation & effect on neurotransmitters



(Swift & Davidson, 1998)

# HANGOVER | Neurochemistry & Immunity

- Cytokines communicate with brain
- Peripherally released cytokines → **Nervus Vagus Pathway** → affect **CNS**
- Cytokines mimic symptoms of hangovers
  - May share similar mechanism
- **Cerebral Cytokines**
  - IL-1 $\beta$ , IL-6, and TNF- $\alpha$
  - Sickness behaviour & lack of memory similar to hangover



# HANGOVER | LACK OF RESEARCH

Changes in cytokine production in control and alcohol hangover conditions ( $N = 20$ )

Cytokine	Mean (S.D.) (pg/ml)		<i>P</i>
	Control	Hangover	
IL-1 $\beta$	269.4 (218.6)	290.9 (221.5)	N.S.
IL-4	0.3 (0.5)	0.4 (0.6)	N.S.
IL-6	724.2 (86.2)	743.5 (46.5)	N.S.
IL-10	68.2 (52.9)	98.1 (68.5)	.001
IL-12	323.7 (72.4)	770.4 (352.5)	.003
IFN- $\gamma$	505.00 (553.53)	955.71 (721.77)	.001
TNF- $\alpha$	1,174.40 (346.11)	1,212.44 (345.15)	N.S.

← Impaired Cellular immunity:  
← Cytotoxicity  
← Inc. cell-mediated immune response

IFN = Interferon; IL = interleukin; TNF = tumor necrosis factor;  
N.S. = Not significant; S.D. = standard deviation.

(Swift & Davidson, 1998)



5

# CURRENT TREATMENTS

*How to treat and prevent the outcomes*



# TREATMENTS | HANGOVER

- **Drinking beverages containing electrolytes**
  - Replenishes needed electrolytes like potassium & sodium
- **Avoid medicine with “Acetaminophen”**
  - May cause liver damage when combined with alcohol
- **Get plenty of rest**



\*\*Alcohol hangovers will end on its own within 24 hours\*\*

# TREATMENTS | ALCOHOL POISONING

- **Supportive care**
  - Careful monitoring for breathing/choking problems
  - Fluids given intravenously for dehydration
  - Glucose for more serious complications
- **Home remedies are not successful**
  - Falling asleep
  - Cold showers



(Mayo, 2018)

# TREATMENTS | ALCOHOL ADDICTION



**Detoxification**



**Behaviour  
Modification**



**Counselling**



**Medication**

(Healthline, 2018)

# PREVENTATIVE MEASURES

- Drink slowly and on a full stomach
- Drink plenty of water thus drinking less alcohol and decreasing dehydration
- Avoid taking medicine while drinking alcohol



(Mayo, 2017)

# REFERENCES

- Alcoholic Addiction: Get the Treatment You Need. (n.d.). Retrieved March 18, 2018, from <https://www.healthline.com/health/alcohol-addiction-treatment#treatment>
- Alcohol poisoning. (2018, January 19). Retrieved March 18, 2018, from <https://www.mayoclinic.org/diseases-conditions/alcohol-poisoning/diagnosis-treatment/drc-20354392>
- Clapp, P., Bhave, S. V., & Hoffman, P. L. (2008). How adaptation of the brain to alcohol leads to dependence a pharmacological perspective. *Alcohol Research & Health: The Journal of the National Institute on Alcohol Abuse and Alcoholism*, 31(4), 310–39. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/20729980>
- Hangovers. (2017, December 16). Retrieved March 18, 2018, from <https://www.mayoclinic.org/diseases-conditions/hangovers/symptoms-causes/syc-20373012>
- Hangover treatment. (n.d.). Retrieved March 18, 2018, from <https://medlineplus.gov/ency/article/002041.htm>
- Kim, D.-J., Kim, W., Yoon, S.-J., Choi, B.-M., Kim, J.-S., Go, H. J., ... Jeong, J. (2003). Effects of alcohol hangover on cytokine production in healthy subjects. *Alcohol*, 31(3), 167–170. <https://doi.org/10.1016/j.alcohol.2003.09.003>
- Kumar, S., Porcu, P., Werner, D. F., Matthews, D. B., Diaz-Granados, J. L., Helfand, R. S., & Morrow, A. L. (2009). The role of GABA(A) receptors in the acute and chronic effects of ethanol: a decade of progress. *Psychopharmacology*, 205(4), 529–64. <https://doi.org/10.1007/s00213-009-1562-z>
- Learn. Genetics. (2018). How Drugs Can Kill. Retrieved March 22, 2018, from <http://learn.genetics.utah.edu/content/addiction/drugskill/>
- Lee, H., Roh, S., & Kim, D. J. (2009). Alcohol-Induced Blackout. *International Journal of Environmental Research and Public Health*, 6(11), 2783–2792. <https://doi.org/10.3390/ijerph6112783>

# REFERENCES

- Pacheco, R., Contreras, F., & Prado, C. (2012). Cells, Molecules and Mechanisms Involved in the Neuro-Immune Interaction. In Sivakumar Gowder (Ed.), *Cells, Molecules and Mechanisms Involved in the Neuro-Immune Interaction, Cell Interaction*. InTech. <https://doi.org/10.5772/48367>
- Rose, M. E., & Grant, J. E. (2010). Alcohol-Induced Blackout: Phenomenology, Biological Basis, and Gender Differences. *Journal of Addiction Medicine, 4*(2), 61–73. <https://doi.org/10.1097/ADM.0b013e3181e1299d>
- Swift, R., & Davidson, D. (1998). Alcohol hangover. *Alcohol Health Res World, 22*, 54-60.
- Valenzuela, C. F. (1997). Alcohol and neurotransmitter interactions. *Alcohol Research and Health, 21*(2), 144.
- Verster, J. C. (2008). The Alcohol Hangover- A Puzzling Phenomenon. *Alcohol & Alcoholism, 43*(2), 124–126. <https://doi.org/10.1093/alcalc/agm163>
- White, A. (2003). What Happened? Alcohol, Memory Blackouts, and the Brain. *Alcohol Research and Health, 27*(2). Retrieved from <https://pubs.niaaa.nih.gov/publications/arh27-2/186-196.htm>
- Wikipedia. (2018). Hippocampus. <https://doi.org/10.15347/wjm/2017.003>

# ALCOHOL CONSUMPTION

*RESEARCH PRESENTATION  
THREE*

**GROUP 4 | Miguel Cardoso, Shara Chowdhury,  
Sabrina Musto, Harpreet Pabla, Ojan Yarkhani**

LIFESCI 4M03 | Research Seminar  
Instructor | Dr. Daniel Yang

