Drugs, Alcohol, the Brain and Suicide

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Different brain regions communicate to produce behavior
Riding a bicycle: vision, balance, motor activity
Speaking: hearing, speech production, motor control
Bee sting: sensory input, pain, integration of senses, alarm/fear
Brain networks

Information flows through neural networks

The networks consist of neurons transmitting information

Neurotransmitters are the chemicals neurons use to communicate

Drugs and alcohol exert their effect on the brain by mimicking neurotransmitters

This changes perception and information processing
Positron Emission Tomography (PET)

Positron emitting molecule, binds to a brain receptor
positron = anti-matter of electron

PET scans can image the **Neurotransmitter receptor**
PET and receptors

PET allows us to image the neurochemistry of drugs and alcohol

GABA - Alcohol

Endorphins – Heroin/Opioids

Endocannabinoids - Cannabis

Serotonin – Psychedelics

Acetylcholine – Nicotine/Tobacco

Dopamine – cocaine, amphetamine
Drugs and the brain: the paradox

Drugs and alcohol (substances of abuse) have a desirable effect

**Alcohol**: reduces short term anti-anxiety (especially social anxiety)

**Nicotine**: improves cognition, increases attention, reduces stress

**Marijuana**: relief for pain, anti-anxiety, sleep, mood

**Cocaine/methamphetamine**: increases attention/cognition, productivity

**Opioids**: Heroin, Oxycontin, Percocet, Diluadid, Vicodin, Morphine

potent pain killers (physical and emotional)

But there are risks:

1) Acute intoxication, accidents and overdose

2) The long term risk of addiction
Substance use and risk
Overdose, accidents, addiction

Overdose is now the #1 cause of death of adults under 50.

Accidents are the #1 cause of death in teens, 50% include alcohol or drugs (mostly cannabis)

Everyone who uses drugs or alcohol are susceptible to the risk of overdose and accidents

Not everyone who uses a drug develops an addiction
Addiction is now as prevalent as diabetes (1/12 Americans)
Alcohol and Intoxication

Alcohol is a small molecule that diffuses quickly into the brain.

It impacts many neurotransmitters with global effects: mostly slowing of brain function.

Alcohol reduces information processing in the cerebral cortex.

- Frontal cortex: reduces social inhibition, reduces judgement (increases impulsivity)
- Temporal Cortex: decreased anxiety and decreased memory
- Parietal cortex: impaired reaction time
- Cerebellum: decreases motor coordination, reaction time

PET scan of brain glucose uptake:
- Baseline
- Alcohol intoxicated
Alcohol and Intoxication

Blood Alcohol Concentration (BAC): Estimates for drink/hour

1 drink (0.02-0.03% BAC): feeling social/relaxed, decreased coordination, decreased judgement (increased impulsivity)

2-3 drinks (0.05% BAC): impulsivity/aggression increases, coordination worsens

3-4 drinks (0.08%- 0.1% BAC): memory worsens, slurred speech, impaired cognition, motor coordination significantly impaired

0.2% BAC: the brain begins to shut down, > 0.3% BAC: erratic breathing and death

6 people die a day from alcohol overdose: many are young and didn’t know the risk

Filled with beer = 1 1/3 drinks
Filled with mixed drink = 4-7 drinks

1 can = about 4 drinks
Is Marijuana safer than alcohol?

Yes: no reported lethal overdose on cannabis alone

And NO: risk of accidents is increased: driving, swimming, hiking, rooftops, biking

The effects of cannabis are long acting and can take a while to resolve.

Overdose is still quite possible with cannabis (even if not lethal, still uncomfortable): confusion, paranoia, anxiety, panic, pale skin, low blood pressure, fast pulse, heart palpitations, chest pain.
Intoxication can be sneaky

Alcohol, cannabis (and all other drugs) have additive effects.

Each dose builds on the dose before it.

Each dose impairs judgement and worsens coordination.

These factors increase the likelihood of:

- **Accident**: Impulsive decisions and impaired motor coordination
- **Overdose or Over-intoxication**: taking more doses without realizing it
Heroin and Opioids

In 2017: drug overdose deaths = 192/day
136/day due to opioids or heroin

**Fentanyl** is about 100x more potent than morphine

Some overdoses occur with experimental use

Heroin with fentanyl
Fake percocet
Fake Vicodin

fake pills, made to look like other pills

Lethal dose heroin, fentanyl, carfentanyl
Opioid/Heroin Crisis
NALOXONE SAVES LIVES

Administer to anyone unconscious or unresponsive
If they’ve overdosed on opiates, they’ll revive
If they’ve overdosed on something else, naloxone isn’t toxic
Naloxone lasts about 5-10 minutes, may need more than one dose

To my 12th grader:
If anyone is unresponsive, can’t be woken up, then:
• Put them in recovery position (on side, knee out) and nothing in the mouth
• CALL 911, be clear about where you are, and say “overdose” (alcohol?, opioids?)
• Get others help so 1st responders can find you
• CALL ME, I will be there as fast as I can (call me first if you’re unsure of what to do)
Good Samaritan laws Save Lives

About 40 states have laws providing immunity for calling 911 to stop an overdose.

New York is one of them.

<table>
<thead>
<tr>
<th>The law protects YOU from charges and prosecutions for:</th>
<th>The law DOES NOT protect you from the following:</th>
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</thead>
<tbody>
<tr>
<td>• Possessing controlled substances up to and including A2 felony offenses (anything under 8 ounces);</td>
<td>• A1 felony possession of a controlled substance (8 ounces or more);</td>
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<tr>
<td>• Possessing alcohol, where underage drinking is involved;</td>
<td>• Sale or intent to sell controlled substances;</td>
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<tr>
<td>• Possessing marijuana (any quantity);</td>
<td>• Open warrants for your arrest; and</td>
</tr>
<tr>
<td>• Possessing drug paraphernalia; and</td>
<td>• Violation of probation or parole.</td>
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<td>• Sharing drugs.</td>
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Overdose and other drugs

- Cocaine: Overdose can happen, cocaine is cardiotoxic, can cause seizures
- LSD/psilocybin: Overdose possible but rare, accidents are a significant risk
- MDMA/ecstasy/Molly: Can cause serotonin syndrome
- PCP/Angel dust: all around bad idea
- K2/spice: very high potency synthetic analog of THC, can overdose, seizures and death
Nicotine and Tobacco

PET scan: nicotinic receptor

Nicotinic receptors: highest density in the thalamus, switch or relay for data

The thalamus prioritizes information:
Switches attention and decides what is most important

Nicotine is very effective in improving cognition and stress. It helps concentration, and reduces anxiety and depression.

But causes insomnia and withdrawal (lethargy, stress, anxiety, depression): increasing the need for more nicotine.
EVALI (E-cigarette, Vaping Associated Lung Injury)

Chest CT scan

Normal  EVALI

- Currently, more than 2,000 cases reported with 48 deaths
- All patients reported e-cigarette or THC vaping products
- Majority used THC vape products, though not all (15-20% nicotine only)
- More than 150 brands implicated
- Possibly caused by vitamin E acetate (but since products don’t list ingredients, it’s hard to track down), may be other causes as well

Symptoms: cough, chest pain, shortness of breath, fever, fatigue (flu-like)
What about addiction?

Addiction is the persistent use of a substance despite adverse consequences.

These consequences can be health (smoking and lung disease), social (drinking and getting into fights), or occupational (getting high and not going to school).

Symptoms include:

- Craving for the substance
- Tolerance to the effects of the substance (needing more to get an effect)
- Failed attempts to stop using a substance
- Symptoms of withdrawal when trying to stop using
- Not meeting obligations (school or work)
- Dangerous situations (driving while drunk or high)
- Taking more than intended

The biggest risk factors in the development of addiction are:
- Age of use
- Self-medication
Brain development and addiction

Early substance use increases lifetime risk of addiction

Infancy: tremendous brain growth, neurons finding each other and forming networks

Ages 13-20: brain pruning, most used network strengthen (Habits)

Drug use during this time increases risk of future addiction BECAUSE HABITS ARE FORMING

Addiction is both preventable and treatable.
Substance use in teenagers

Regular use of any substance in teens, consider self-medication and psychiatric diagnoses:

What is “regular use?”
• Use that’s weekly, even if at parties
• Use on a weekday that interferes with school or activities
• Use when alone

Think of self-medication = the use of a substance to lessen psychiatric symptoms.
Substance use in teenagers

Diagnoses to investigate:

- **Bipolar disorder** (1-3%): Mania alternating with depression, sleep disturbances and intractable irritability. Delusions and psychosis possible.

- **Conduct disorder** (5-7%): aggression or violence towards people or animals, theft or destruction of others’ property, and setting fires.

- **Oppositional Defiant Disorder** (10%): resentful, angry and argumentative, especially towards people of authority (teachers or coaches).

- **Attention Deficit Hyperactivity Disorder** (ADHD, 10%): inattention, disorganization, impulsivity, and difficulty concentrating. Social functioning and friendships can be hard to maintain.

- **Depression and/or anxiety disorders** (10-20%): feeling down, hopeless, a loss of interest in activities or friends, sleep problems difficulty concentrating, and the loss of energy.

- **Learning Disability:** (10%) Dylexia most common but there are others.
Self-Medication

Kids with ADHD have an increased risk:
- Nicotine, Cannabis and Alcohol Use as teens, especially problematic use
- Addiction (nicotine, cannabis, alcohol, other illicit drugs) as adults

Treatment for ADHD reduces the risk

Similar data applies to depression and anxiety disorders:
- Depression is associated with nicotine use.
- Depression in teens associated with an increase in alcohol use (including hazardous use) and alcoholism as a young adult.
- Depressed or anxious teens are more than twice as likely as their peers to abuse or develop problematic marijuana use.
ADHD: associated with increased substance use and addiction.

Treatment of ADHD significantly reduces this risk.

Similar data applies to anxiety/depression
40% HS student report that drug or alcohol use to reduce anxiety
Suicide

**Suicide is often impulsive:**
The majority acted on the urge to end their lives within minutes of making the decision.

**Suicide is often tied to the moment:**
Suicide is the reaction to circumstances. Suicidal thoughts are common. But these are temporary, they change as the situation changes.

However, there are still warning signs to watch out for

**Things that factor into the storm:**
Sadness, worry, feeling alienated and alone
Stress, argument, rejection from family and friends
Impulsivity, aggression, embarrassment, fear

**Substance use**
**Social isolation**
**Stressful event, rejection**
**Loss of hope for the future**
Unravelling the storm
How can we improve prevention?

Talking about suicide with family or friends doesn’t increase risk.

Have a conversation at any time: even when things are calm.

Set up an emergency plan: a text or a code word.

Family is important but so are friends.

NETWORKS: A text, a phone call helps, even if the person hasn’t expressed distress.

KEEP IN TOUCH: text your friends if you haven’t heard from them.

If a friend is missing from school or meeting up, contact them. If no answer, have a network to check in set up.

**CRISIS TEXT LINE 741741 (ANY CRISIS)**
or call 1-800-273 TALK (suicide hotline)
or 1-800-NYC-WELL (CRISIS HOTLINE)
If anyone is intoxicated:
• Don’t leave them alone
• Watch our for potential accidents
• Don’t let them drive, swim, ride a bike

If anyone is sick or unresponsive:
• But them in the recovery position
• Nothing in the mouth
• CALL 911 and say overdose, make sure they can find you
• Call a parent, call an adult

CRISIS TEXT LINE 741741 (FOR ANY CRISIS) – text “home” or “talk”
1-800-273-TALK (suicide hotline)
1-800-NYC-WELL (CRISIS HOTLINE)

Family emergency plan: FIRST WE SAVE LIVES
In case of intoxication or any emergency: transportation home (Uber, Lyft, Arrow)

Questions? dmm437@gmail.com