Understanding Addiction
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Understanding Addiction

• Why addicted patients baffle and overwhelm us
• Limbic (Reward) System of the Brain
• Rats & Levers & People
• Hedonic Tone
• Ways to define addiction
• Treatment & Outcomes

Acknowledgements

Ed Salsitz, MD
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National Institute on Drug Abuse (NIDA)
Addiction in our practice

- Pulmonary---Tobacco Addiction
- GI---EtOH (Top→Bottom), HCV, HBV
- Endo/Diabetes---Food→Obesity→DM2
- Infectious Disease---IDU→HCV, HIV, infection
- ER---Intoxication, OD, MVA & trauma
- Psychiatry---Vulnerability/Co-morbidity
- Pediatrics---Abuse, Adolescents
- Geriatrics---Alcohol Mimics other diseases

Why do people use drugs?

- Alter moods
- Escape negative feelings
- Promote & enhance social interactions
- Enhance pleasure & Sensation
- Enhance religious practice
- Explore the “self”

Within the Limbic System

- The basic reward circuitry of the brain is a 3-neuron in-series synaptic circuit
  - Descending Link ABN → VTA, via Medial Forebrain Bundle
  - Ascending Link VTA → NAcc, via Medial Forebrain Bundle
  - Further Ascending Link NAcc → VP
The crucial reward neurotransmitter is dopamine (DA)
How we know this

Highly Aversive Consequences

START  LEVER
Progressive Ratio Breakpoint

- Progressively increases workload on the animal to get the next hit (1, 2, 4, 8... lever presses required for injection)
- At some point, animal stops abruptly
- Rank-order drugs by breakpoint = human reports of addictivity

Progressive Ratio Breakpoint

diazepam 10:1 (Easy!)
Morphine 200:1
Heroin 500:1
IV Cocaine >10,000 Presses: 1 dose

The common crucial reward neurotransmitter is dopamine (DA)
LIMBIC SYSTEM:
Reward Center of the Brain

Slide courtesy of Ed Salsitz, MD

HEDONIC TONE
• Sense of wellbeing, happiness, pleasure, contentment
• Set by/in the mesolimbic dopaminergic circuitry
• Range: Euphoria ↔ Dysphoria
• Altered by Psychoactive Substances
• A Delicate Balance
• Life=weathering Low Hedonic Tone
• People vulnerable to addiction have low/abnormal tone

What is Addiction? (a helpful description)
• An activity which initially provides pleasure, and is relatively harmless.
• In those who are vulnerable the use increases, the pleasure/hedonic tone decreases, and the harm increases.
What is Addiction? (neuro-biology)

- An activity which initially stimulates the limbic system, which results in changes of neurotransmitter levels, which are perceived as euphoria or pleasure.
- In the vulnerable, as the stimulation to the limbic and other parts of the brain continue, perturbations in brain function result in dysphoria, withdrawal, and impairments.

Hedonic Tone

Opioid Dependence (DSM-IV) (3 or more within one year)

- Tolerance
- Withdrawal
- Larger amounts/longer period than intended
- Inability to/persistent desire to cut down or control
- Increased amount of time spent in activities necessary to obtain substance
- Social, occupational and recreational activities given up or reduced
- Continued use despite adverse consequences

WHAT IS ADDICTION?

Physical Dependence

Does Not Necessarily Equal

Addiction

Does Not Necessarily Equal

Addiction
What is Addiction?
(Primary Care perspective)

• A chronic, treatable, recurring disorder
• DM, HTN, asthma

Type I DM

• Compliance with:
  - Medication <50%
  - Diet and Foot Care <30%
• Re-treated within 12 months (ER or Hospital) 60-80%

Hypertension

• Compliance with:
  - Medication <30%
  - Diet <30%
• Re-treated within 12 months (ER or Hospital) 50-60%
Asthma

- Compliance with:
  - Medication <30%
- Re-treated within 12 months (ER or Hospital) 60-80%

McLellan et al. (2000)

Alcohol and Drug Dependence

- Abstinence one year after treatment:
  - 40-60% completely abstinent
  - 15-30% not completely abstinent but have not resumed dependency or problematic use

McLellan et al. (2000)

Compliance/Relapse Rates

![Graph showing compliance/relapse rates for different conditions]

- Type I DM
- HTN
- Asthma
- Addiction
Addiction vulnerability

- Genetic
- Environmental
  - Culture & Family
  - Destitution
  - Trauma
  - Substance Availability

Addiction History as taught

- Which drugs are you using
- How much, when last
- Age of onset for each drug
- Route of administration for each drug
- Previous treatment history
- Medical/Psych problems
- Other consequences
- Almost nothing about prior to addiction hx
- As though addiction fell from the sky.

Addiction hx is the search for, and the understanding of the unique life circumstances affecting the patient’s *hedonic tone.*
IS X POTENTIALLY ADDICTIVE?

• Must Activate the Limbic Circuit
• Tetracycline?
• Water
• Food
• Sex
• Exercise
• Alcohol

Feelings

• Water
• Food
• Sex
• Exercise
• Alcohol

Addiction Medicine Office Supplies

LIMBIC SYSTEM

Feelings
Tobacco Abuse: 1ppd x 20 years

10 Puffs/ Cigarette
200 Puffs/ Day
1,400 Puffs/ Week
6,066 Puffs/ Month
72,800 Puffs/ Year
1,456,000 Puffs/ 20 years

What is Addiction?
(descriptive)

• Attempts to abstain from the activity are thwarted by cravings and “prolonged” withdrawal syndromes.
• Relapse is common, and often related to drug cues, stress, or drug exposure.
• Treatment is directed at improving mood state, functional status, and reversing or ameliorating harm that has occurred. This is done by stabilizing, improving and hopefully reversing the neurobiological perturbations secondary to the addictive agent, and the underlying vulnerability.
Project MATCH

1726 patients: 10 sites
2 arms: inpatient & outpatient rehab
3 therapies: CB, TSF, MET
12 wks therapy
1 yr follow-up

Project MATCH Findings

60-80% reduction in:
- Percent days abstinent
- Drinks/drinking day
TSF = 40% abstinent in 90 days prior to 15 mo FU
CBT & MET = 36-38% abstinent
Difference significant but not large
No interactions with psychiatric severity, ASPD, many others

Project MATCH Conclusions

Psychosocial treatments (counseling and psychotherapy) help
Differences between therapies not large, when found
Therapist effects can be significant
Medications for Opioid Dependence

- Methadone
- Naltrexone (ReVia, Vivitrol)
- Buprenorphine (Suboxone/Subutex)

Diagrammatic summary of functional state of typical "mainline" heroin user. Arrows show the repetitive injection of heroin in uncertain dose, usually 10 to 30 mg but sometimes much more. Note that addict is hardly ever in a state of normal function ("straight").

Archives of General Psychiatry, 15, p. 301.

Stabilization of patient in state of normal function by blockade treatment. A single daily oral dose of methadone prevents the preexisting symptoms of withdrawal ("sick") for 24 hours ("straight"). Dotted line indicates course if methadone is omitted.

Medications for Opioid Dependence

- Methadone (do not Rx for addiction!)
- Naltrexone (ReVia, Vivitrol)
- Clonidine (patch)
- Buprenorphine (Suboxone/Subutex)

Buprenorphine

- High-affinity partial-\textit{Mu}-agonist
  - Binds tightly to receptor, blocking opiates
  - Displaces other opiates, can precipitate withdrawal
- Low abuse potential (Suboxone® has naloxone deterrent)
- Few side effects but tricky to start
- Can Rx in the office (DEA “X” Required if not treating off-label for pain)

Medication for Alcohol Dependence

- Disulfiram (Antabuse)
- Naltrexone (Revia, Vivitrol)
- Acamprosate (Campral)
- Topiramate (Topamax)-Not FDA approved
- antidepressants - only for co-occurring depression, do NOT decrease drinking

House staff Question

Have You Ever Had A Hangover From Drinking Too Much Alcohol?
What Did You Say To Yourself When You Were Hanging On To The Toilet Bowl?
“I’ll Never Do That Again”
What Did You Do At The Next Party?
Isn’t That What Addicted People Do?

Attending Question

• Do You Want To Lose Weight?
• What Did You Say To Yourself The Last Time You Ate Too Much?
  “I’m Going On A Diet, and Will Exercise”
• How Is The Diet Going?
• How Much Weight Have You Lost?
• “That’s Why God Invented Statins”

Understanding yourself

…it’s all about Hedonic Tone
Realistic Goals
What You Can **NOT Accomplish**

- “Cure” the Addiction Problem
- Eliminate craving for the addictive agent
- Prevent relapse without ongoing treatment

Realistic Goals
What CAN be Accomplished

- Addiction is a chronic, relapsing, progressive brain disease, which can be treated, and put into remission
- Listening to the “Story”—help both understand
- Brief Interventions (5-10 minutes) decrease smoking and problem drinking by 10-20% of patients
- Refer for addiction evaluation & treatment—“detox” is not treatment
- These are challenging Cases

For More Information

- [www.samhsa.gov](http://www.samhsa.gov)
- [www.drugabuse.gov](http://www.drugabuse.gov)
- [www.niaaa.nih.gov](http://www.niaaa.nih.gov)
- [www.nida.nih.gov](http://www.nida.nih.gov)

National Clearinghouse on Alcohol and Drug Information (NCADI):
1-800-729-6686

Many slides courtesy of NIDA, Ed Salaz MD, and Eliot Gardner PhD