The Big Brain Theory
Basics of Treating Addiction and Mental Illness
A Chronic Health and Wellness Model

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How does the brain become addicted?

Drugs and alcohol work!

Drug use of any type activates the same circuits as do behaviors linked to survival and pleasure
- eating
- bonding
- sex

The drug causes a surge in levels of a brain chemical called dopamine, which result in increased feelings of pleasure. The brain remembers this pleasure and wants it repeated.
Why do people take drugs in the first place?

Drugs and alcohol work!

To feel good
To have novel:
- feelings
- sensations
- experiences

To feel better
To lessen:
- anxiety
- worries
- fear
- depression
- hopelessness

AND
Continued drug abuse – a voluntary behavior?

This begins as a choice – Brain imaging studies from drug-addicted individuals show physical changes in areas of the brain that are critical to:

- judgment
- decision making
- learning and memory
- behavior control

Scientists believe that these changes alter the way the brain works and may help explain the compulsive and destructive behaviors of addiction.
What is addiction?

Addiction is a brain disease
Characterized by:
- compulsive behavior
- continued abuse of drugs despite negative consequences
- persistent changes in the brain’s structure and function
Addiction is like other diseases...

- It is preventable
- It is treatable
- It changes biology
- If untreated, it can last a lifetime

**Decreased Brain Metabolism**
- Healthy Brain
- Diseased Brain
  - Cocaine User

**Decreased Heart Metabolism**
- Healthy Heart
- Diseased Heart
Stimulants boost the normal brain levels of the neurotransmitter dopamine, which produces feelings of pleasure and increases energy. Methamphetamines causes an excessive spike in dopamine. Scientists say the excessive release contributes to the drug’s destruction of the brain.

**Dopamine Index**

- Cheeseburger 1.5
- Sex 2.0
- Nicotine 2.0
- Cocaine 4.1
- Methamphetamine 11.0
Dopamine D2 receptors are lower in addiction

Repeated drug exposure changes brain function. Positron emission tomography (PET) images are illustrated showing similar brain changes in dopamine receptors resulting from addiction to different substances - cocaine, methamphetamine, alcohol, or heroin. The striatum (which contains the reward and motor circuitry) shows up as bright red and yellow in the controls (in the left column), indicating numerous dopamine D2 receptors. Conversely, the brains of addicted individuals (in the right column) show a less intense signal, indicating lower levels of dopamine D2 receptors.
Loss of dopamine neurons after heavy methamphetamine use

Methamphetamine user recovery

Depleted dopamine transporter levels in methamphetamine abusers show recovery after prolonged abstinence.

In these brain scans, high dopamine transporter levels appear as red, while low levels appear as yellow/green.

Dr. Nora Volkow, Director of NIDA
National Institute on Drug Abuse
The cycle of addiction

- Emotional Trigger
- Craving
- Ritual
- Using
- Guilt

Cycle of Addiction
Where drugs work
Biochemical

Biologically alcohol & other drugs interfere with alter neurotransmitters that allow neurons to communicate with each other, tell our body what to do, how to react, what to experience, etc. These things all happen in the “primitive” brain. (survival section)

The four major neurons addressed in addiction abuse are:

1. **Dopamine** - governs reward, stimulation (cocaine, methamphetamines)
2. **Serotonin** - governs mood, sleep, appetite, perceptions etc. (THC, hallucinogens)
3. **Gaba** – governs sedative, anti-anxiety (benzodiazepines)
4. **Endorphins** - governs pain (opiates/opioids)

When most addictive drugs enter they brain they give corresponding messages (more of this less of that)
Important point!

Addiction is not a disease of willpower; it's a disease of instinct. It lives in the part of the brain that tells you to breathe.

Dependence is not a “loss of will power” for two reasons:
1. The main problem with dependence lies in the subconscious
2. Problems with the frontal cortex produce a pathological impairment of decision making.

Thus, dependence is not primarily under conscious control!
Neurotransmitter depletion
Your brain after drugs
Drugs have long-term consequences
Why do some people get addicted to drugs while others do not?
Genetics is a big contributor to the risk of addiction. The nature of this contribution is extremely complex.
No single factor determines whether a person will become addicted to drugs

- Genetic factors account for 40-60% of a person’s vulnerability to addiction including the effects of environment on these factors.
- Parents or older family members who abuse alcohol or drugs, or who engage in criminal behavior, can increase children’s risks of developing their own drug problems.
- The earlier a person begins to use drugs the more likely they are to progress to more serious abuse.
- Method of administration. Smoking a drug or injecting it into a vein increases its addictive potential.
- Some people will never develop diabetes because they never go over a certain weight – much like some people will never become drug dependent because they never try drugs. If they did, they would in both cases.
Risk factors

Factors Leading to Addiction

Biology / Gens
- Genetics
- Gender
- Mental disorders
- Route of administration
- Effect of drug itself

Drugs
- Early use
- Availability
- Cost
- Chaotic home and abuse
- Parent’s use and attitudes
- Peer influences
- Community attitudes
- Poor school achievement

Brain Mechanisms

Addiction
Addiction is a developmental disease: It starts early

First Marijuana Use by % of Initiates

- Child <12: 1.5%
- Teen 12-17: 67%
- Young Adult 18-25: 26%
- Adult >25: 5.5%
Gene cluster associated with nicotine dependence

**Immediate Communication**

α-5/α-3 nicotinic receptor subunit alleles increase risk for heavy smoking

W Berrettini, X Yuan, F Tozzè, K Song, C Francks, H Chilcoat, D Waterworth, P Muglia, and V Mroser

**Article in Press**

The CHRNA5/A3/B4 Gene Cluster Variability as an Important Determinant of Early Alcohol and Tobacco Initiation in Young Adults

Isabel R. Schlaepfer, Nicole R. Hoft, Allan C. Collins, Robin P. Corley, John K. Hewitt, Christian J. Hopper, Jeffrey M. Lessem, Matthew B. McQueen, Soo Hyun Rhee, and Marissa A. Ehringer

A variant associated with nicotine dependence, lung cancer and peripheral arterial disease

Does drug abuse cause mental disorders, or vice versa?

• Drug abuse and mental disorders often co-exist. In some cases, mental diseases may precede addiction; in other cases, drug abuse may trigger or exacerbate mental disorders, particularly in individuals with specific vulnerabilities.

• 50-75% of all clients have some psychiatric disorder
Comorbidity

Drug Users have a Higher Risk of Developing Mental Disorders

- Psychosis
- Depression
- Anxiety
- Panic attacks
High prevalence of drug use among individuals with mood & anxiety disorder
High prevalence of mental disorders among individuals with drug use disorder
Why do mental illnesses and substance abuse co-occur?

Self-medication
• substance abuse begins as a means to alleviate symptoms of mental illness

Causal effects
• Substance abuse may increase vulnerability to mental illness

Common or correlated causes
• the risk factors that give rise to mental illness and substance abuse may be related or overlap
What environmental factors contribute to addiction?

- Stress
- Trauma - Early physical or sexual abuse
- Trauma - Witnessing violence
- Peers who use drugs
- Drug availability
Effect of prolonged use - Tolerance

- Take higher doses
- Dose more frequently
- Change their method of drug intake
- “Run” - forego food and sleep while binging
- No tolerance for effects on judgment, impulsivity, aggression, and susceptibility to paranoia, delusions, and hallucinations – opposite reaction
Relaxative addictive properties of substances

Note. Ratings based on scales of 1-6, where 1 = "Least" and 6 = "Most." Data adapted from rankings by Dr. J. E. Henningfield of the National Institute on Drug Abuse, and Dr. N. L. Benowitz of the University of California at San Francisco. Graph by Gordon E. Kenney, Ph.D.
Behavior changes
psychotic changes on methamphetamine

- Paranoia
- Visual and auditory hallucinations
- Mood disturbances
- Delusions (ex – the sensation of insect creeping on skin).
- Homicidal and suicidal thoughts
- Out of control rages
- Can persist for years after discontinued use.
Effects of methamphetamine use - withdrawal

Physical
- Polyphagia (excessive hunger)
- Hypersomnolence (sleepiness)

Psychological
- Depression
- Anxiety/agitation “Free floating” anxiety
- Delusional state lasting up to a week
- Fatigue/malaise
- Paranoia - hallucinations
- Aggression
- Intense craving for the drug
- Skin lesions - pimples
Abstinence Syndrome

After awakening from bingeing, psychological and behavioral symptoms include:

- Dysphoric mood—that may deepen into clinical depression and suicidal ideation
- Persistent and intense drug craving
- Anxiety and irritability
- Impaired memory
- Anhedonia—loss of interest in pleasurable activities
- Interpersonal withdrawal
- Intense and vivid drug-related dreams
Why can’t addicts just quit?

Because addiction changes brain circuits… this is why treatment is essential.
Treating a biobehavioral disorder must go beyond just fixing the chemistry.

We need to treat the whole person.

Pharmacological Treatments (Medications)

Behavioral Therapies

Medical Services

Social Services

In Social Context
Today’s options

(It’s all about options…)

• Traditional: 12 step programs (abstinence)
• Talk: inpatient/outpatient/aftercare
• Misunderstood: harm reduction, MM
• New: brief motivational counseling, CBT, MET, SO-involved therapy, vouchers
• Medical tx: new medications to enhance abstinence - anticraving meds, methadone, vaccines, drugs to alleviate withdrawal

MM - moderation management
CBT - cognitive behavioral therapy
MET - motivational enhancement therapy
SO - significant other
Treatment can work

NIDA’s Principles of Treatment:

• No single treatment is appropriate for all individuals.
• Treatment needs to be readily available.
• Treatment must attend to multiple needs of the individual, not just drug use.
• Multiple courses of treatment may be required for success.
• Remaining in treatment for an adequate period of time is critical for treatment effectiveness.
Many stimulant dependent individuals demonstrate:

1. Low impulse control
2. Low tolerance for frustration
3. High likelihood of Psychiatric complications (paranoia, delusions, agitated depression)
4. High risk for explosive, violent behavior
5. High risk of depression and high risk of suicide
6. Very strong craving
7. Cognitive and memory impairment
8. Brief attention span
What does work?

Treat them with respect:

• Listen to their concerns and reasons for continued or relapse.
• Meet our people where they are emotionally and intellectually, not where we are.
• Use drug testing
• People must be held accountable and have to face consequences for their actions.
• If we take away their only solution to life’s problems we need to follow that up with some other means of coping.
What else works?

Trust is a very big issue with addicts

- Be honest and upfront with them from the beginning.
- If you say that you are going to do something, do it.

Use team meetings

- They are a helpful way to help address what needs to be looked at first.
- Treatment center staff need your help to learn about the client and help to hold the client accountable.
Evidence-based treatment

12-Steps

Family Systems

Contingency Management

Evidence Based Treatment

Stages of Change

Pharmacology

Cognitive Behavioral Therapy

Motivational Interviewing
Relapse rates are similar for drug addiction and other chronic illnesses.
Chronic medical diseases’ similarity to alcohol/drug dependence

Similarities to other chronic diseases:

- Less than 50% take medications as prescribed
- Less than 30% of patients comply with prescribed behavioral change
- Relapse rates of 40% - 60% per year
- Re-emergence of symptoms following discontinuation of treatment

But, drug addiction is a chronic illness with relapse rates similar to those of hypertension, diabetes, and asthma.
Relapse

• 60% of people who successfully complete treatment will relapse within the first year after leaving a facility.
• The leading cause for relapse is failure to follow the prescribed continuing care plan set up at discharge.

The Memory of Drugs

Front of Brain

Amygdala not lit up

Back of Brain

Nature Video

Cocaine Video

Full recovery is a challenge, but it is possible!
Extended abstinence is predictive of sustained recovery

After 5 years – if you are sober, you probably will stay that way.

It takes a year of abstinence before less than half relapse
Relapse: Lessons to learn

- Can be the “shock” to one’s system that demonstrates the recovering person’s continued vulnerability
- Could show them that recovery is a life-long process
- Relapse is a progressive psychological and behavioral change
- Can start hours, days, weeks or months before a person uses mood-altering chemicals

When the world says give up. Hope whispers... Try it one more time.
Back to basics questions

- Are they willing to resume or stay in formal treatment services longer?
- Is the person/family cooperating with team meetings and complying with service plan?
- Revisit the treatment plan.

i’m not telling you it is going to be easy, i’m telling you it’s going to be worth it.
Resources

TIP series from SAMHSA Substance Abuse and Mental Health Services Administration under Publications at
www.samhsa.gov/index.aspx

NCSACW National Center on Substance Abuse and Child Welfare
www.ncsacw.samhsa.gov

Children of Alcoholics Foundation
www.coaf.org
Resources

HBO Addiction Project
Documents
Information, Press Release and FAQ

Drug Abuse and Risky Behaviors: The Evolving Dynamics of HIV/AIDS. View the Webcast from May 6-9.


News & Events
- NIDA Announces Recommendations To Treat Drug Abusers, Save Money, and Reduce Crime
- Electronic Submission of Grant Applications (NIH)

Students & Young Adults
Education resources & materials on drugs of abuse, marijuana, ecstasy, smoking, steroids, (more)

Parents & Teachers
Drug information & facts, education materials, curriculum guides, classroom tools, (more)

Medical & Health Professionals
Resources for Your Practice, Resources for Your Patients, Centers of Excellence (more)

Researchers
Grants & funding, Research Dissemination, Ethics & Policies, Data Sets, (more)

Clinical Trials Information
Looking for information on clinical trials? (more)

En Español
Recursos y materiales educativos sobre las drogas de abuso, consumo, salud, etc. (more)

Drugs of Abuse
- Alcohol
- Club Drugs
- Cocaine
- Heroin
- Inhalants
- LSD (acid)
- Marijuana
- MDMA (Ecstasy)
- Methamphetamine
- PCE/Phencyclidine
- Prescription Medications
- Smoking/Nicotine
The Films

Resources collected from:

http://www.health.org/govpubs/PHD861
Kci.org (Formerly Koch Crime Institute)
Lifeormeth.org
Methabuse.net
Dr. Rizwan Shaw, Medical Director Regional Child Protection Center
Dr. Resmiye Oral, U of I Child Protection Program & Child Health Specialty Clinic
Judy Murphy - Meth Specialist Cedar Rapids Area Iowa DHS
Dr. Joyce Gilbert - Medical Effects of Meth on Children - Idaho DEC Conference 2004
Brian Reed - Decontamination of Meth Contaminated Residences - Idaho DEC Conference 2004
Dr. John Martyny, Ph.D., CIH National Jewish Medical and Research Center Chemical Exposures Associated with Clandestine Meth Labs - Idaho DEC Conference 2004
Dr. Kathryn Wells & Dr. Wendy Wright - Medical Summit - Idaho DEC Conference 2004
Captain Clark Rollins - Idaho State Police Investigations Michelle Britton Regional Director Department of Health and Welfare DEC Successes - Idaho DEC Conference 2004
Dr. Kiti Freier - Associate Professor Psychology & Pediatrics Loma Linda University, Associate Director, Center for Prevention Research Andrews University Psychological and Social Needs of the Drug Endangered Child - Iowa DEC Conference 2005
CC Nuckols PhD - Methamphetamine Addiction: “Speed” Still Kills Counselor Magazine January 03
Iowa Division of Narcotics Enforcement
Matrix Institute www.matrixinstitute.org
Iowa Drug Endangered Children Program www.iadec.org
Iowa DHS
North Carolina Division of Social Services
For more information

NIDA Public Information:
www.nida.nih.gov
www.drugabuse.gov

NIDA International Program:
www.international.drugabuse.gov