THE SCIENCE OF RECOVERY:
AN ADVANCED SEMINAR

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KINTSUKUROI
KINTSUKUROI

• Kintsukuroi (keen-\textit{tsoo-\textit{koo-\textit{roy}) is the Japanese art of repaired pottery.

But it's something more than that. An important something.

When a potter makes a bowl, he makes it by hand with malleable clay. The bowl is formed to the potter's liking, then fired to a couple thousand degrees. Afterwards, it is finished and presented as a true work of art. - See more at: http://1dsperfectday.blogspot.com/2013/12/why-word-kintsukuroi-means-so-much-to.html#sthash.p0iqCh1M.dpuf
KINTSUKUROI

• Now, let's say the bowl broke. Would you even consider repairing it, let alone consider it more beautiful for having been broken? Of course not! We (especially in the Western world) demote and dishonor it, throwing it out in the trash.

But others would not only repair it, but also elevate it to a whole new level of appreciation - See more at: http://ldsperfectday.blogspot.com/2013/12/why-word-kintsukuroi-means-so-much-to.html#sthash.p0iqCh1M.dpuf
The current opioid epidemic is not driven by pharmaceutical pain relievers.

Heroin, fentanyl and analogues of fentanyl such as carfentanil are the driving forces.

Carfentanil is 100 times stronger than fentanyl and 10,000 times stronger than morphine (2mg can knock out a 2000 lb. elephant).
HEROIN AND FENTANYL OVERDOSE
PREGABALIN AND GABAPENTIN

• These drugs are especially dangerous when used with heroin or other opioids.

• Pregabalin (Lyrica) and gabapentin (Neurontin) were easy to access and that taking them was associated with a feeling of loss of control and an enhanced effect of heroin—feelings of euphoria and a sense of calmness—including respiratory depression.

THE SCIENCE OF RECOVERY:
NEUROPLASTICITY
THE NUCLEUS BASALIS IS...

NOVELTY
THE MODULATORY CONTROL CENTER FOR PLASTICITY
THE SCIENCE OF RECOVERY: NEUROPLASTICITY

YOU ARE NEUROPLASTICIANS!

WHAT ENHANCES PLASTICITY?

• NOVELTY
• THERAPEUTIC RELATIONSHIPS
• PHYSICAL EXERCISE
• MINDFULNESS
THE SCIENCE OF RECOVERY:
DOPAMINE (DA) TONE

- Ventral Tegmental Area
- Nucleus Accumbens
- Arcuate Nucleus

- Dopamine
- Opioid Peptides
- Naltrexone
THE SCIENCE OF RECOVERY: GENETICS

- GENETICS
  - A1 ALLELE OF THE DOPAMINE D2 RECEPTOR GENE
  - FOUND IN ONE-THIRD OF POPULATION
  - LOW DOPAMINE TONE
THE SCIENCE OF RECOVERY:
DOPAMINE (DA) TONE

• SUFFICIENT
  • DA TONE IN REWARD CIRCUITRY YIELDS ADEQUATE
    • ATTENTION
    • MOTIVATION
    • ATTACHMENT
    • HEDONIC TONE
THE SCIENCE OF RECOVERY: DOPAMINE (DA) TONE

- REDUCED OR LOW DA TONE
  - ANHEDONIC RELATIVE TO THOSE AROUND THE INDIVIDUAL
  - SENSE OF NOT FITTING IN
  - POOR ATTENTION
  - POOR LEVEL OF MOTIVATION
  - RESTLESS
  - IRRITABLE
  - DISCONTENTED
THE SCIENCE OF RECOVERY: GENETICS

• A shortage of D2 receptors, some researchers surmise, could predispose a person to addiction.

• Nora Volkow, NIDA Director, led two studies that involved artificially increasing the number of D2 receptors in rats by administering adenoviral vectors directly into their brains. Viral vectors transmit their genetic material and makeup into foreign cells, in this case increasing the number of D2 receptors in the new cells to match their own.
In one study involving rats and alcohol, the increased number of D2 receptors led the rodents to consume less alcohol, compared with their baseline intake.

In the other study, the D2-receptor increase caused rats to significantly reduce their intake of cocaine.
High receptor level 
unpleasant response

Low receptor level 
pleasant response
THE SCIENCE OF RECOVERY: GENETICS

- Association between DA D2 receptor numbers and drug self-administration (PET)
  - Increased D2 receptors reduced alcohol consumption
  - Decreased D2 receptors higher risk
- DA D2 receptor levels influenced by stress and social hierarchy
Michael Nader, a researcher at Wake Forest School of Medicine, is investigating ways to raise D2-receptor levels naturally.

One experiment he helped conduct focused on five separate groups of four monkeys. Each had been self-administering cocaine to the point of habit and were then deprived of the drug for an eight-month period. To create a picture of D2-receptor availability, the monkeys were given a radioactive tracer that competes with dopamine for receptors.
The monkeys were then randomly put in social groups of four and given the opportunity to self-administer the drug again.

Positron emission tomography (PET) imaging of the monkeys over time showed fluctuations in dopamine levels, which allowed the researchers to estimate the changing numbers of available D2 receptors.

After only three months, the socially dominant monkeys in each group had naturally increased their numbers of D2 receptors.
There was no increase in the subordinate monkeys. Further, the subordinate monkeys reverted to using cocaine at much higher levels than the dominant monkeys.

"There is an interesting relationship between D2-receptor numbers and vulnerability to drug addiction," Nader said. "It appears that individuals with low D2 measures are more vulnerable compared to individuals with high D2-receptor numbers."
THE SCIENCE OF RECOVERY: GENETICS

• Why did the socially dominant monkeys show D2-receptor increases?

• One hypothesis is *environmental enrichment*. For the monkeys, it seems, being dominant was the enriching trigger.

• One physiological consequence of involvement in 12-step meetings, therefore, could be an increase in the natural production of D2 receptors.
THE SCIENCE OF RECOVERY: GENETICS

- **Social interventions can change neurobiology**
  - Increased DA D2 receptors
  - Reduced self-administration

- **Behavioral interventions could counteract the aversive effects of drug abuse and reinforce the power of group approaches**
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<td>ABNORMALLY NORMAL</td>
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<td>SUBJECTIVE W/DRAWAL</td>
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<td>ACUTE ABSTINENCE SYN.</td>
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OPIOIDS AND CHILDHOOD LOSS AND TRAUMA

• ABOUT 50 % OF OPIOID ADDICTS HAVE CO-OCCURRING DISORDERS (MOSTLY TRAUMA RELATED)
  • Anxiety, depression and post-traumatic stress disorder are common
  • The more childhood loss and trauma someone has experienced the higher the risk of addiction.
  • Boys who experienced six or more childhood traumas had a 46 times greater risk of becoming an IV addict (http://goo.gl/6KalC- ACE Study)
WHY OPIATES?

• **Relieves stress**
  • Action on mu receptors on amygdala

• **Feeling of being warm, fed and cared for**

• **Dissociation from negative feeling states**

• **Cognitively intact**

• **Dopamine high and enhanced sense of well-being**
  • Dopamine signal from reward center to prefrontal cortex
THE SCIENCE OF RECOVERY: DOPAMINE (DA) TONE

- **SUBUTEX** - Buprenorphine sublingual (SL)
  - 2mg and 8mg tablets
- **SUBOXONE** - Buprenorphine/Naloxone SL tablets AND FILM
- **Zubsolv** SL
- **PARTIAL AGONIST**
  - Increasing dose does not increase effect like a full agonist
THE SCIENCE OF RECOVERY: DOPAMINE (DA) TONE

- **BUPRENORPHINE** - Very high affinity for mu opioid receptor
- Mu receptor will choose buprenorphine over other opioids
- Buprenorphine will displace other opioids
- Slow dissolution from mu receptor
  - Half-life on receptor is 34-36 hrs
  - Heroin on and off receptor in millisecond
  - At Buprenorphine dose of 16mg almost no binding to other opioids
THE SCIENCE OF RECOVERY: GLUTAMATE

• TWO STAGE MODEL OF ADDICTION
  • STAGE 1-OCCASIONAL DRUG USE BECOMES INCREASINGLY CHRONIC AND UNCONTROLLED. THE NEUROBIOLOGICAL SOURCE OF THESE SYMPTOMS IS DRUG-INDUCED DEREGULATION OF THE BRAIN’S REWARD CENTER
    • DOPAMINE
  • STAGE 2-ADDITIONAL FEATURES INCLUDE WITHDRAWAL SYMPTOMS, PERSISTENT VULNERABILITY TO RELAPSE WITH ALTERATIONS IN DECISION MAKING AND OTHER COGNITIVE PROCESSES
    • DRUG-INDUCED SIGNALS BY NEUROTRANSMITTER GLUTAMATE FROM BRAIN AREAS PRIMARILY ASSOCIATED WITH JUDGMENT
THE SCIENCE OF RECOVERY:
GLUTAMATE

• CHANGES IN BRAIN GLUTAMATE SIGNALING INDUCED BY CHRONIC DRUG EXPOSURE HAS A WIDE VARIETY OF NEUROBIOLOGICAL EFFECTS INSTRUMENTAL IN THE TRANSITION FROM DRUG ABUSE TO ADDICTION (KAVALIS, 2009)

• THESE NEURAL ALTERATIONS LIMIT THE ABILITY TO ADAPT TO NEW INFORMATION (TO STOP TAKING DRUGS IN SPITE OF ADVERSE CONSEQUENCES) AND STRENGTHEN THE POWER OF DRUG LEARNED ASSOCIATIONS
THE SCIENCE OF RECOVERY: GLUTAMATE

- Addiction as impairment in reversal learning

IN ADDICTION...

“WHEN I USE DRUGS I FEEL GOOD”

CHANGES TO

“WHEN I USE DRUGS BAD THINGS HAPPEN”

NEW RULE BUT CANNOT ADAPT
The Science of Recovery: Glutamate

- Addicts can learn a new rule but run into problems when the rules change.
  - Cocaine and alcohol abusers were asked to press key each time they saw a green rectangle on the screen.
  - After 500 repetitions told not to press key when saw green rectangle.
  - Controls easily adapted while addicts kept pushing the key even after given feedback.
  - Impaired reversal learning due to drug use and not genetics.
THE SCIENCE OF RECOVERY: COGNITIVE FUNCTION

- Addiction is a disorder of altered cognition
- Addiction impacts...
  - LEARNING
  - MEMORY
  - ATTENTION
  - REASON
  - IMPULSE CONTROL
- Effects are particularly disruptive when exposed during brain development and in the co-occurring population
THE SCIENCE OF RECOVERY: COGNITIVE FUNCTION

- Cognitive deficits in chronic drug abuse
  - Withdrawal produces cognitive symptoms
    - Cocaine-deficits in *cognitive flexibility*
    - Amphetamine-deficits in attention and impulse control
    - Opioids-deficits in *cognitive flexibility*
    - Ethanol-deficits in working memory and attention
    - Cannabis-deficits in *cognitive flexibility* and attention
    - Nicotine-deficits in working memory and declarative learning
THE SCIENCE OF RECOVERY: COGNITIVE FUNCTION

• Why give an alcoholic or addict a 60 minute didactic or video?
• A new format
  • 15-20 minute simple didactic
    • How to participate in treatment
  • 10 minute questionnaire
  • 30 minute discussion group
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<th>DR. JENNY LUM *</th>
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<td><strong>FEEL</strong></td>
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**MY FUTURE BEHAVIOR WILL CHANGE...**
PSYCHOLOGICAL

First consideration:

Is the patient a candidate for rehabilitation or do they need habilitation?
PSYCHOLOGICAL

If Habilitation

Emphasis is on:

Neuroplastic development of the prefrontal cortex

Staff as healthy family

Discharge planning
• PREFRONTAL TAKES AROUND 25 YEARS TO DEVELOP IN A GOOD ENVIRONMENT

0-5 YEARS OLD- NURTUREANCE

10-20 YEARS OLD- SUPERVISION
Second Consideration: Where is the patient in regard to their stage of change?
PSYCHOLOGICAL

• If patient is in precontemplation or contemplation (Stages of Change Model), the use of Motivational Interviewing techniques are warranted

• *Education and assessment can serve as confrontational tools*

• To create cognitive dissonance
Third consideration:

Is there presence or absence of a recovery-oriented environment and/or support system?

RECOVERY CAPITAL
A recovery safety plan involves 3 parts. The *first part* helps each client identify how they will know they need to activate their safety plan. The *second part* dictates a place of physical/psychological safety to which they will go as quickly as is possible. The *third* is a list of who they will contact as soon as they can.
RECOVERY SAFETY PLAN

PART I. I will know I am in trouble and need to activate my recovery safety plan if any of the following occur:

1. _____________________________________
2. _____________________________________
3. _____________________________________
4. _____________________________________
5. _____________________________________
RECOVERY SAFETY PLAN

PART II. If I experience any of the above, I will go to one of the following places as soon as I can get there.

1. ____________________________________________
   
   ______

2. ____________________________________________
   
   ______
RECOVERY SAFETY PLAN

PART III. If I experience any of the above, I will contact the following people as soon as I possibly can.

1. _______________________________________
   _______________________________________
   _____

2. _______________________________________
   _______________________________________
   _____
RECOVERY SAFETY PLAN

NAME       PHONE

1. ________________________________
2. ________________________________
3. ________________________________
Fourth consideration:

Understanding and treating the patients that struggle

History of trauma with or without self-injurious behavior

Earlier onset of use and other self-destructive behaviors

Nonenriched environment

Personality immaturity

High levels of distress (Neuroticism)

Lack of recovery capital
High levels of neuroticism associated with suicide.

The risk for suicide death was over 2-fold for men with Opioid Use Disorder. For women, it was more than 8-fold.

Hidden behind the terrible epidemic of opioid overdose deaths looms the fact that many of these deaths are far from accidental. They are suicides.
THE SCIENCE OF RECOVERY

- RELAPSE FALLS ALONG A SPECTRUM
  - COMPULSIVE RELAPSE
  - PREFRONTAL CORTEX OFF-LINE
  - REGULATED RELAPSE
  - SOME PREFRONTAL AVAILABILITY
  - LITTLE OR NO RELAPSE
  - PREFRONTAL CORTEX AVAILABLE
THE SCIENCE OF RECOVERY:
HABIT

YOU CANNOT
EXTINGUISH A BAD
HABIT; YOU CAN ONLY
CHANGE IT
THE SCIENCE OF RECOVERY: HABIT

THE CUE TRIGGERS THE ROUTINE AND ALSO TRIGGERS THE CRAVING FOR THE REWARD TO COME
THE SCIENCE OF RECOVERY: HABIT

• When a habit begins the whole brain is activated as it actively processes all of the stimuli
• After this phase the higher brain begins to reduce level of activation
• Then even the memory centers reduce activity
• BASAL GANGLIA has now taken control of recalling the patterns and acting on them
BASAL GANGLIA

- Putamen
- Globus pallidus (lateral part)
- Globus pallidus (medial part)
- Caudate nucleus
- Thalamus
- Subthalamic nucleus
- Substantia nigra
- Amygdala
THE SCIENCE OF RECOVERY: HABIT LOOP

CUE <-> REWARD <-> ROUTINE
THE SCIENCE OF RECOVERY: HABIT

- CUE AND REWARD BECOME INTERTWINED CREATING A CRAVING (CONDITIONING)
- In a habit the brain reduces emphasis on decision making
- Pattern unfolds automatically unless you find a new routine
- After craving develops, cannot extinguish a bad habit, you can only change it
THE SCIENCE OF RECOVERY: HABIT LOOP

SAME CUE(S)

SAME REWARD

DIFFERENT ROUTINE
THE SCIENCE OF RECOVERY: HABIT

• ALMOST ANY HABIT CAN CHANGE IF YOU KEEP THE SAME CUE(S) AND SAME REWARD

• ALCOHOLICS ANONYMOUS changes the habit loop

• ALCOHOLICS ANONYMOUS succeeds because it helps use the same cues and get the same rewards but shifts the routine
THE SCIENCE OF RECOVERY: HABIT

• To change a habit must address the same cues and rewards as before and feed the craving by inserting a new routine

• WHAT DO ALCOHOLICS AND ADDICTS CRAVE?
  • It isn’t a craving to be drunk
  • Physical effects of alcohol are the least rewarding (the same can be said for cocaine, methamphetamine, etc.)
  • Is it connection, reduce anxiety, forget worries?
  • Meetings and companionship—another bar to escape to, catharsis, distraction
THE SCIENCE OF RECOVERY: HABIT

• What is the pleasure we seek in the first place?
  • Is it…
    • COMPLETION
    • RELAXATION
    • TO FORGET
    • TO CONNECT
    • TO REWARD MYSELF
    • TO GIVE ME COURAGE
    • TO FEEL LIKE YOU BELONG AS ONE OF THE GROUP
THE SCIENCE OF RECOVERY: HABIT

• ALMOST ANY HABIT CAN CHANGE IF YOU KEEP THE SAME CUE(S) AND SAME REWARD

• ALCOHOLICS ANONYMOUS changes the habit loop
  • AA offers…
    • Escape
    • Catharsis
    • Distraction
    • Relief via talking
THE SCIENCE OF RECOVERY: HABIT

• **ALCOHOLICS ANONYMOUS** succeeds because it helps use the same cues and get the same rewards but shifts the routine.

• AA forces new routines for what to do each night as opposed to drinking.

• *To change a habit must address the same cues and rewards as before and feed the craving by inserting a new routine.*

• **WHAT DO WE CRAVE?**
  • *Is it connection, reduce anxiety, forget worries?*
  • *Meetings and companionship—another bar to escape to, catharsis, distraction*
THE SCIENCE OF RECOVERY: HABIT

• What is the thirst behind the thirst?
  • “I was thirsty because I was feeling incomplete and alcohol helped me feel more connected, more alive.”
  • Bill Wilson, “Before A.A. we were trying to drink God out of a bottle.”
  • Gerald May- a deep yearning for fulfillment or completion; a longing to love and be loved and a desire for the source of this love-God
THE SCIENCE OF RECOVERY: HABIT

• What is the thirst behind the thirst?
  • The great analyst Carl J. Jung put it thus, “His craving for alcohol was the equivalent, on a low level, of the spiritual thirst of our being for wholeness, expressed in medieval language: the union with God.”

• An intense, urgent, or abnormal desire or longing. At the time it seems more painful than any other longing. It subsumes us and we are a slave to it...and it seems it will never end. Although not understood in that moment, it is really a powerful thirst to go “home.”
THE SCIENCE OF RECOVERY: HABIT

• REPLACEMENT ROUTINES ONLY BECOME DURABLE NEW BEHAVIORS WHEN SPIRITUALITY IS ADDED (this is what gets you through the major crises in your life)

• PATTERN:
  • Could only stay sober by habit replacement until a major crisis hit
  • Add spiritual element and now can get through these tough times