Neurochemistry of Relapse & Recovery

"In the middle of the night I realized I don't want to stop but I have to or I'm going to die. And I made a phone call and that phone call I was willing to hear the answer. The answer was surrender really. It's just to give up my way of doing my things selfishly. Do something a different way that works."

The reasons that people give up their compulsive use of psychoactive drugs vary, but they almost always include survival.

"It's gotten progressively worse as I've gotten older. Medical problems have started to happen. I have hep C. I had . . . As a result of an altercation with 2 detectives, I had my ribs broke and lung punctured and almost died from that."

When addicts decide to stop using their drug of choice…or favorite compulsive behavior, and enter treatment, they go through 4 phases:

"They knew that they were going to send me to treatment if I ever wanted to see my daughter again or be with her so I went to outpatient treatment but still thinking, 'Once I get out of treatment I'm going to drink and do drugs again, if that's what I want to do," you know and had no intention of being sober for good. But after a few months it just, it worked, being sober."

The main obstacle to any stage of treatment is relapse and since cravings lead to a slip which leads to a relapse, learning how to control cravings is crucial for recovery.

"You wake up every day saying, 'Okay, I'm not going to use and you know, twenty minutes later, it's like an out of body experience. I'm yelling at myself across the room as I'm talking to the dope man."

"I'm walking down the street seeing someone I know smoking a blunt doing something, they hand it to me and I take it and I forgot, I didn't think twice about it."

"Fear, biggest one there is for me, resentment, and that includes anger."

The reason sensory and emotional triggers cause craving and a subsequent relapse is due to their effect on memories, and subsequently, memories' effects on feelings and actions. In fact, memories are the driving force in every part of one's daily life.

From the moment we're born, and even before, according to some, we begin to remember.

We remember feelings and emotions first and then more concrete things such as colors, shapes, sounds, and smells.

As we grow, the creation of memories continues.

The more intense the experience, the more likely we are to remember it immediately and forever.

Wartime traumas are the most well known of intense experiences, but in fact, powerful emotions and experiences in childhood and adolescence, particularly physical, sexual, and emotional abuse are as deeply imprinted as any wartime trauma.

"I didn't tell anybody about me being molested from my grandfather until I was seventeen years old. And then at that point, I was so already gone on drugs and alcohol and that's a part of killing the pain."

"I was an abused child, a sexually molested child. Yeah, those things are very traumatic and weigh very heavily on me to this day."

So, as we live our lives, the brain continues to store memories that can possibly be used to solve future problems.

This is how it works. Memories are imprinted on the dendrites of nerve cells . . . . . Dendrites are tiny fibers that receive messages from other nerve cells.

Memories are retained as tiny bumps, known as dendritic spines. These protrusions grow when stimulated by a sensory input. If the input is important, the dendritic spines, and therefore the memory becomes permanent. The more it is used, the more permanent it becomes. A person might need a thousand of these memory spines to store a single piece of information.

"Well we have a hundred billion brain cells in our head, and then a brain cell, one single brain cell, can have 10 to 10,000 dendrites and on 10 micrometer section of a dendrite you can have 20 memory spikes on it. So when you multiply that out, our capacity for memory is almost unlimited."

So, if we have a problem we need to solve, our brain automatically searches for an answer.

Most often, it will settle on the memory of the action that worked in the past. Then it will use that memory to go into action and solve the new problem.

The problem we wish to resolve can also be emotional conflict or pain, and we look for ways we resolved that kind of worry in the past.

Some of the most important memories are survival memories, found in both humans and animals. These survival memories record ways we satisfied certain critical needs.

Where did we find food?

How did we get access to water?

What did we do to attract the opposite sex?

What happens is that when we satisfy basic needs by finding water, food, or companionship, a signal is sent through "the reward reinforcement pathway," particularly the nucleus accumbens, also known as the go switch. This go switch tells us three things.

Then, the other major part of the reward/reinforcement circuit, the prefrontal cortex, tells us when we've satisfied that need. It's referred to as the "stop switch..

Activation of the stop switch shuts off the "Do it again, message from the go switch.
This unique survival mechanism helps keep us alive and in balance.

Now growing up, many people drank alcohol,

used other psychoactive drugs,

Or engaged in compulsive behaviors, and have thousands of memory bumps of how, when, and where they used and the feelings those activities triggered.

"By the time I was 11, and I was looking for something outside of myself, because I couldn't live within myself, I was really depressed, I was actually suicidal, I remember suicide feelings at 10 years old, and I, at that point started to drink alcohol."

Since these addictive drugs and compulsive behaviors are psychoactive and work on the survival brain, particularly the reward/reinforcement circuit, they have an exaggerated influence on the dendrites.

The memory bumps grow in numbers and in size until they become permanent influences on one's behavior.

"In my adult life, the acquisition of drugs has been more than a full time job, it's an overtime job. I have spent, on the average, probably 16 hours a day, you know I'm out hustling, acquiring, using the drugs."

So, the brain comes to think that what the person is doing, the drinking, the drug use, or the compulsive behavior is for survival because of how it makes one feel.

The reward/ reinforcement circuit has been hijacked. So the nucleus accumbens, the go switch, which has been fooled, says, "do it again," and the user keeps doing it.

"My brain was constantly saying, just another hit, just another hit, and it scared me. Here I was pregnant, big giant belly, waddling around, and I wanted a hit of dope."

But here's the other problem. The prefrontal cortex, the stop switch, also malfunctions. Fibers that are supposed to relay information from the thinking brain back to the emotional brain are damaged.

So, when the reward reinforcement circuit continually encourages users to do it again, they cannot stop. And they don't stop.

"I'm the type of person that once I start using, there is no, well, I'm going to go to detox. I have to be locked up. And if I'm not locked up, I will continue until some very big disaster happens."

So what happens if a person's balance and feelings are challenged . . .
Well, if there is anger . . .
loneliness . . .
exhaustion . . .
physical or emotional pain . . .
or simply boredom,

the mind looks for the way that unwanted feeling was relieved the last time . . . and if all the person has been doing to solve most problems is the addiction, the odds are that the brain will come up with a drug memory when it looks for an answer.

"Maybe if I had waited another day I would have been all right. But I wasn't feeling well so automatically when I'm not feeling well, why suffer. You know where to go, go to the corner. Make the phone call. Make that phone call. Don't sit there you dummy, you know you're slicker than that. You don't have to go through this and I mean your mind goes through a lot of biological changes."

And since the addict has stopped participating in most other activities, it is even more likely that addiction memories will be chosen when challenged with an unwanted mood.

"When I'm really tired, I want to drink. If I'm really angry, I want to drink. I'm really happy, I want a drink. And so the addiction eclipses everything else and so there's not a pursuit of everyday stuff because everything leads to how am I going to cope with it by drinking, by drugging myself."

"The chasing of the drug took me away from fulfilling my obligations . . . going to

work, taking care of family. Those things became secondary."

People don't have to be hungry, angry, lonely, tired, in pain, or bored to activate drug memories.

"I think you relapse way before you relapse. Well it starts with your attitude. It starts with um, you start to um, sometimes it's daydreaming about the drugs, sometimes it's putting yourself in shady situations, starting to talk to people that use,."

Just the sight of an old hangout can activate memories of alcohol use.

Cash on hand is almost the same as carrying around the drug itself.

All these sensory triggers start the reward-reinforcement circuit going.

At first, the effect of the environmental trigger is muted and the user might be able to resist, especially if in treatment or recovery, But if an unwanted mood allows that craving to grow, the person will most likely use and then the reward/reinforcement circuit is fully activated and the addict can't stop.

"I don't actually really know what led up to it. You know, I try to think about it, I try to put two and two together. What happened that day? Did somebody make me mad? Nobody made me mad. I just thought that I could drink."

Stinking thinking can get me killed. It can get me put in jail. It can make me homeless . . . all the negatives. I don't like being in that negative side. I mean I . . . because I'm not that person."

A study of people in recovery at the Haight-Ashbury Clinic in San Francisco found that

"As soon as I'd have a drink, hey, I felt great and, you know, which was really short lived, you know while I was drinking maybe I felt great for the first couple drinks and then it would turn into a blacked out nightmare."

"The importance of 95% of slips turning into relapses almost immediately is that as treatment professionals, we have to give addicts and alcoholics, substance use abusers, every tool we can to help them avoid taking that first one and then it's a responsibility of people with this condition to use those tools to make sure they avoid that first hit because if they can avoid the first one, then they can avoid going back into full scale addiction."

Let's look more closely at how neurotransmitters (which help transmit messages), affect drug craving and the tendency to relapse,

In terms of the reward/reinforcement center, dopamine is the most important neurotransmitter. Besides activating the go switch and interfering with the stop

switch, prolonged use of drugs depletes the amount of dopamine and the number of dopamine receptors. Both these factors increase craving.

These brain scans show the density of dopamine receptors in normal people versus those who are dependent on some psychoactive drug or compulsive behavior.

All addictions cause a reduction in the number of dopamine receptor sites, thus making the brain crave more dopamine. Unfortunately, the fastest way to satisfy that craving is through the use of psychoactive drugs and addictive behaviors.

"I wanted to stop a long time ago, you know. And you know, I was dealing with things that were basically beyond by control or ability to, you know, cravings that I could not deny."

Each person has a unique response to a craving depending primarily on how much, how often, and how long they use.

Heredity, environment and the use of the drug itself or practice of the compulsive behavior also determine vulnerability.

"I believe I was an addict before I ever touched drugs. and that was the piece of me not feeling comfortable in my skin before I ever touched drugs,

All of these factors also determine how easily the go switch is activated and how quickly the stop switch is deactivated.

"Once I stopped, I felt like every time I stopped, something was going on in my brain and I didn't feel like normal. I felt like I couldn't focus or anything like that."

"I want Tony to have a better life. I want Tony to go back to his other life. I was a responsible good person, a good member of society. That's the person I want. If I choose to go back down that road to that alcohol, I know exactly where that leads and don't want that in my life any more. It's too much pain."

What does all this information about the influence of addiction-related memory bumps and stop or go switches mean in relation to recovery? Can addiction memories be erased?

Can stop and go switches be repaired?

The fact is most memory bumps are permanent and can't be changed. They are with us for a lifetime. But what can be changed, is the strength of the connections from one bump to another. Strong memory bump connections encourage compulsive drug use and behaviors. Weak ones encourage recovery.

"This time I was done. I mean I couldn't take any more. I couldn't put anymore bad memories inside my head and I figured let me just give this a try and let's see how it works out, and for the last 18 months I've been sober."

When addicts are abstinent, the networks gradually weaken over a period of months. If they relapse and drink, use, gamble, or overeat, the connections re-strengthen more rapidly, often within hours. In addition, the networks remain overactive for days, weeks, even months, keeping the addict at a much higher vulnerability level than before the slip.

"Sometimes to an addict it just becomes daunting, all this science on the brain but the wonderful thing about the brain is the brain we discovered to be, is very, very resilient, it has a plastic capacity it has the ability to mold and reshape and what we see is that as long as a person stays in recovery the resilience of the brain is such that it starts to reform networks, and reform its functionality, so that it grows healthier and healthier."

"Well in early sobriety you got to, I tell people to just hold on to your ass because it isn't going to be fun. Just hang on, and hang out with people that are sober."

What this means is that at all costs, those who have altered their brain chemistry by continued and high dose use must avoid the first drink, the first hit, or even the first bet.

"He pushes a bottle of wine my way and I take the bottle and I drink and before I know it I'm not drinking to taste the wine, I'm drinking for an effect that I'm going to get out of it. And at that point I lost all sense of control and it was very humiliating."

Continuous abstinence is absolutely necessary to avoid reinforcing the o-ld connections and just as important, to aid the creation of new recovery connections.

"We all have automatic thinking. When I say black, automatically you say white."
"White."
"And that's automatic firing of neural pathways. Well what this exercise is going to do is to allow you to create new neural pathways or new automatic thoughts. And it will help you in the relapse process."

Drug use impairs the stop switch, making abstinence even more crucial, not only from one's drug of choice but from any psychoactive drug or any compulsive behavior. All addictions trigger the reward circuit and they all deactivate the stop switch.

"Maybe an addiction they never had before they were doing drugs or alcohol, but

they start gambling and then they're drinking. Sometimes it's sex. Sometimes it's overeating. It can be so many different disorders of people sabotaging their sobriety."

Since activation of a drug memory triggers the reward/reinforcement circuit by flooding the junctions between nerve cells in the nucleus accumbens with dopamine, the addict needs to hold off giving into the craving, so the brain has time to reabsorb those excess chemicals and let the craving subside. It takes anywhere from 20 minutes to several hours for the intense craving to go away.

There are any number of activities one can use to let the time pass in order to diminish the craving and deactivate the addiction memories

There is exercise . . .

"With a narcotic addict who has completely screwed up their whole endorphin receptor system in their brain, it's really the only way that I can kind of relieve those feelings. I run and I run almost every day"

Making a phone call to a friend, an AA or NA sponsor, or another fellow 12-stepper is a powerful tool . . .

For some, the creative process diverts the mind and rekindles non-destructive passions.

Reestablishing family relationships and spending time with loved ones dissipates craving.

Journaling or just writing a letter can relieve guilt and anxiety.

Prayer can counter the urge to use as it encourages recovery.

"So a lot of praying, a lot of praying. Interestingly, I really recently had some um, emotional challenges that in the past would have just, you know, sent me off like spinning, just freaking out and my reaction was almost shocking to me because I was like, I'm okay, I feel okay."

And finally 12-step meetings, other recovery groups, or counseling are crucial to maintaining abstinence.

"Well I have to be doing the program of alcoholics anonymous and the twelve steps specifically as they are written in the book. Following those steps, those twelve steps. They're so simple and so basic and they just work. Every time I go through them my life changes and there's another layer pealed off and it's usually good under there. "

"And I went to one on ones with my counselors, every week . . . actually twice a week; because I had to…I had to talk to somebody. It was hard to realize that I could not

ever drink again."

Any response to a craving should be automatic because craving arises in the old emotional brain which is more powerful and reacts faster than the new thinking brain,

"A Budweiser commercial is going to look really cool with a sexy fine girl, there's going to be weed smells really good, there's going to be a test someday where I'm going to want to stay up for four days and study and I'm going to want tweak. There's going to be all that,, it has happened. But the only way I think I'm not gonna do it is by staying right with what the program has told me to do."

Because craving arises so quickly, researchers have developed various medications to help control the neurochemical surge.

"We see a lot of medications in development, actually more medications are in development to treat addiction than almost every other medical condition is what we are seeing now. As these medications get approved, Verenicline say for nicotine, Suboxone for opiate addiction, naltrexone in a depo form to treat alcoholism, acomprosate - things like that- that come about, it is giving us another tool, another resource to help people deal with their craving, deal with their withdrawal symptoms, stay drug free for a longer period of time, and get bonded into the recovery."

Other substances used to treat addiction through their effect on neurochemicals are psychiatric meds which include antianxiety drugs, antipsychotics, and antidepressants.

"When I first tried to get sober, Doc gave me Paxil I believe it was, 10 mg of Paxil, and that gave me enough , brought me up enough to where I could keep from picking up the first drink, cause I could get into my drinking…I was drinking just to feel better and it was killing me."

Now what about long-term recovery of our central nervous system? Scans of the brain reveal how an addicted brain tries to repair itself. Functional MRIs and SPECT scans show variations in brain activity due to psychoactive drugs.

This scan compares normal brain activity in a non-drinker, shown in red on the left, to the lack of activity in the brain of a 15-year-old heavy drinker, shown on the right.

These scans of recovering cocaine addicts show how long it takes for the brain to restore normal activity, shown in yellow and red. . . . After 10 days of abstinence, much of the brain is still inactive. Even at 100 days, the brain is functioning at about half of its full potential. Even after stopping, it takes months for brain chemistry to return to a semblance of normalcy.

This is probably the most important thing, this leads directly to why I relapsed for so long, is being physically clear of narcotics for a period, a short period of time where you're no longer going through withdraw, where all the physical symptoms seem to be gone, you know, a couple of weeks or a month, you're still a long ways away from being mentally capable to make decisions for yourself. .

Some say that it takes 8 months to a year for a cocaine, alcohol, or heroin user's brain to return to even close to normal functioning. A stronger drug such as methamphetamine, which is quite toxic to nerve cells, can take up to 2 years or longer. But with any drug, even after many years of sobriety, susceptibility to cravings still exists and can trigger a slip and relapse, particularly if the addict has stopped participating in recovery.

"In May it will be fifteen years clean and sober and what's different is you know, to tell you the truth, in some ways, I still don't trust, you know, I don't trust my power..."

"Relapse isn't really that much about will power it's about what has happened to the brain with addiction. The brain, with its memory spines becomes hyper sensitive to drug triggers and those drug triggers can lead to slips and slips can lead to relapse. To better understand this hypersensitivity, maybe its useful to think of it sort of like an allergy, say like an allergy to a bee sting.

If someone with that allergy gets stung, they react, they swell up, and they can't breathe. It doesn't matter if they are moral or immoral, sane or insane . . . they will react badly, their life will be threatened.

A similar life-threatening reaction happens with an addict who has become sensitized to a psychoactive drug or compulsive behavior. They are also allergic. If they come in contact with meth, Vicodin, alcohol, or a slot machine and use even once, they will break out in craving, they will break out in slips, they will break out in a relapse.

"Its alcohol. It's always alcohol. Whenever I had a problem or any type of argument or disagreement, blazzy blah, blazzy blah, alcohol was always involved."

The main difference between the two allergies is that people who are allergic to bees, don't play near a beehive. This is because their memories only consist of the bad things that happened to them when they got stung, whereas with addictions, they have good memories as well as bad memories. So, even if addict's lives are in shambles, they still have a strong tendency to recall the good memories first which then trigger the reward pathway and lead to relapse.

"Allergy, I don't know what you want to call it. Allergy, poison, whatever it is. It just don't work for me. That's all I know."

"If I ever pick up a drink, I know exactly where that drink will take me to. It doesn't

matter whether it's a beer, or a near beer, or whatever it is, it will take me to the same spot. And it took me a long time to realize that."

"If I gave up my sobriety it would be my child, it would be my house, it would be my car, it would be my money, it would be my, ah... my relationship, my parents, my business that I want to start, …..um, eventually I'd work down to my soul again, maybe my life, the final sacrifice, the one that you don't get another chance."

"A lot of people would look at my life and say that it is very limited, to what I can accomplish and what I can do, and.. ah, they are wrong – it is, you know, my life… I've never felt freer, I've never felt, you know, more full of life than I do right now, and ah, my future looks wide open…I could do anything. "