MEDICAL ASPECTS OF ALCOHOLISM

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Medical Aspects of Alcoholism

- Alcohol affects almost every organ system in the body directly or indirectly. Some people may be more vulnerable than others to the medical effects of alcohol for genetic reasons. There also seems to be a relationship between medical consequences and the amount, duration, and pattern (daily vs. binge) of drinking. While most people are aware of problems like cirrhosis and "wet brain", there are other organs affected which are also catastrophic. To examine how alcohol affects the body, it is easiest to envision taking a drink and follow the affects of alcohol on the organs as it moves through the body

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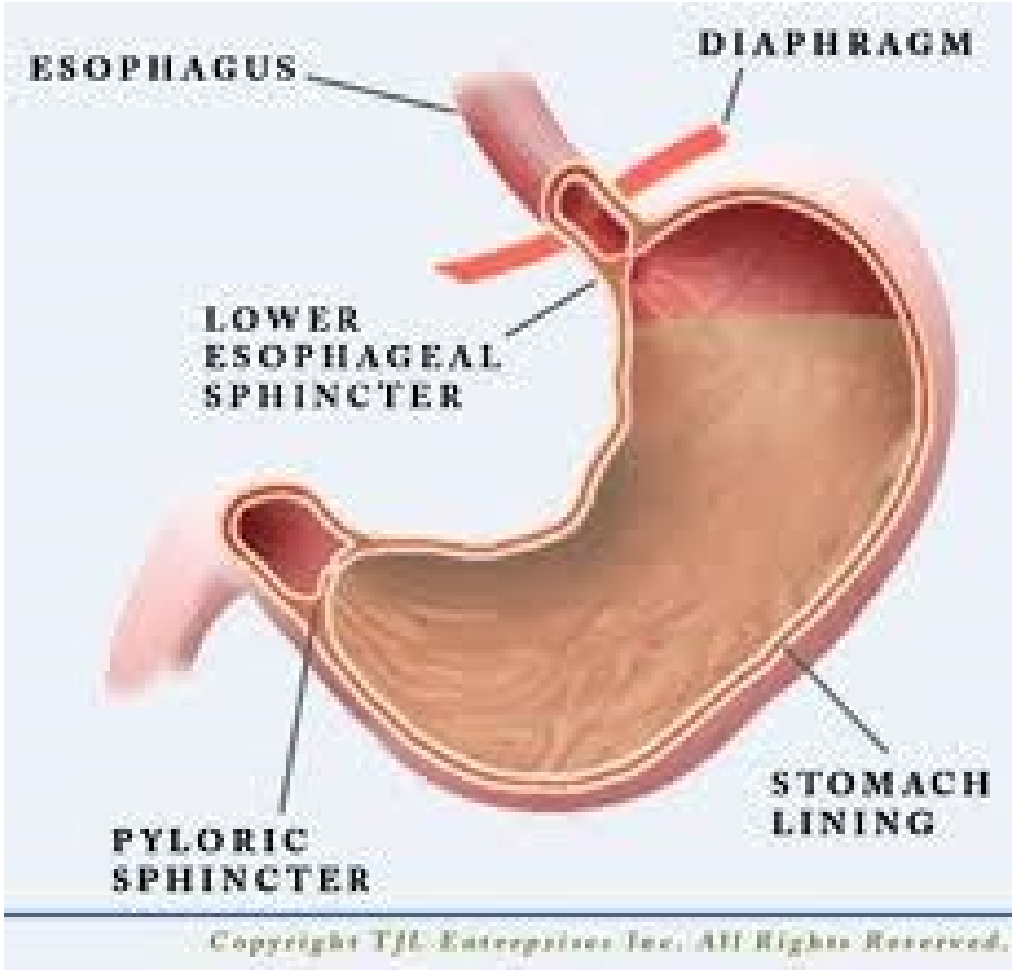
Alcohol and Cancer

Alcoholic beverages are classified by the International Agency for Research on Cancer (IARC) as a Group 1 carcinogen (carcinogenic to humans). IARC classifies alcoholic beverage consumption as a cause of

- Female Breast
- Colorectum
- Larynx
- Liver
- Esophagus
- Oral Cavity
- Pharynx Cancers
- and as a probable cause of pancreatic cancer.

Journal of the national Cancer Institute.

The Stomach and Esophagus



The Stomach and Esophagus

- Breakdown of the normal stomach lining creating gastric (stomach) ulcers. This leads to…
- Decrease in ADH production, which causes alcohol to be absorbed directly into the blood stream.
- A slowing of gastric or stomach emptying which interferes with the esophageal sphincter.
- The combination of these can lead to different types of problems including peptic ulcers:
- Alcohol damaged stomach lining can't make ADH so it can't block alcohol from being absorbed directly into the brain, damaging the brain.
- The slower emptying of the stomach means the acid stays longer in the stomach. This causes more damage to the stomach's capillaries leading to more erosion of the stomach lining. The esophageal sphincter closes the stomach off from the esophagus. When this is damaged, the acid content in the stomach can reflux back up in to the esophagus, causing lesions and ulcers there too. Heavy drinkers have higher rates of esophageal cancers and gastric carcinomas.

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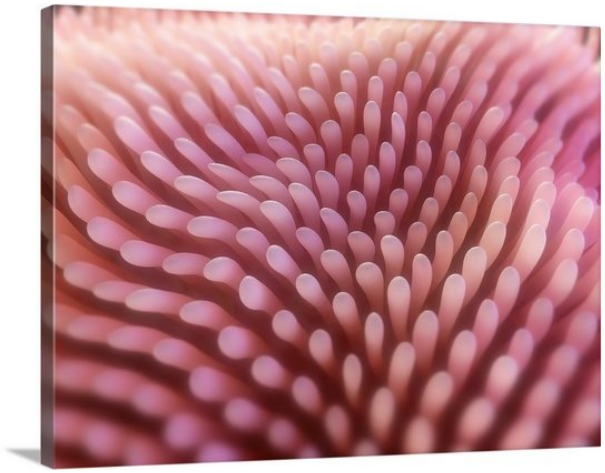
The Intestines

- The intestinal lining is composed of microscopic-finger-like-projections called villi. These villi are full of capillaries necessary to transport nutrients and release enzymes for digestion. Alcohol damages and flattens these villi. As a result, there is less surface area for absorption of nutrients, inhibition of certain enzymes necessary to transport sugars and proteins into the blood. In addition, the intestinal cells become damaged and allow the flow of large molecules, like fats, into the blood, which may lead to gallstones.
- Heavy alcohol consumption also causes problems with peristalsis, the intestinal muscular contractions which move food along the intestines. This is probably due to the damage of the nerves along the lining.
- The combination of the above leads to major problems with absorption and metabolism, and is a major factor in the malnutrition and ulcerations associated with alcoholism.



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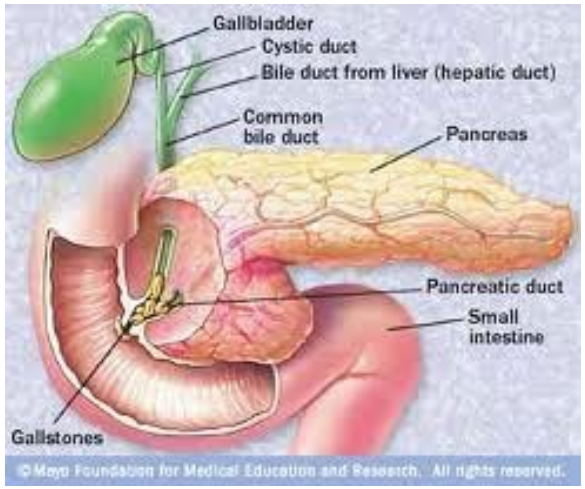
The Pancreas

- The pancreas is the long gland behind the stomach which is crucial to digestion. It secretes enzymes into the small intestines to break down carbohydrates, fats and proteins so they can be absorbed. The pancreas maintains blood sugar levels by producing insulin and glycogen.
- It irritates the pancreatic duct which pours the digestive enzymes from the pancreas to the small intestines, causing obstructions in the duct.
- Alcohol also stimulates the pancreas to make more enzymes to break down the alcohol. Because these enzymes are activated but blocked from entering the small intestines, the pancreas digests itself, causing death to tissue.



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The Liver

- The liver is the largest organ in the body and provides functions essential to life: Filtering circulating blood, secreting bile in the GI tract, making proteins and other compounds vital to sustaining life. The liver is the primary organ for alcohol metabolism. When alcohol reaches the liver, it is broken down into acetaldehyde which is *extremely toxic* to the liver! Because it is so toxic, acetaldehyde is rapidly converted to acetic acid (vinegar) which is further converted to H2O and CO2. While there are other toxic aspects of alcohol in the liver, this large build up of acetaldehyde associated with heavy drinking is the most understood medical problem.
- Research shows that alcohol damages the liver in primarily two ways:
- Alcohol Use Raises Cancer Risk -When you drink alcohol, your body breaks it down into a chemical called *acetaldehyde*. Acetaldehyde is toxic to the liver and damages cells. It damages your DNA and prevents your body from repairing the damage. DNA is the cell's "instruction manual" that controls a cell's normal growth and function. When DNA is damaged, a cell can begin growing out of control and create a cancerous tumor.
- When alcohol is ingested, large amounts of oxygen in the liver are diverted from others areas of the liver to metabolize the alcohol. These oxygen deprived areas in the liver can't do their job, part of which is to break down fats, so the liver becomes fatty.

The Liver

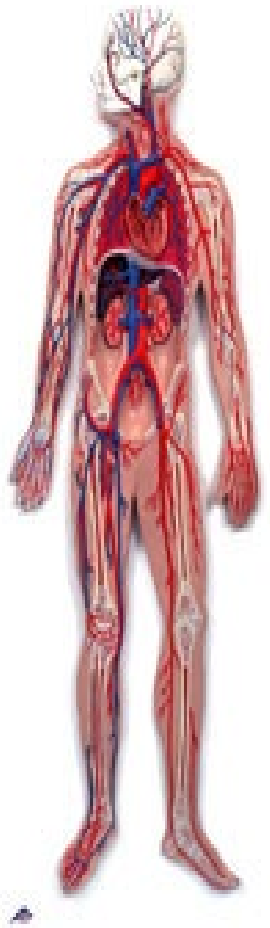
- Fatty Liver
- Alcohol Hepatitis
- Jaundice
- Cirrhosis –

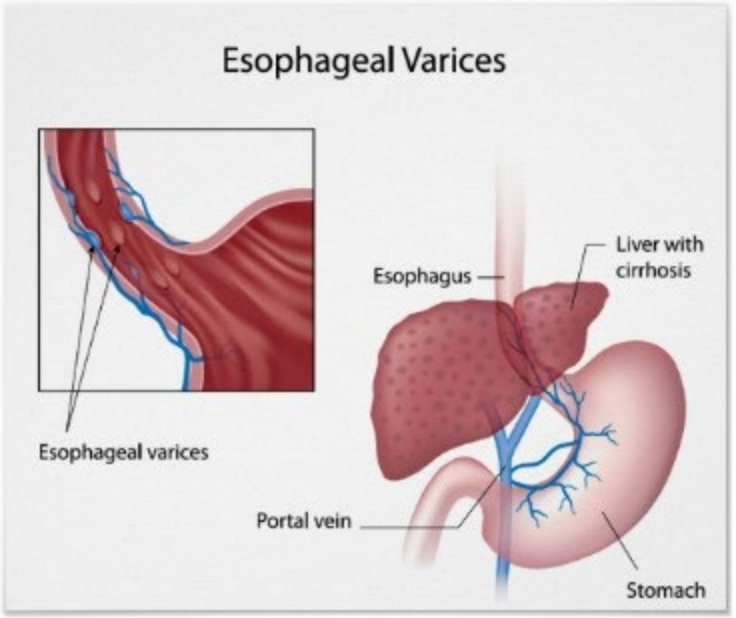
- With abstinence, the formation of new scar tissue subsides. Life expectancy depends upon the extent of the cirrhosis. It is suggested that those diagnosed with cirrhosis who continue to drink should say goodbye to their friends and write their wills.

The Heart

- It can affect the heart tissue itself, causing a condition called cardiomyopathy (or degeneration of the heart muscle). This causes an enlarged hear with weaker contracting muscles.
- It can cause cardiac arrhythmias – irregular heartbeats.
- A weak fatty heart combined with a loss of oxygen and irregular heartbeats leads to heart attacks, heart failure and strokes. Alcohol induced cardiomyopathy is reversible with abstinence in only about 30 percent of patients. *Up to half the deaths related to alcohol are associated to cardiac disease.*

The Vascular System





The Vascular System

- Alcohol causes hypertension! Three to four drinks per day will elevate blood pressure which can lead to strokes. In addition, alcohol affects magnesium levels in the brain causing brain blood vessel spasms. This is also a fatal combination. The spasms lead to more hypertension in the brain, busting vessels and causing strokes. Hypertension is simply increased pressure in the blood vessels. When the liver is damaged, the blood can't circulate well. Blood then backs up in the portal vessel which congests the portal veins in the liver. Pooling blood in the portal system, a weakened heart, and hypertension from drinking adds incredible pressure to those damaged veins, causing them to finally burst and explode. An example of this is esophageal varixes. As discussed earlier, chronic drinking damages the esophagus and weakens its blood vessels. This weakened vessel becomes "varicosed"; increase pressure backing up in the liver leads to increased pressure in the esophageal vein. This increased pressure actually causes this vein to explode and the person usually bleeds to death in a few minutes. Abstinence can't reverse the varicose vein, but it will lower blood pressure and prolong life.

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The Blood and Immune System

- Alcohol is toxic to bone marrow. Basically it interferes with the formation of red blood cells, causing "immature" cells to be developed instead of healthy red blood cells. These immature red blood cells don't carry oxygen well and anemia also results. In addition, alcohol destroys blood platelets which help the blood clot. Excessive bleeding and hemorrhages are common among alcoholics. Alcohol affects the immune system by altering the production and function of many of the "white cells", greatly reducing their ability to fight off infections. As a result alcoholics get sicker faster and stay sicker longer. Also, due to high risk behavior by reduced inhibitions, alcoholics risk higher exposure to the HIV virus. Because alcohol lowers the immune system, alcoholics are more prone to being infected when exposed.

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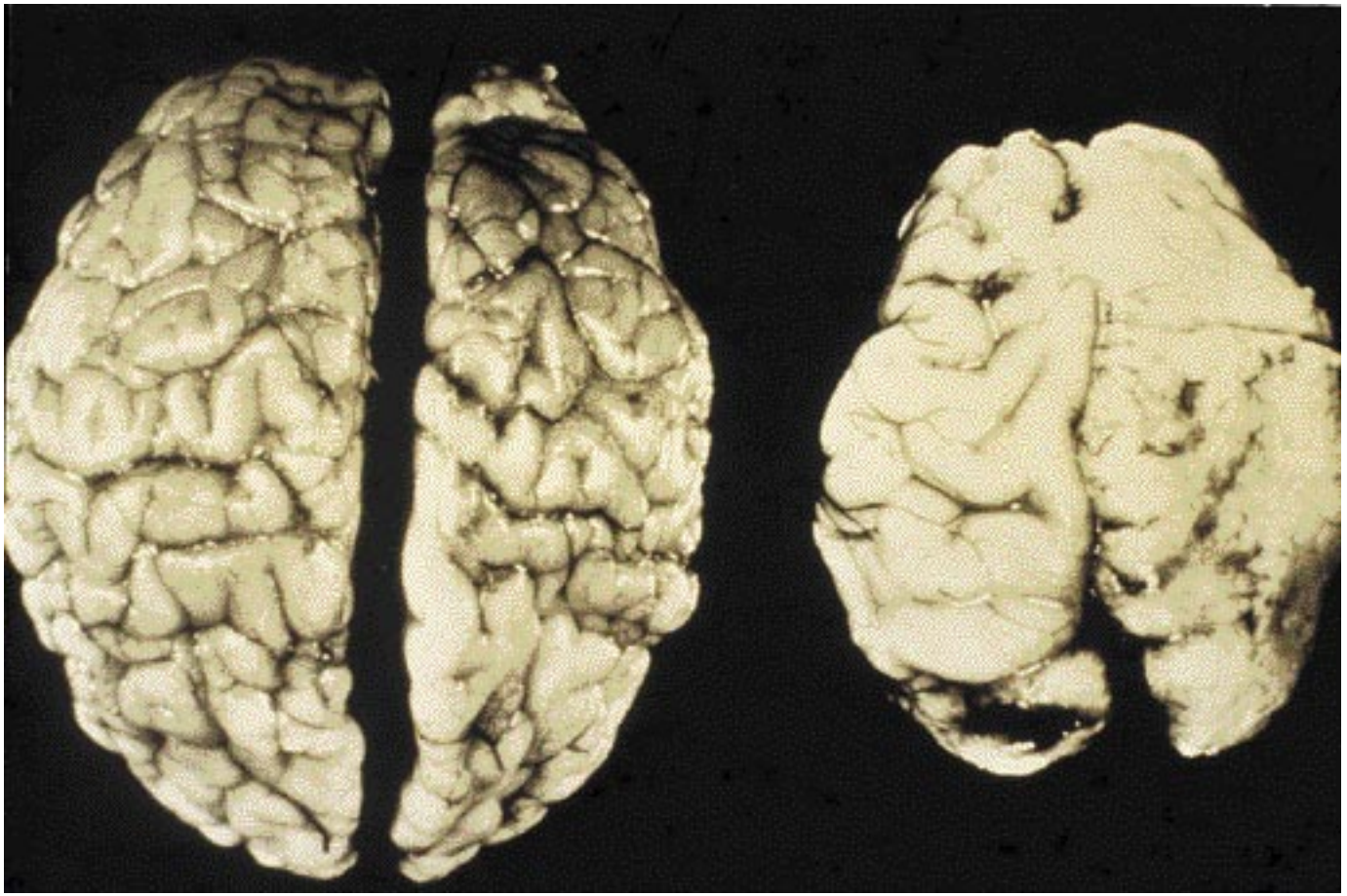
Endocrine and reproductive System

- Alcohol affects every endocrine (glands) organ. How this happens is still not clear, but chronic alcoholics show changes in their thyroid glands (which controls among other things the basal metabolic rate for the body). Alcohol affects the adrenal glands which are responsible for the production of steroids and adrenaline which helps us respond to stress and infection. It also affects the pituitary gland, the "master" gland which sends messages to these glands.

- Alcohol affects the reproductive system. Very common among alcoholic men are disorders stemming from alcohol such as: Impotence, low testosterone levels, low sperm count, and testicular atrophy, or shrinkage! Alcohol seems to affect women's reproduction functions. A few of the problems are pathological ovary changes, amenorrhea (absence or sparse menstruation) and problems with ovulation. Because alcohol suppresses hormone secretion, women alcoholics seem to have an earlier onset of menopause as well.

The Brain and Neurological System



The Brain and Neurological System

- Alcohol affects the brain and neurological system both directly and indirectly.
- Heavy drinking affects brain tissue – obvious examples are blackouts, hallucinations, and seizures.
- Alcohol directly affects the brain by causing change and deterioration in the brain cells.
- Alcohol indirectly affects the brain by causing damage to the other body organs which help the brain function normally, like the liver and the heart.

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The Brain and Neurological System

- Prolonged use of alcohol (5 – 10 years) begins to cause damage which affects the structure of the brain and nervous system. The brain is responsible for not only governing the body's functions, but is also the center for "human" functions – thinking, feeling, emotions, memory, etc. Even minor damage to the brain can have a major impact on a person's life.

- Fifty to seventy five percent of detoxed alcoholics show brain impairment: memory, problem solving, coordination, perception, and behavioral changes. Some of these are reversible with abstinence. The more severe the drinking, and the progression of the disease, the more structural changes happen in the brain and nervous system.

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The Brain and Neurological System

- **Peripheral Neuropathy** is a condition where nerve endings are damaged causing numbness or tingling in the fingers and toes.

- A CT scan of a chronic alcoholic's brain shows shrinkage in all areas of the brain, which is irreversible and indicates a much more severe impairment. Eventually this brain impairment develops into "organic Brain Syndrome" or "wet brain". There are two kinds of organic brain syndromes – alcoholic dementia and Korsakoff's psychosis. These individuals require constant care. Twenty percent of of mental institutions house these people at this stage of the disease.

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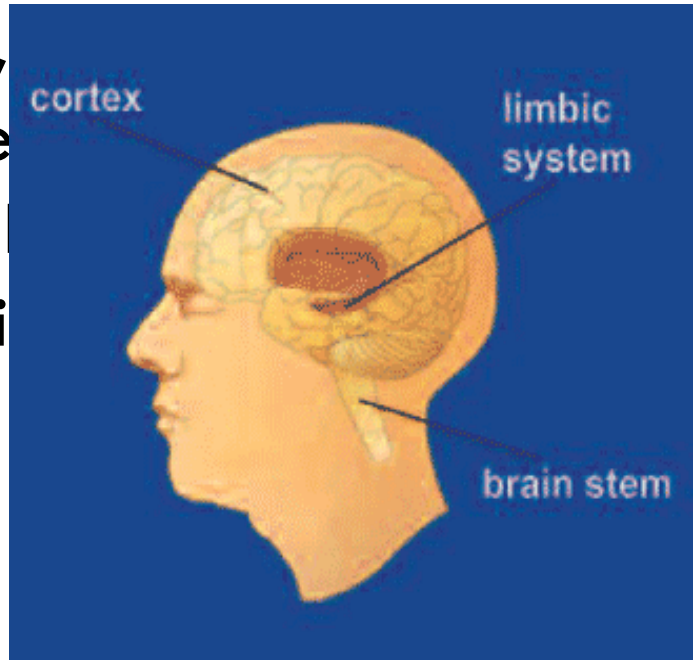
The Brain and Neurological System

- Addiction is a lot like other diseases, such as heart disease. Both disrupt the normal, of the underlying organ, have se consequences, and are preventa but if left untreated, can last a li
- Source: From the laboratories of H. Schelbert



- The brain is made up of many parts that all work together as a team. Different parts of the brain are responsible for coordinating and performing

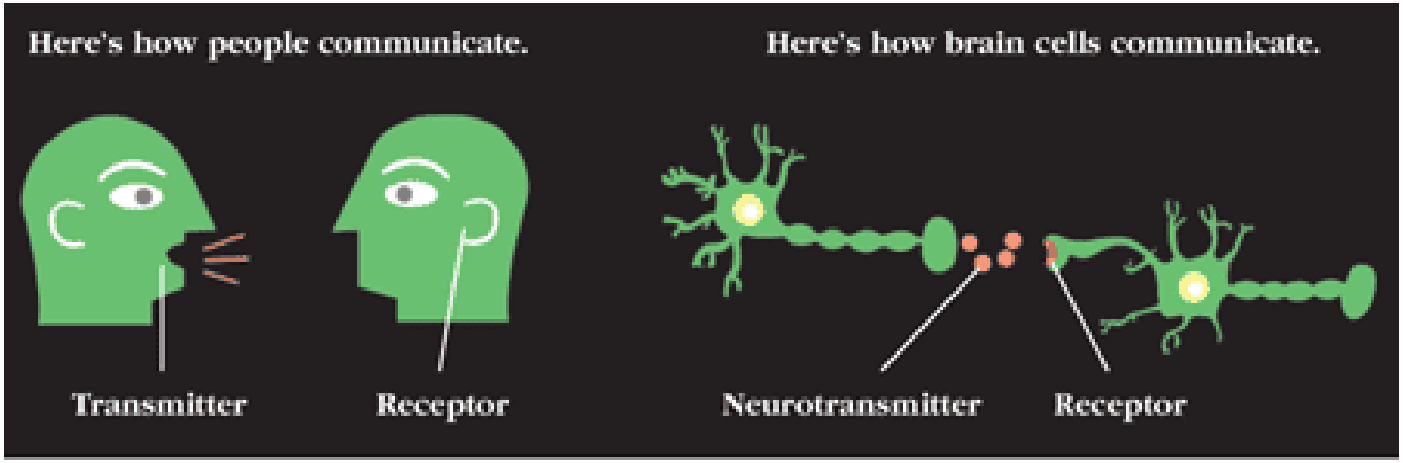
The Brain and Neurological System

- ***The brain stem***, which controls basic functions critical to life, such as heart rate, breathing, and sleeping.
- ***The cerebral cortex***, which is divided into areas that control specific functions. Different areas process information from our senses, enabling us to see, feel, hear, and taste. The front part of the cortex, the frontal cortex or forebrain, is the thinking center of the brain; it powers our ability to think, plan, solve problems, and make decisions.
- ***The limbic system***, which contains the brain's reward circuit. It links together a number of brain structures that control and regulate our ability to feel pleasure. Feeling pleasure motivates us to repeat behaviors that are critical to our existence. The limbic system is activated by healthy, life-sustaining activities such as eating and socializing—but it is also activated by drugs of abuse. In addition, the limbic system is responsible for our perception of other emotions, both positive and negative, which explains the mood-altering properties of many drugs.

The Brain and Neurological System

- How do the parts of the brain communicate?
- The brain is a communications center consisting of billions of neurons, or nerve cells. Networks of neurons pass messages back and forth among different structures within the brain, the spinal cord, and nerves in the rest of the body (the peripheral nervous system). These nerve networks coordinate and regulate everything we feel, think, and do.
- ***Neuron to Neuron***
  Each nerve cell in the brain sends and receives messages in the form of electrical and chemical signals. Once a cell receives and processes a message, it sends it on to other neurons.
- ***Neurotransmitters - The Brain's Chemical Messengers***
  The messages are typically carried between neurons by chemicals called neurotransmitters.
- ***Receptors - The Brain's Chemical Receivers***
  The neurotransmitter attaches to a specialized site on the receiving neuron called a receptor. A neurotransmitter and its receptor operate like a "key and lock," an exquisitely specific mechanism that ensures that each receptor will forward the appropriate message only after interacting with the right kind of neurotransmitter.
- ***Transporters - The Brain's Chemical Recyclers***
  Located on the neuron that releases the neurotransmitter, transporters recycle these neurotransmitters (that is, bring them back into the neuron that released them), thereby shutting off the signal between neurons.

The Brain and Neurological System

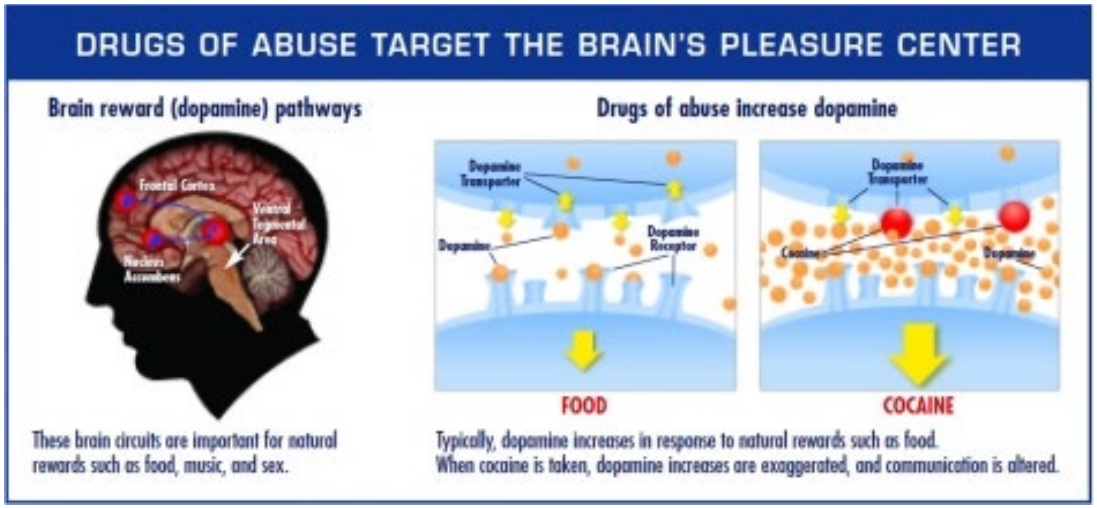


Concept courtesy: B.K. Madras

To send a message, a brain cell (neuron) releases a chemical (neurotransmitter) into the space (synapse) between it and the next cell. The neurotransmitter crosses the synapse and attaches to proteins (receptors) on the receiving brain cell. This causes changes in the receiving cell—the message is delivered.

The Brain and Neurological System

- Most drugs of abuse directly or indirectly target the brain's reward system by flooding the circuit with dopamine. Dopamine is a neurotransmitter present in regions of the brain that regulate movement, emotion, motivation, and feelings of pleasure. When activated at normal levels, this system rewards our natural behaviors. Overstimulating the system with drugs, however, produces euphoric effects, which strongly reinforce the behavior of drug use—teaching the user to repeat it.
- Displays how drugs of abuse target the brain's reward system by flooding the circuit with dopamine. Why are drugs more addictive than natural rewards?



The Brain and Neurological System

- When some drugs of abuse are taken, they can release 2 to 10 times the amount of dopamine that natural rewards such as eating and sex do. In some cases, this occurs almost immediately (as when drugs are smoked or injected), and the effects can last much longer than those produced by natural rewards. The resulting effects on the brain's pleasure circuit dwarf those produced by naturally rewarding behaviors. The effect of such a powerful reward strongly motivates people to take drugs again and again. This is why scientists sometimes say that drug abuse is something we learn to do very, very well.

The Brain and Neurological System

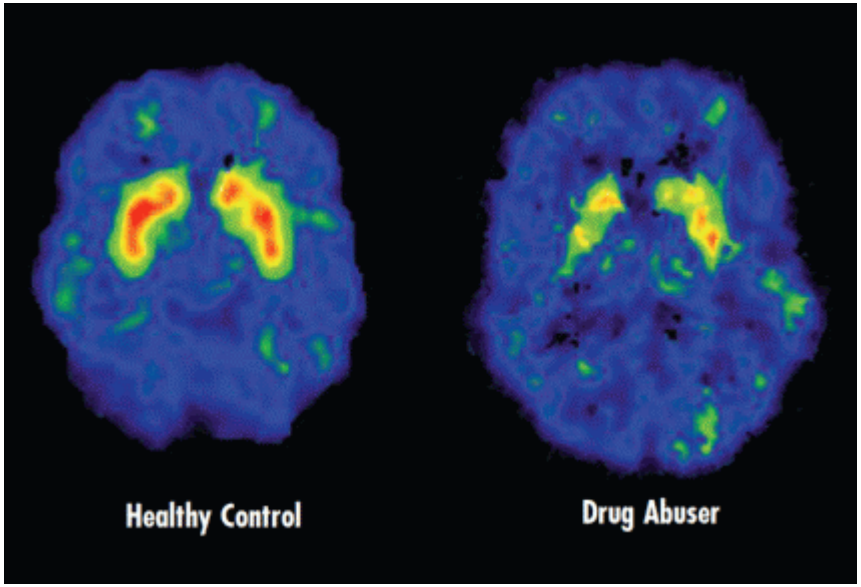
- What happens to your brain if you keep taking drugs?
- For the brain, the difference between normal rewards and drug rewards can be described as the difference between someone whispering into your ear and someone shouting into a microphone. Just as we turn down the volume on a radio that is too loud, the brain adjusts to the overwhelming surges in dopamine (and other neurotransmitters) by producing less dopamine or by reducing the number of receptors that can receive signals. As a result, dopamine's impact on the reward circuit of the

The Brain and Neurological System

How does long-term drug taking affect brain circuits?

- long-term drug abuse can trigger adaptations in habit or non-conscious memory systems. Conditioning is one example of this type of learning, in which cues in a person's daily routine or environment become associated with the drug experience and can trigger uncontrollable cravings whenever the person is exposed to these cues, even if the drug itself is not available. This learned "reflex" is extremely durable and can affect a person who once used drugs even after many years of abstinence.

Two brain scans. The first scan shows a healthy brain.
The second scan shows decreased dopamine transporters in the brain of a drug abuser



The Brain and Neurological System

- This brain-based view of addiction has generated substantial controversy, particularly among people who seem able to think only in polarized ways. Many people erroneously still believe that biological and behavioral explanations are alternative or competing ways to understand phenomena, when in fact they are complementary and integrative.
- Modern science has taught that it is much too simplistic to set biology in opposition to behavior or to pit willpower against brain chemistry. Addiction involves inseparable biological and behavioral components. It is the **quintessential bio-behavioral disorder.**
- **Many people also erroneously still believe that drug addiction is simply a failure of will or of strength of character. Research contradicts that position.**
- **Responsible For Our Recovery**
  However, the recognition that addiction is a brain disease does not mean that the addict is simply a hapless victim. Addiction begins with the voluntary behavior of using drugs, and addicts must participate in and take some significant responsibility for their recovery. Thus, having this brain disease does not absolve the addict of responsibility for his or her behavior. But it does explain why an addict cannot simply stop using drugs by sheer force of will alone.

Medical Aspects of Addiction

Resources

- http://www.addictionrecoveryguide.org/articles/
- https://www.drugabuse.gov/publications/drugs-brains-behavior-science-addiction/preface
- **Groups** - A Manual for Chemical Dependency and Psychiatric Treatment, John Olesen, Joanne Fallon, Louise Mark, CL productions Santé Fe NM 1993