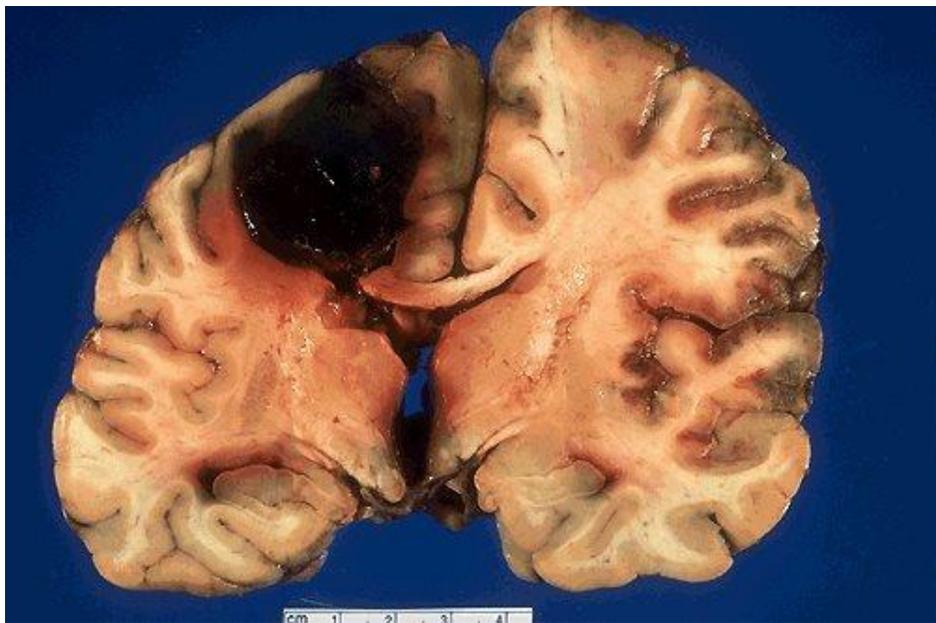
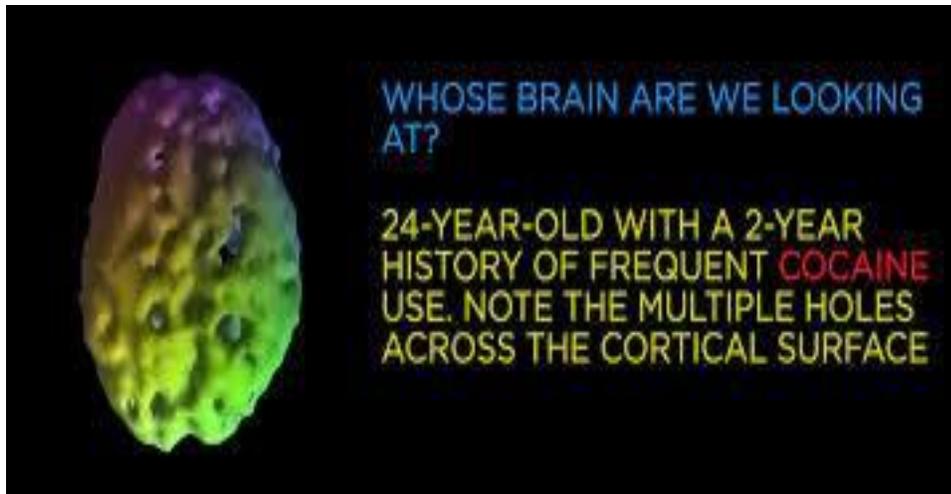


**Daily Life with Christ-75: Understanding brain addictions (14). Psychoactive drugs: how cocaine changes the brain.**



Our consideration of brain addictions that are caused by psychoactive drugs has taken us to a look at the hardest and most dangerous drugs—those drugs that do the most devastating damage to the brain and thus human life. This article covers cocaine.

The psychoactive drug cocaine is also known as a psychostimulant, aka an “upper.” This is because it produces a feeling of excitement, euphoria, increase alertness and focus, and decrease fatigue and appetite.

Like many other drugs of abuse, cocaine comes from a plant. It comes from the coca plant, which is prevalent in the countries of Colombia, Peru, and Bolivia in South America. And just like caffeine and nicotine, cocaine is thought to act as a natural insecticide for the coca plant, to prevent bugs from eating it.

People who live where the coca plant grows have eaten the coca leaves for thousands of years for its stimulating effects. However, cocaine eaten this way reaches the brain slowly over a long period of time, so the effects are much milder than snorting cocaine powder or smoking cocaine in the form of crack. In the mid-1800s, German scientists isolated cocaine in its pure form, and its use (and abuse) really took off. By the 20th century, people began to realize just how addictive and harmful cocaine was.

Cocaine comes in a number of different forms. The most familiar is probably cocaine powder, which is a water-soluble salt called cocaine hydrochloride. This form of cocaine is often snorted. In the 1970s, some users began treating cocaine powder with chemicals and freeing the cocaine base from the hydrochloride salt in a process called freebasing. The resulting freebase cocaine melts at a lower temperature, which means it can be smoked—and this gets the cocaine to the brain faster and produces a much more intensive high. However, freebasing also involved the use of highly flammable dangerous solvents. About 1980, a dried, hardened version of cocaine called crack cocaine appeared. Crack cocaine can also be smoked, leading to a similar very intense high, and this produced does not involve the use of flammable solvents.

Cocaine is called a psychostimulant because it stimulates the nervous system. This stimulation has some “positive effects.” It reduces fatigue, increases alertness, and produces feelings of excitement and euphoria. Unfortunately, the negative consequences are horrendous. In addition to the stimulating psychological effects, cocaine also constricts blood vessels, meaning that less blood can reach critical organs, such as the brain and heart, resulting in strokes and associated with brain damage and heart attacks.

Chronic stimulation also can lead to psychosis, including vivid hallucinations and delusions. The user often experiences extreme paranoia and delusions of being followed or persecuted. Users also commonly claim that they feel imaginary insects burrowing under their skin, so they compulsively pick and scratch at themselves. As a result, they often have scars and lesions all over their body.

As far as the brain, psychostimulants directly increase dopamine levels in the brain. As we have noted in previous articles dopamine plays the central role in craving and addictions. Nicotine, alcohol, and marijuana all lead to the release of dopamine, but these other drugs do so indirectly. Psychostimulants, however, increase dopamine levels directly, which is why they are the most abused drugs in the world.

Most of the drugs we have studied thus far work by mimicking the action of naturally produced chemicals in the brain and bind to receptors—either blocking or activating the receptors. But psychostimulants work differently. Rather than binding to receptors, psychostimulants affect the cell’s transporters. Rather than sucking the dopamine out of the synapse, the transporter molecules are now spraying dopamine back into the synapse, resulting in much higher levels of

dopamine than normal. Cocaine can lead to double the normal amount of dopamine in the synapse, and methamphetamine (which I will examine in the next article) can produce a tenfold increase in dopamine levels. This is why cocaine and methamphetamine are among the most addictive drugs in the world, especially when they are smoked or injected.

Cocaine addicts often exhibit bingeing behavior with psychostimulants. After taking an initial dose, they experience an intense high and euphoria, but as soon as that high starts to wear off, they administer another dose to try to keep the high going and avoid coming down. They might repeat this cycle for days without eating or sleeping until they finally run out of the drug or crash from exhaustion.

As noted with other brain addictions (including junk food, which I will cover in a later article), three areas of the brain are physically changed in an addictive brain: (1) the nucleus accumbens (pleasure center), (2) the VTA (dopamine producer), and (3) the prefrontal cortex (thinking center). However, with harder drugs like cocaine, there is more than abnormal firing along with more significant brain damage. For example, studies have shown that rats that have used cocaine for a month experience significant changes to the structure of the prefrontal neurons. In particular, the dendrites of the neurons (which receive inputs to the neuron) were actually misshapen in rats which were fed cocaine.

Likewise, neuroimaging studies in humans have found reduced activity in the prefrontal cortex of those who have used cocaine. In fact, even the volume of the prefrontal cortex is reduced in addicts. As we have noted, the prefrontal cortex is the logical, rational circuit that understands consequences and that inhibits inappropriate behavior. However, with drug abuse, it does not work as well as it normally does and therefore has a hard time overcoming the increasingly powerful urges coming from the reward circuit. Essentially, the drug addict's ability to exhibit self-control and override drug craving becomes weaker and weaker.

As far as treatment, there are no pharmacological treatments; although scientists have been working on vaccines that could train the body's immune system to recognize and attack cocaine before it reaches the brain. The idea is that even if an addict falls off the wagon, much less of the drug would reach the brain, and he would not experience the normal high.

The only treatment for cocaine abusers is cognitive behavioral therapy—e.g., Cocaine Anonymous. The fact that the only treatment is behavioral underscores the biblical emphasis on the truth that what we actualize in our lives becomes what we are—actions develop into habits. It is not just thinking about this or that that actually changes us. It is when we act on those thoughts that make us who we are; again, it is what we do that creates the habit for more of the same. This fits perfectly with the mandates of Scripture to “put on the Lord Jesus Christ, and make no provision for the flesh in regard to its lust” (Rom. 13:14)—“no means no.” If we make no provision, we will avoid so many problems caused by actualizing illicit behavior, which will always undermine both our freedom and virtue.

Let us redouble our efforts to live in the freedom and the happiness of that freedom by putting on the Lord Jesus Christ, and in so doing avoid those pernicious illicit fleshly lusts. We are born again to be free and to be filled with the joy of the Lord—we do not need drugs to stimulate our nucleus accumbens. Christ Himself offers us His own eternal joy, fulfilled in us: John 15:11, "These things I have spoken to you, that My joy may remain in you, and that your joy may be full."

In His Grace,

Pastor Don