BRAIN RESEARCH SUCCESS STORIES

Opiate Addiction

Making a Difference Today

The abuse of illegal and legal opiates, including heroin and prescription pain relievers, is a serious global public health problem. Between 750,000 to 1 million people in the United States are addicted to heroin, according to the Office of National Drug Control Policy. What's more, an estimated 30 million people aged 12 or older have used opiate prescription pain relievers, such as OxyContin and Vicodin, inappropriately in their lifetime.

Opiates can be highly addictive, causing strong cravings, tolerance, and dependence that overpower the user's ability to stop taking the drugs on their own, even in the face of devastating consequences. Chronic opiate use can lead to infectious diseases like HIV/AIDS (through the reuse of needles), fetal complications, crime, death, and disruptions in family, work, and education.

Drug abuse costs American society an estimated $180 billion a year, including health care, reduced job productivity, and crime, according to the Office of National Drug Control Policy.

Research Leads to Better Understanding

Thanks to years of continued research, scientists have learned more about opiates and how they act in the brain.

One of the first major breakthroughs in opiate addiction came in the 1970s, when scientists supported by the National Institutes of Health (NIH) discovered the brain's own opiates and opiate receptors, specialized proteins located on the surface of cells in the brain, spinal cord, and gastrointestional tract, where opiates bind and cause reactions.

Scientists then found that opiate receptors are concentrated in areas of the brain that control pain and emotions. Drugs that bind to opiate receptors in the reward centers of the limbic system—the region of the brain that regulates emotions—enhance the release of the brain chemical dopamine in another brain area called the nucleus accumbens, according to research. This results in a flooding of dopamine in the brain, which produces a "high" of pleasure and relaxation and can begin to initiate the addictive process. Opiates also act independently of dopamine by directly producing dopamine-like effects on these same brain areas.

Scientists later discovered that long-term opiate use changes the way nerve cells in the brain work. Tolerance occurs when these cells need more of the opiate to work normally. If the opiate is removed, the cells become overactive and the user experiences withdrawal symptoms, such as aching, fever, sweating, and chills.

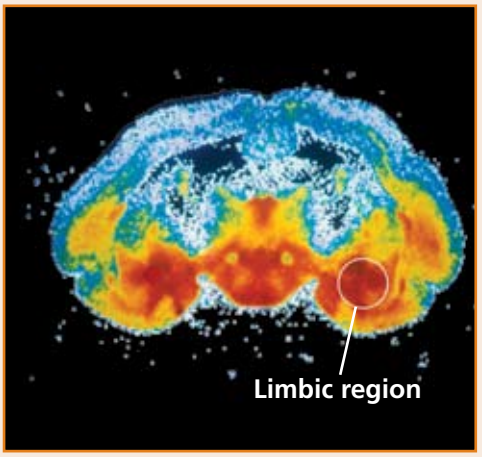
Research Leads to Better Treatments

Fortunately, NIH-supported research has helped scientists generate a growing list of treatments to help those addicted to opiates stay drug-free.

After more than a decade of NIH-supported animal and human research, buprenorphine became one of the daily-administered medications most recently approved—in October 2002—to treat opiate addiction. With the help of the opiate receptor discovery, researchers determined that buprenorphine worked like a treatment already available, termed methadone, by activating opiate receptors and mimicking opiate drugs of abuse. Receptor-activating medications can help relieve drug cravings and control a person's addiction. Buprenorphine, however, causes a weaker effect on the receptors than methadone and heroin, and creates only a limited high, which deters an addict from abusing the medication itself.

Other medications developed for the treatment of opiate addiction after years of NIH-supported research include naltrexone, which blocks the pleasurable effects of heroin without sustaining or producing opiate dependence, and clonidine, which reduces some opiate withdrawal symptoms.

Although opiate medications help many addicts, they do not help everyone. More research is needed to develop better medications that will aid more people in overcoming opiate addiction.



This image shows the distribution of opiate receptors in a portion of the guinea pig brain with red showing where the highest density of receptors lie. Research indicates that opiate drugs create their alluring effects by attaching to these special cell areas, particularly in the brain's reward centers. Activity in the circled region above, as well as areas in front of it, are thought to create pleasurable feelings that make a user want to use the drugs again and again.

Continued funding for research could lead to:

- Improved medications that help more opiate addicts stay drug-free, including longer-lasting medications and medications that target receptors involved in stress responses.
- Increased knowledge of other addictive drugs and how they affect the brain.
- A better understanding of pain processes in the brain and spinal cord and of how to treat pain.

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Opiate Addiction

Making a Difference Tomorrow

Through research to understand how opiates act in the brain, scientists were able to develop medications to treat opiate addiction, but more information and better treatments are needed.

Did you know that:

- Between 750,000 to 1 million people in the United States are addicted to heroin, and an estimated 30 million people aged 12 or older have used prescription pain relievers, such as OxyContin and Vicodin, inappropriately in their lifetime.
- Drug abuse costs society an estimated $180 billion a year, including health care, reduced job productivity, and crime.
- Opiates can be highly addictive, and can lead to infectious diseases like HIV/AIDS (through the reuse of needles), fetal complications, crime, death, and disruptions in family, work, and education.

Research Improves Treatments

Improvements on currently available medications come from human research supported by the National Institutes of Health (NIH) and include new types of long-lasting medications in the form of tiny, injectable capsules that dissolve or implants under the skin. The medication in these capsules and implants is released over four to six weeks into the bloodstream, where it slowly and consistently travels to the brain.

These longer-lasting forms of medication work similarly to taking a pill—they bind to opiate receptors to block withdrawal symptoms and to block the effects of taking opiate drugs like heroin and painkillers—but their therapeutic benefits work for weeks with just one administration.

Recent NIH-funded human studies have shown that injectable buprenorphine is safe and effective and blocks the effects of opiates for six weeks, and initial human studies on buprenorphine implants have shown that medication from one implant can be delivered for up to six months. New research on injectable naltrexone has shown that a monthly injection blocks the opiate receptors and heroin's effects for three to six weeks, and human studies on naltrexone implants also show promise.

The advantages of sustained-released medication are a decrease in abuse potential, because there are no take-home, daily medications, and more cost-effective treatment, due to an increase in compliance with taking medications and a decrease in clinical support with fewer clinical visits.

Another promising therapeutic target for opiate addiction medications is the corticotrophin releasing factor (CRF) receptor. CRF regulates stress responses to emotionally charged and aversive events and situations. Drug withdrawal syndromes themselves are aversive or stressful states. Recent NIH research has shown that medications that block CRF soothe several withdrawal symptoms in opiate-dependent rats and mice. These findings indicate that CRF-related medications could alleviate opiate withdrawal, reduce aversive responses to stressful events, and decrease stress-related relapses to opiates.

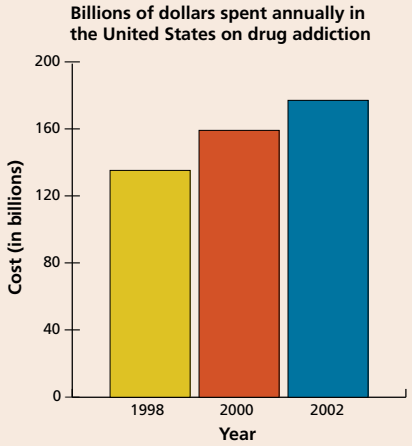
Hope For Other Disorders

Understanding how opiates cause addiction can lead to greater insight into the brain processes of addiction to other dependence-producing drugs, and to discovering how to prevent dependence from occurring.

Also, research into opiate addiction can increase understanding of the brain networks involved in pain, as opiates and opiate receptors in the brain and spinal cord are involved in pain processes. With a better knowledge of addiction and of pain—another urgent public health issue—scientists can develop specific medications to treat these distinct disorders.

Only continued funding for research will help develop better treatments that are selectively targeted, helping more addicts to stay drug-free.

For more information please e-mail brss@sfn.org.



Over the years, the abuse of drugs—including heroin and prescription pain relievers like OxyContin and Vicodin—has cost American society more and more. The latest estimate is $180 billion a year, including health care, reduced job productivity, and crime.

Already research has led to:

- A greater understanding of how opiates and opiate receptors work in the brain.
- A better comprehension of the opiate addiction process, including how chronic opiate use affects the brain.
- Medications, like buprenorphine, that help some addicts overcome opiate addiction.

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