CalQuits

# The Science Behind Nicotine Addiction

> Addiction: Habitual psychological and physiological dependence on a substance or practice which is beyond voluntary control. - *Stedman's Medical Dictionary*

Today, the medical community considers smoking worse than a bad habit. Research indicates that most smokers continue to do so because they are addicted to the nicotine in cigarettes.[1]

## Nicotine Addiction[2]

Nicotine causes brain changes that make people want to use it despite deadly consequences.

- Within seconds smoking sends nicotine to the brain starting a series of biochemical reactions causing the release of dopamine, giving a feeling of pleasure and calm.
- Between cigarettes, the level of dopamine declines and the smoker starts to experience withdrawal symptoms. The brain craves nicotine to release more dopamine to bring it back to a level of pleasure and calm.
- Another cigarette will start the dopamine release.

Nicotine is one of the hardest substance use dependencies to break. Cigarette smoking is a cycle of craving, smoking, calming, and craving.

- Within hours of the last cigarette, withdrawal symptoms can begin. These symptoms include lightheadedness, anxiety, sleep disturbance, poor concentration, increased appetite, depression, restlessness, irritability or aggression, and craving for nicotine.
- Nicotine addiction is stronger than logic and reason.

## Most Smokers Want to Quit but Relapse

- Smoking statistics from the US Department of Health and Human Services show that approximately 70% of current smokers report that they want to quit.
- Fewer than 7% of smokers who try to quit remain smoke-free for 1 year after quitting.
- Experts agree that smoking is a chronic, relapsing condition. Nicotine addiction has a mechanism of action (MOA) similar to that seen in cocaine. For most smokers, the compounding effects of behavioral, psychological, and physical triggers make overcoming their addiction extremely difficult.

## The a4ß2 Receptor

- Scientists have identified a specific nicotinic acetylcholine receptor (nAChR) in the brain that is believed to act as a primary mediator of the addictive properties of nicotine—the $a_4ß_2$ receptor. The isolation and characterization of this receptor is a significant advancement in the understanding of the neurobiology of smoking addiction.

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[1] Smoking nicotine meets the four criteria the Surgeon General has used to define addiction:

1. Addiction leads to compulsive use, despite adverse consequences
2. Addiction involves a psychoactive substance with reinforcing properties
3. The addicted subject develops tolerance
4. An addictive substance causes physical dependence, as evidenced by withdrawal and relapse

[2]

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