

How can science help smokers to quit?

September 28 2015, by Robert West



Craving for cigarettes plays a crucial role in driving people back to smoking when they try to stop. I want to explain what we think causes it and how best to deal with it to improve the chances of becoming an ex-smoker.

To the [brain](#), the [nicotine](#) found in tobacco products looks a lot like a chemical 'messenger' known as acetylcholine, which transmits signals

between nerve cells in certain parts of the brain.

We're particularly interested in an important part of the brain known as the ventral tegmental area, or VTA, right down deep in the midbrain. We've known for many years that this is important in controlling behaviour, and it's packed with nerve cells that respond to acetylcholine.

When a person inhales smoke from a cigarette, nicotine is absorbed very rapidly through the lining of the lungs into the bloodstream, leading to a spike of nicotine hitting the receptors on the nerve cells in the VTA. This makes the brain think something fantastic has happened – it doesn't realise all you've done is smoke a cigarette – and it causes a surge of activity in that part of the brain.

As a result, these cells release a second chemical – dopamine – which is a very important neurotransmitter that effectively makes the brain think "That was good – do it again!" So next time you're in a similar situation, you experience an impulse to smoke.

This process is entirely non-conscious, and smokers do not have to actively experience any pleasure for these connections to form – it's all driven by brain chemistry. When people first smoke their initial experience is usually pretty horrible – they cough, splutter and feel sick – but the brain doesn't care about that. It still thinks it was a good idea, and strives to get that rapid nicotine hit again.

Cues, hunger and withdrawal

There are several things going on in a smoker's brain that add up to a powerful urge to keep smoking.

First is something we refer to as 'cue-driven' or situational [cravings](#). After a smoker's first cigarette their brain chemistry changes just a little

bit. Then they do it again, and again, and again, so this pathway becomes very strongly established. In a matter of months, smokers find that when they're in certain situations where they normally smoke, or exposed to certain cues, that they experience a powerful urge to smoke.

Often smokers say: "Well, I don't need to smoke when I'm on a plane or in the supermarket, therefore I can't be addicted." But actually they probably are – nicotine makes them crave a cigarette in situations when they would usually smoke.

But there's more to cigarette addiction than these situational cravings. After smoking for a while, the pathways in a smoker's brain change so that their [nerve cells](#) don't produce enough dopamine unless they've got enough nicotine in their system. For heavy smokers, if their brain is not topped up with nicotine they experience what I call nicotine hunger, which can add to the cue-driven cravings.

Then there are the withdrawal symptoms that smokers experience when they stop – such as irritability, depression, anxiety, problems concentrating, increased appetite and restlessness. These are ways in which the brain is being disturbed by the fact that it is used to having nicotine and it doesn't have it any more.

And then of course there is the psychological side of things. Smoking can be part of bonding with others and smokers can come to believe strongly that nicotine helps them concentrate or cope with stress. So it's easy to see why smokers often find it hard to stop.

Combating cravings – what the science says

We know an awful lot about how to break this cycle of addiction, and if only people would use what we know already, there would be far fewer smokers. One of the big challenges is not necessarily to discover better

ways of beating the cravings, but getting people to use the ways that we already know are effective. I've put all of this information into a book called "[The SmokeFree Formula](#)", which is a distillation of 40 years of research into how best to stop smoking.

The moment a smoker has his or her last cigarette, the clock starts ticking as the brain realises it's not getting any more nicotine. This gets worse over the first few hours and days, but then it starts getting better. So if you can just make sure that you don't have a cigarette for long enough, the cravings all but disappear. The key thing is to do as much as you can in the first few weeks and months to avoid falling off the wagon and having another cigarette.

Of course, some people quit smoking quite easily, but that's not the norm. Most people have to find a solution to the problem of craving. And that's where science can help.

Just about everyone has heard of [nicotine replacement therapy](#) (NRT), including gum, patches, nasal spray, and lozenges. Most of these deliver nicotine to the brain more slowly than regular cigarettes and they are far less addictive. Smokers typically use them for up to 12 weeks and then find it quite easy to stop – others need to use them for months or, very rarely, for years.

One thing to note about nicotine replacement therapy is that when people just buy products from a shop they don't use them properly – tending to use too little and stop too early, which severely limits their effectiveness. Also users should try a skin patch plus one of the faster acting products, such as gum, rather than one thing on its own.

There has been a lot of debate about e-cigarettes. We find that these can be effective in helping smokers to stop but it might not be helpful to smoke and use e-cigarettes at the same time. It's early days, but the best

e-cigarettes seem to be the ones that use a refillable cartridge so users can more easily adjust the nicotine dose to their needs.

Then we have prescription drugs. The most commonly used one – which also gives best results – is varenicline (Champix).

To the cells in the brain, varenicline looks very similar to nicotine. It blocks the acetylcholine receptors, helping to reduce cravings, but it also stops nicotine itself from binding. This means that if someone taking the drug has a lapse and smokes a cigarette, there is nowhere for the nicotine to attach.

Like any drug, varenicline has side effects. Some people feel quite sick to begin with, and it can cause sleep disturbance but – based on current research – it's the most effective pharmacological aid to stopping smoking. But a nicotine patch plus a faster acting nicotine product can give similar results if used properly.

Aside from drugs and NRT, we also know that expert advice and support is very effective in helping people to quit. We're very fortunate in the UK to have a national network of stop smoking services which combine such behavioural support and practical advice with drugs and nicotine replacement therapy. Success isn't guaranteed, but it can give smokers the best chance of quitting.

But there are also several things people can do themselves that are proven to combat cigarette cravings. For example, we found that even just going for a walk is enough to cut the urge to smoke. And although people might not be in a situation where that's possible, even just tensing and relaxing your muscles for a few minutes actually has quite a big effect on reducing cravings.

Breathing exercises can also help. One of the ones that we have tested is

abdominal breathing, used in yoga. You simply breathe in for a certain amount of time, usually about five seconds and then breathe out slowly – the key thing is that you do it with your abdomen, so your chest isn't moving but it's your tummy going in and out.

The crucial thing smokers need to know is that it doesn't matter how many times you've tried in the past to give up, it makes no difference to your chances of success the next time. It's really like rolling dice – you might strike it lucky the first time or it could be the second time, the third, fourth or twentieth time.

Why it matters

It's vital that Cancer Research UK funds research into understanding why people smoke and how best to quit. Smoking is by far the biggest preventable cause of cancer in this country, and the leading preventable cause of premature death – and we all know that prevention is better than cure.

Even though we've been very successful in getting smoking rates down below 20 per cent, we're still losing hundreds of thousands of human lives every year across the whole of the UK. On average every person who dies from a smoking-related disease is losing 10 years of their life.

Not only are [smokers](#) dying younger, but even if they're not killed by their habit, many lives are made miserable by lung disease, heart disease and other preventable health problems. The cost of smoking is enormous to society and to individuals.

Cancer Research UK puts huge resources into helping find better ways of treating cancer, but if we can stop people getting that cancer in the first place then that's even better. Helping people to stop [smoking](#) is the best way of doing that.

Provided by Cancer Research UK

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