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Ask a Scientist: Why do pain meds make you loopy?

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Courtesy of The University of Tennessee, Knoxville.

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Painkillers are something that, for better or worse, we are all too familiar with.

You've probably had some experience with them, maybe from some minor surgery like wisdom teeth removal. After the surgery, you wake up, and a nurse confirms you're reasonably conscious before plopping you in a wheelchair and sending you home.

In the car, your designated driver might hear you say some pretty ridiculous things. Maybe you reveal a secret obsession with squirrels or start pondering about the philosophical nature of reality. Maybe you catcall at every stranger you pass by or repeatedly ask to sit in your companion's lap. Whatever you do, it's probably because the doctors pumped you full of pain medication both during and after the surgery.

Then you get home and things start making a little more sense, but you realize that the pain medication they gave you at the doctor's office is starting to wear off. Wow, it hurts. You quickly ask for one of those prescription-strength painkillers, and the next few days are a blur of sleep, pain and maybe some more really weird behavior. You might not even remember a lot of it!

So, why do we have these embarrassing reactions to pain medication? What is it about pain killers that make us loopy?

Most prescription pain medications are opiates, which stem from — you guessed it — opium. Yes, opium, the drug referenced in “opium dens” and the “First Opium War.” Opium and opiates act on a special receptor in the brain that's usually activated by endorphins, which are the same chemicals in the brain that give us “natural highs.” Exercise is one thing that causes a release of endorphins in the brain, which is why there's such a thing as a “runner's high.” Our brains use endorphins as part of the reward system — whenever something makes us feel good, it's because of the activity of endorphins in the brain.

Let's think about what feeling “good” really means. Usually when we feel good, we are relaxed. Physically, this means our muscle tension is reduced along with our heart and breathing rates. When we feel good, we also usually aren't in pain. Endorphins work to accomplish all of those things: they reduce our blood pressure, muscle tension, breathing rate and pain sensitivity. They also give us feelings of peace and well-being, a so-called “euphoria.”

Opiates are pain medications because they work like endorphins, but they are much more effective. Ultimately, these drugs inhibit brain activity. When it comes to pain, opiates stop its signals from reaching our brain so that we aren't aware of whatever is hurting us. This is the intended effect of pain medications, but because pain medications mimic endorphins, they have a lot of side effects, like intense feelings of well-being, confidence and relaxation.

The mechanism of these side effects can fully explain all of your weird experiences with pain killers. You see, endorphins and opioids are tricky because although they decrease brain activity, they usually also decrease the activity of brain cells which inhibit other things.

This is one of the ingenious tricks of your brain. Most cells in the brain, without any input at all, will fire at a relatively constant base rate. To make it easy to fine-tune this activity whenever necessary, a lot of brain cells also have other brain cells that constantly inhibit them.

That way, all the brain needs to do is increase or decrease the activity of the inhibiting cells, and the activity of their target cells will also increase or decrease. This means that neurons won't ever become overactive, because they won't surpass their base firing rate. That presents a distinct benefit, since surpassing that rate could kill the neurons.

In this round-about way, endorphins and painkillers decrease the built-in regulations your brain has on your emotions, impulsivity, memories and muscle activity. In small amounts, such as with natural endorphins, a little less regulation causes you to feel just a little better, like during a runner's high. With painkillers, however, the regulation gets completely out of whack. Instead of just feeling "better-than-average," your thoughts, emotions and behaviors get completely out of whack too.

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