The Case of the Frozen Addicts

On July 16, 1982, a prisoner woke only to find himself to be "frozen", in quite the literal sense. He was taken to River Valley Medical Center, where he saw Dr. J. W. Langston and Dr. Ballard. Dr. Langston and Dr. Ballard found that while the patient was unable to move his body, he could follow the sight of the doctor's finger moving in front of him with his eyes. His body didn't work, but his brain still did. The only thing Dr. Langston could compare this peculiarity to was an illness by the name of Wilson's Disease. According to the Mayo Clinic, "In Wilson's disease, copper isn't eliminated properly and instead accumulates, possibly to a life-threatening level. Symptoms include swelling, fatigue, abdominal pain, and uncontrolled or poorly coordinated movements." But in reality, this unusual ailment was much closer to a more well-known disorder, Parkinson's Disease. In Parkinson's, one slowly loses the ability to move, as a sort of "stiffness" sets in. Just like in the case of the patient, who had awoken to find that his body was stiff, and he was unable to move. They found that they were able to communicate with the patient through writing(this part isn't exactly explained, but I'm assuming it's like in the case of Lock-In Syndrome), and through that, they discovered he was a heroin addict. Long story short, through some hospital and police work, they discovered that not only the patient in Dr. Langston and Dr. Ballard's care, but several other addicts had taken a bad batch of heroin made on the streets. All were suffering similar symptoms of near-total paralysis, burning sensations, freezing up, shaking in the right hand, and the inability to speak. According to Dr. Langston, the patients were manifesting all of the signs of Parkinson's disease. Due to this revelation, Dr. Langston ordered all the "frozen patients" to be given the same treatment as Parkinson's patients, which included the drug prescribed to those diagnosed with Parkinson's, Levodopa. Once they were given Levodopa, the frozen patients were all essentially revived, slowly regaining their ability to move again. It was a miracle, but why did Levodopa work? In sufferers of Parkinson's, the cells make dopamine die too quickly, leaving the person with a substantial lack of dopamine in the brain. If you don't have enough dopamine, the process of movement can't be completed. You can envision yourself moving, the brain can order your body to move, but your body won't move, because it can't without dopamine. Levodopa replaces the lack of dopamine in the brains of Parkinson's patients, so the problem with the frozen patients must have been a lack of dopamine. But if the cause was the heroin taken by the patients, why weren't all the heroin addicts showing up in the ICU? It turns out that whatever the patients took wasn't heroin, but

closer to pure MPTP. Back in the 80s, there was a spike in drugs on the streets, which eventually led to the creation of "designer drugs", or synthetic drugs. Designer drugs were made in a lab, and not derived from any natural objects like plants. These drugs were purely chemical and created in underground labs. Because they were usually so chemically distinct(structure-wise), they couldn't be classified as illegal, since technically, they weren't any of the illegal drugs. What the frozen patients had all taken was a designer drug based on heroin, and it was all from the same batch too. The doctors concluded that something in the synthetically made heroin had passed over all other parts of the brain and specifically destroyed the part of the brain that produces dopamine, the substantia nigra. Through a series of miraculous discoveries(plus a chemist named Ian Irwin), they found that the designer drug was most likely MPTP, a product of MPPP, which was similar to heroin, but easier to make in a lab. When a drug dealer(maker? Would they be one in the same or separate entities? I don't know, let's assume they're always the same person for simplicity) wants to make heroin in his underground lab, it's only logical to choose the cheaper, easier to make option, MPPP. MPPP, as I've already said, was similar to heroin, so similar in fact, that it could be made and marketed as heroin on the streets. This is exactly what the man who had made the frozen patient's heroin had done, or at least, tried to do. You see, MPPP doesn't cause the symptoms seen in frozen patients, but one of its side products does MPTP. This information is known thanks to Barry Kidston, who made and tested MPTP on himself(accidentally), causing scientists to look into the incident. Through a series of tests, they discovered that not only did MPPP only have a temporary paralysis effect on mice but that the chemical mixture Barry had taken was most likely MPTP, not MPPP. MPTP would not be tested in animals for several years after the fact, but when it was, a shocking discovery was made(well, it wasn't very shocking to one of the scientists onboard). MPTP did not affect mice. Stan Burns, the man who wasn't very shocked, proposed they test MPTP on Chimpanzees, an animal much more biologically closer to humans. MPTP caused an effect in chimpanzees that was almost identical to the symptoms in the frozen patients. It caused Parkinson's in the Chimps, and it could even be reversed with Levodopa, like in humans. As it turns out, Like Barry Kidston, the man who had created the synthetic heroin had made a mistake during the synthesis too. He too hadn't created MPPP as he wanted, but MPTP. Almost 90% of it was MPTP and a dangerous concoction for human intake. In humans(and in Chimps), MPTP directly targets the substantia nigra, destroying it and all the cells that produce dopamine within it. This, of course, causes

Parkinson's, since the cause of Parkinson's is the degeneration of the substantia nigra. But in actuality, MPTP isn't dangerous, at least, not to humans normally. The chemical itself is harmless, but when it enters the brain and becomes a deadly toxin. The brain's waste disposal system has special enzymes(NH2CH2CH2) that dissolve unwanted toxins in the brain. They're rendered into harmless forms usually, but in the case of MPTP, the enzyme(MAO) dissolves it into a highly toxic form, MPP+. The worst part of this is that MPTP can enter your bloodstream just through exposure(inhalation, skin contact, etc...) to it, and MPTP is very common in the world around us. MPTP is a pyridine, which is all over the place and widely used both as a solvent and catalyst, and MPP+ can be found in the world as a ready-made herbicide/pesticide (Cyperquat). The video theorizes that Parkinson's Disease could be a disease of the industrial age since there weren't any reports(or at least very few) before it was discovered in 1817 by James Parkinson. The belief is that Parkinson's is caused by new chemicals from the industrial age that we're now commonly exposed to. A study even found a correlation between pesticides(or at least agriculture and pulp/paper mills) and Parkinson's. Luckily, even though MPP+ is very deadly, MPTP isn't, and some substances can inhibit the enzyme MAO. Pargyline is one of them, with one dose before a dose of MPTP completely blocking the effects of MPP+. Pargyline has side effects though, so its use was limited. However, another MAO inhibitor, Deprenyl, was being used in Europe to slow the progress of Parkinson's. It turns out Deprenyl is a lot like Pargyline, just with fewer side effects. If Deprenyl can prevent MPP+ from forming in the brain, thus killing on the (), then we can prevent Parkinson's entirely. A PET scan can even be used to determine Parkinson's before any clinical symptoms ever appear. According to Dr. Langston, it may be possible to make Parkinson's a fear of the past by having a PET scan check-up in 50-year-olds. They'll check for signs of Parkinson's, and send them home with Deprenyl if there are signs. There's even a possible surgical procedure that replaces the damaged dopamine-producing cells which might reverse Parkinson's, but it was still in the early stages of the study when this mini-movie came out. I did do some digging and found this really cool study on that very surgery and stem cells. It seems the results weren't super positive at first, but gradually there were incredible improvements, like in Patient 4. Here's a quote from the study. "Patient 4, who had been transplanted one week later, also did very well after surgery. He was able to withdraw his L-dopa treatment completely after three years and at 10 years after transplantation, had only mild parkinsonian symptoms. Low-dose L-dopa (one-third of

preoperative dose) had been reintroduced after six years owing to progression of symptoms axially and in the limbs ipsilateral to the graft." It seems there's still hope in this surgical procedure, especially since this was done not too long ago, back in 2017!

NOVA. (1986, Feb 18) 'The Case of the Frozen Addict'. Boston, MA: GBH Archives. http://openvault.wgbh.org/catalog/V_474CF2C8A20B4173988486AC4C605A3C

NOVA; Case of the Frozen Addict, The (wgbh.org)

Björklund, A., & Lindvall, O. (2017). Replacing Dopamine Neurons in Parkinson's Disease: How did it happen?. Journal of Parkinson's disease, 7(s1), S21–S31. https://doi.org/10.3233/JPD-179002