WVU Engineering Essay 2019- Engineer Better Medicines

"Modified DNA Drug Technique"

In 2015, West Virginia had the country's highest drug overdose rate, according to Centers of Disease Control and Prevention. The opioid crisis and the amount of drug addictions in our state aren't getting any better as the years go on. Scientists will decrease the chance of drug addiction by using the ideas of personalized medicine and CRISPR to remove the A1 allele of DRD2 and making sure the patient has two copies of the ALDH\(^*2\) gene variation. Personalized medicine is a type of medical care in which treatment is customized for an individual patient. This will positively impact the drug epidemic in our state by greatly reducing the chance of addiction in people with family histories of overdoses and drug abuse.

Personalized medicine is a big step in the health community. It tailors treatment plans and drug amounts specifically to genetics and family history. Personalized medicine can be used for risk assessment, prevention of illnesses and diseases, detection, diagnosis, and treatment. Personalized medicine was first used extensively for breast cancer patients. Through genetic testing, scientists found that about 30% of these patients had have a form that over-expresses a protein called HER2. Pharmacists created a drug tailored to this protein called Trastuzumab. This reduced the recurrence of cancer in patients to 52% working alongside chemotherapy.
Using personalized medicine, patients can be genetically tested for the A1 Allele of the dopamine receptor gene DRD2, which is more common in people addicted to alcohol or cocaine. If the gene is present, doctors can use CRISPR to remove it and replace it with a ALDH*2, if they only have one copy of the ALDH*2 gene variation (two copies of this gene variation makes alcoholism very rare). CRISPR is kind of like copying and pasting DNA and genes. A Cas9-RNA complex will cut the DNA. Then, programmed DNA can be inserted at the cut.

This technique, called the Modified DNA drug technique, could really help the state of West Virginia and the community. In 2017 alone, West Virginia led the country in the most overdose deaths, with a frightening statistic of 57.8 deaths per 100,000 people. The opioid crisis seems to be the most publicized problem in West Virginia, but we have other drug problems too. The Modified DNA drug technique isn’t just a big step towards solving the opioid crisis, but to the overall drug crisis in West Virginia and even across the United States.

The Modified DNA Drug technique will decrease the chance of drug addiction by using the ideas of personalized medicine and CRISPR to remove the A1 allele of DRD2 and making sure the patient has two copies of the ALDH*2 gene variation. Our country already has the CRISPR technology and perform multiple genetic tests everyday on patients throughout our country. Using this technology, scientists will remove the DRD2 dopamine receptor gene, a gene more common in people addicted to alcohol or cocaine, and replace it with a second copy of the A1 allele of ALDH*2 gene variation, since alcoholism is rare in people with this variation. This will decrease the chance of
drug addiction overall in the patient. This technique will have a wonderful impact on our state, making it more successful and overall a better place for all West Virginians.

Bibliography


Nutrition & the Epigenome, https://learn.genetics.utah.edu/content/addiction/genes/


