Company: NanoKnights

Project: Drug Overdose Prevention Using Implantable, Self-Injecting, Drug-Delivery Device

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Overview: Around 30 million people in the world have an opioid use disorder. In the US, 70,000 people die from opioid overdose every year and more than 2.1 million people at considered at high risk for opioid-use-disorder. Unfortunately, with black market and synthetic drugs, these numbers are on a steady rise. There are pre-approved solutions/device in the market to prevent overdosing in these high-risk population. However, administration of the anti-opioid drugs requires a second person to be physically present. In addition, some level of training is required by the secondary person in order to use the devices.

Opioid overdose can be identified by a combination of three symptoms: pinpoint pupils, unconsciousness, and respiratory depression (Contet *et al*, 2014). Our drug-delivery device will have a built in vital monitoring system looking for signs of respiratory depression while providing real-time data of breathing rate, oxygen levels (SPO_2), Heart rate etc. The customizable nanotech capsules will contain nanoparticles that can hold opiate antagonists or opiate agonists depending on the utility of the device. For the opioid agonists, the nanoparticles within the capsule will compete with the opioids for the opiate receptors (specifically mu-opioid receptor) in the Central Nervous System (Harrison *et al*, 1998; Ream *et al*, 2011). The nanoparticles will be released in the blood stream as soon as the monitor detects declining respiration and heart rate in the body. Integrated alongside these two chambers would be the auto-injector that would inject specific amounts in the body through an advanced microfluidic system thereby saving the life of the individual experiencing the overdose in a precise and efficient manner.