

Opioids: Treatments for Overdose and Addiction

Primary Author: Miriam Peters

Teammates: Lucas Allen, Zoe

Anderson, Kelsey Casper, Aaliyah Edson,
Lindsey Friend, Michael Krueger, Alec
Kysely, Maddie Martin, Skyler Moye,
Taylor Olund, Tim Plevak, Erica Ruppel,
Jordan Russell, Ekin Vang, Phoebe
Wheeler, Sophie Winowiski, Pajra Xiong

Mentor: Dr. Cody Wenthur

University of Wisconsin

Advisors: Mr. Bill Heeren,

DC.Everest High School

Dr. Diane Munzenmaier, Center for Biomolecular Modeling Milwaukee School of Engineering

Primary Citations:

Opioid Addiction. (2019). *Drugabuse.gov*. Retrieved 1 June 2019, from <https://www.drugabuse.gov/publications/principles-drug-addiction-treatment-research-based-guide-third-edition/evidence-based-approaches-to-drug-addiction-treatment/pharmacotherapies>

Susanth. (2015). *Opioid Structure Activity Relationship*. *Slideshare.net*. Retrieved 30 May 2019, from <https://www.slideshare.net/sujisusanth/opiod-sar-48199676>

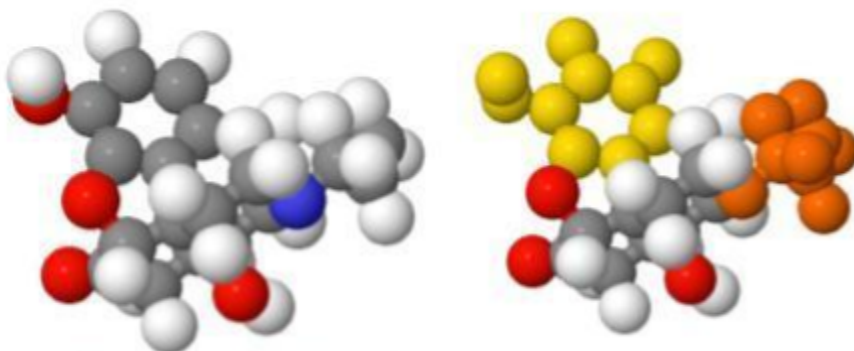
Naloxone - DrugBank. (2019). *Drugbank.ca*. Retrieved 1 June 2019, from <https://www.drugbank.ca/drugs/DB01183>

SMILES Files:

Naloxone. (2019). *Pubchem.ncbi.nlm.nih.gov*. Retrieved 30 May 2019, from <https://pubchem.ncbi.nlm.nih.gov/compound>

Buprenorphine. (2019). *En.wikipedia.org*. Retrieved 1 June 2019, from <https://en.wikipedia.org/wiki/Buprenorphine>

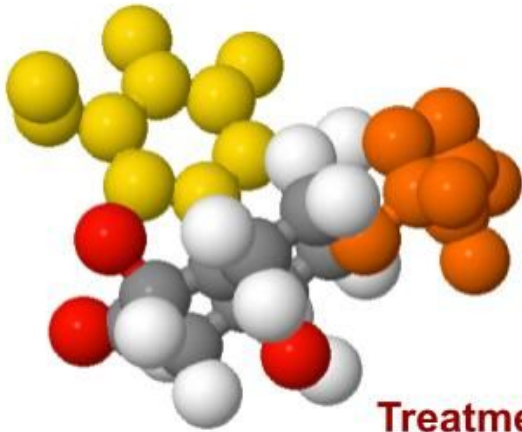
Methadone. (2019). *En.wikipedia.org*. Retrieved 1 June 2019, from <https://en.wikipedia.org/wiki/Methadone>



Treatment for Overdose: Two naloxone molecules, one highlights in gold the common binding site and in orange the different residue group preventing an agonist-like change. Hence naloxone is an antagonist

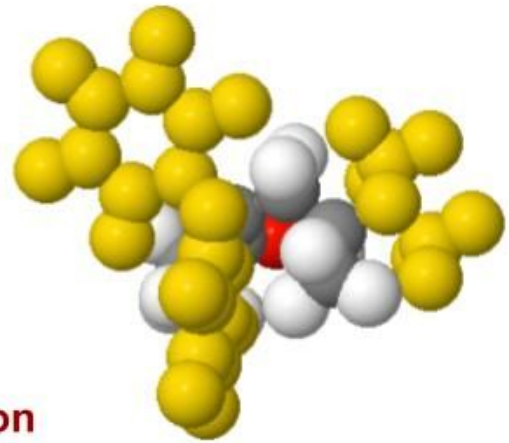
As the use of opioids grows, the risk of overdose deaths and addiction cases increases. Researching and improving treatment for both overdose and addiction can only be furthered after recognizing the difference. Overdose is the result of flooding an individual's body with too many high efficacy opioids. Addiction is the dependence of an individual on a drug, a condition in which the individual's normal processes seem to require intake of said drug. These two situations call for different treatments.

Naloxone is an antagonist, an opioid that inhibits cellular responses. The injection of Naloxone into the body essentially blocks opioids from causing any further damage. Due to its high affinity and low efficacy, Naloxone is an effective treatment for overdose. By replacing the opioids in the receptors, the cellular responses causing the overdose are inhibited, possibly saving the individual's life.



Treatment for Addiction

Buprenorphine, a partial agonist, highlighting in gold the agonist binding site and in orange the part of the molecule that prevents the full response when bonding in the mu opioid receptor.



Methadone is an agonist used also in the treatment of addiction. Highlighted in gold are the parts of the molecule that bind to the mu opioid receptor. Methadone with its long half life, makes it a useful drug in combating opioid addictions.

Addiction however, is treated much differently. A popular treatment for addiction is weaning the addicted individual down from high efficacy opioids to low efficacy opioids. This can be accomplished through the use of agonists (such as methadone), and partial agonists (such as buprenorphine). The basis of the treatment is to slowly transition the individual from opioids with a long half life, for example agonists; to opioids with shorter half lives such as partial agonists. This process helps decrease the individual's opioid dependency.

There are ways to treat both overdose and addiction as of today; however there is still endless research to be conducted. Treatments for opioid problems would not be necessary with an alternative method for pain relief. A method as effective as opioid use is yet to be found and is an area of research that should be given the proper attention.