

PRIMER ON OPIOIDS AND METH FOR LWV EDUCATION COMMITTEE

Both opioids and methamphetamines affect us because they either mimic or produce abnormal amounts of the chemicals we already use normally in our brains. These chemicals are called neurotransmitters because they make nerves pass signals along to other nerves. The nerve cell bodies have proteins on their surfaces that act as locks. The right chemical that comes along can act as a key, fit in the lock, and make the nerve respond. These locks are called receptors, because they receive the chemical keys.

OPIOIDS

Opioids are a class of chemicals, many used in medicine, that come from opium which comes from poppies. These are opium and heroin and morphine. Now many are made in chemical factories but they have the same chemical heart: Demerol, hydrocodone, oxycodone, fentanyl and others. All the opioids work to block pain because they are chemically similar to the pain-blocking chemicals our brains make normally. Some of these are endorphins, enkephalins, nociceptins.

Pain transmitting nerve cells in the brain have receptors on the surface into which these natural opiates fit and block pain. At the same time, the breathing is slowed and the mind is calmed. There is a limit to the amount of these natural opiates that can be made and used at any time and therefore there is a limit to the amount of pain they can block and the amount of respiratory depression they cause and the calming they induce. When we administer artificial opioids, we can use higher doses than ever could be naturally produced. This floods the receptors and blocks much stronger pain, but also depresses breathing more, the calming becomes a euphoria, and the gastrointestinal system is also slowed, causing constipation.

This overstimulation also triggers the reward system of the brain, called the dopamine system. The dopamine system normally regulates movement, emotion, cognition and the feeling of pleasure. Stimulating this system is a strong reward and can lead the brain to become aware that something good and important is happening and can teach us to do it again and again without engaging the executive thought process.

Having strong analgesics (pain blockers) has been useful to us, allowing us to do surgery and treat serious trauma, but it has two significant problems.

OVERDOSE

A dose of an opioid that fills too many receptors can decrease the breathing to the point of decreasing oxygen intake or stopping it altogether and therefore can cause heart problems and death. This respiratory depression can be reversed with a drug called Naloxane (Narcan). Narcan can be injected into a vein or into a muscle, and is now available in a nasal spray. Narcan displaces the opioid on the receptor and reverses the effects within 2-5 minutes. Unfortunately, it will also reverse any pain blocking as well. Narcan's effect lasts 30-60 minutes and many opioids last in the system longer than that, so re-dosing with Narcan is often needed.

TOLERANCE

The opioid signaling system has extreme tolerance development potential. Tolerance is the tendency to need increasing doses of an opioid to obtain the same pain blocking effect. For some time, we thought that tolerance would not occur in short times of opioid usage, such as during the time of surgery and recovery. However, we have learned that tolerance can develop rapidly, occasionally within hours if high doses are used. We also thought that even if tolerance developed, we could always just give higher doses. Unfortunately, we've learned that continued exposure induces more tolerance. It also induces hyperalgesia, which is an increasing sensitivity to pain, which is made worse by increasing opioids.

We also thought that tolerance to the pain blocking effects of opioids implied greater tolerance to the side effects of opioids: depression of respiration and constipation. Wrong again; each effect has its own rate of tolerance, developing first for pain, then respiratory depression, then constipation. This is known as differential tolerance.

Hyperalgesia, also known as Opioid Induced Hyperalgesia (OIH) is produced by a different mechanism than tolerance. We don't quite know why it happens but possibly the use of anti-pain chemicals induces the brain to produce natural pain sensitizing chemicals. Therefore we get the situation found in treating chronic pain with opioids of not only needing more opioids (tolerance) but increased opioids producing more perceived pain (OIH).

WITHDRAWAL

Withdrawal is a normal physiological response to the sudden stopping of some drugs. Opioids are one type. Physical dependence is defined by the body relying on an outside source of opioids to prevent withdrawal symptoms. How long opioids can be used before physical dependence occurs varies with the drug, the dose, the person, but is considered possible after a few weeks of continuous use. Symptoms of withdrawal to opioids can include any combination of: vomiting, muscle cramps, insomnia, stomach cramps, diarrhea, shaking, sweating, irritability, being jittery, increased sensitivity to pain. Symptoms can last for a week or a month.

Post-acute withdrawal describes the syndrome of mood swings, anxiety, variable energy, low enthusiasm, variable concentration, and disturbed sleep that can last more than 2 years after ending use of opioids.

TREATMENT

Treatment of opioid use starts with treatment of withdrawal. Either Buprenorphine (Subutex) or Methadone are used to slowly taper off other opioids without precipitating withdrawal symptoms. Some people can taper off these eventually; some cannot, especially if they have chronic pain. More recently, a combination of buprenorphine and naltrexone has been used. Naltrexone is an oral long-acting antagonist of opioids, blocking the euphoria if opioids are taken. It has been found to be helpful with post-acute withdrawal syndrome.

Psycho-social interventions are needed at all stages of treatment.

METHAMPHETAMINES

Methamphetamines are manufactured stimulants, related to amphetamines. They have similar effects to cocaine, but are cheaper and their effects last longer. Meth is found as a white, bitter powder, or pill. Crystal meth is meth cooked down to glassy appearing fragments or shiny bluish white rocks. It can be inhaled/smoked, swallowed as a pill, snorted with the nose, or injected as a dissolved powder.

Meth has the effect of both blocking the re-uptake and increasing the release of dopamine, thereby flooding the brain with dopamine. The immediate effect is increased wakefulness and physical activity, decreased appetite, increased respiratory rate, rapid or irregular heartbeat, and increased blood pressure and body temperature. The effects start and fade quickly and lead to “binge and crash” usage.

The long-term effects of meth use can include: increased risk of infections due to high risk sex, altered judgement and decision making, worsened progression of HIV, cognitive problems, weight loss, dental problems, itching leading to body sores, anxiety, confusion, sleeping problems, violent behavior, paranoia, hallucinations. Meth use may increase the risk of Parkinson’s Disease. Many cognitive problems do not ever go away even after prolonged abstinence. It is thought that the overexposure of the neurons to dopamine can be toxic, leading to permanent neuronal damage.

OVERDOSE

Overdosing on meth is possible and lethal. Symptoms can be high body temperature, headache, seizure, which can lead to organ failure and possibly death.

WITHDRAWAL

Withdrawal from meth causes anxiety, fatigue, severe depression, psychosis, and intense drug cravings.

There is no specific drug treatment for methamphetamine use or withdrawal or overdose. Medically, only supportive treatment can be offered. Prolonged behavioral treatment has been successful.

DESIGNER DRUGS

Flakka and Bath Salts are two examples of Designer Drugs. They are synthetic chemicals which evade illegality by being slightly different molecularly than banned drugs, and by being labeled “not for human consumption.” The DEA lists Flakka as a Schedule 1 drug. They are cheaper than the officially banned drugs and frequently have additional drugs and other materials mixed into them.

Flakka is alpha-Pymolidinopentiophenone, or alpha-PVP. It is a synthetic cathinone. Cathinones are derived from the Khat plant. It and “bath salts” have similar actions to Cocaine and

Methamphetamines, but are cheaper and have more prolonged highs, lasting one to several hours. Flakka can be snorted, smoked, vaped, or swallowed.

Like Meth, Flakka attaches to the Dopamine receptors causing Dopamine release. It also prevents the re-uptake of Dopamine, which causes the prolonged high. During this euphoric state the body temperature can go as high as 104 degrees, and blood pressure also is elevated. Some users have an excited delirium during which they tear off clothes and run around, sometimes violently breaking things; they can show incredible strength from the adrenaline surge.

Long term, neurons can be permanently damaged, as with Meth. Also, the high temperatures and extreme activity can cause muscle damage called rhabdomyolysis which can cause kidney damage, sometimes severe enough to require dialysis for life. There is also risk of heart attack and death, as with Meth.

Treatment for overdose is symptomatic with benzodiazepines (sedatives) for agitation and seizure prevention. IV Fluids can help prevent rhabdomyolysis from hurting the kidneys. Long term treatment is cognitive and behavioral.