

# The effects of morphine on pain relief

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Objective: to look into the effects of morphine specifically in severe casualties/ injuries such as in aviation nursing in war or in patients with terminal cancer in clinical practice during US civil war

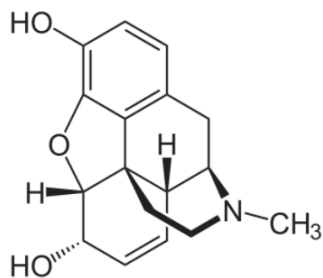
## 1 Introduction

Throughout the years, Morphine has been through many disputes, regarding its use and the risks. In the 21st century, Morphine is heavily used amongst teenagers as recreational drugs instead of relieving physical pain. As a group, we recognise that this is a relevant global issue bombarding the present times. In the past, Morphine was first introduced as a battlefield anesthetic, which was derived from pure opium, during the Civil war. As years passed, due to medical advancements, Morphine has been developed into a more safer and efficient drug to be used in many procedures, including physical therapy, surgery, as well as aftercare. In this research paper, we will be exploring the history, uses, statistics, ethical issues and more.

## 2 What is morphine

### 2.1 Morphine

Picture 1. The chemical structure of morphine (C<sub>17</sub>H<sub>19</sub>NO<sub>3</sub>)



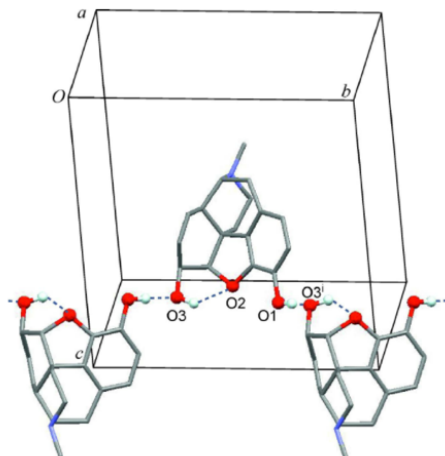
Morphine is the medication for severe pain relief; this is a narcotic analgesic drug that relieves pain selectively without blocking the conduction of nerve impulses; this only alters the sensory perception or affects consciousness.

Morphine is the type of alkaloid, which is any of a class of naturally occurring organic nitrogen-containing bases. This includes, cocaine, caffeine, nicotine and quinine, etc.

It was not easy to elucidate the structure of alkaloids, including morphine, C<sub>17</sub>H<sub>19</sub>NO<sub>3</sub>, because their chemical structures were very complex. In particular, “the morphine molecule had 40 atoms, each of which was so complex that it had a precise position with respect to the rest of the atoms”.

The morphine forms strong covalent bonding, which leads to a high boiling (527.15K) and melting point (528.15K). The existence of oxygen (O) and nitrogen (N) creates the hydrogen bondings that strengthen the intermolecular forces between morphine and other molecules. For example, the stable polymorph of morphine (the image below) shows the strong intermolecular and intramolecular forces between 2 other morphine molecules formed by the hydrogen bonding.

Picture 2. Hydrogen bonded helical chain and intramolecular and intermolecular O—H···O bonds are drawn as broken lines; H and O atoms involved in hydrogen bonding are drawn as balls



## **2.2 How morphine is ingested**

Morphine works directly on opioid receptors in the central nervous system, and reduces feelings of pain by interrupting the way nerves signal pain between the brain and the body. Opioid Receptors are G protein-coupled receptors (GPCRs), which mediate the human body's response to most hormones, neurotransmitters, drugs, and are involved in sensory perception of vision, taste, and olfaction. According to research, morphine is available in "tablet, capsule, granule, oral liquid and injection formulations" and "It exerts its action by binding to stereospecific receptors". It exhibits analgesic effect by increasing the pain threshold, changing the perception of pain, and blocking the synergistic pain pathway.

It is selective for pain relief and, unlike an anesthetic, has little effect on other sensory or mental functions, except in case of overdose. Usually, morphine exhibits antitussive effects below the analgesic dose, but causes overall central nervous system depression.

## **2.3 Historical background**

During colonial America in the 1700s, Doctors prescribed opium to their patients to manage pain as well as help with dysentery, coughs, and other maladies. Morphine was first isolated chemically in 1805 by the German pharmacist Zertuner. During the industrial revolution, the U.S began to manufacture morphine. Then in 1855, Alexander Wood of Scotland devised the first hypodermic needle to administer morphine to a patient suffering from neuralgia.

The Civil War (1861-1865) helped set off America's opiate epidemic. During the Civil War, "the Union Army alone issued nearly 10 million opium pills to its soldiers, plus 2.8 million ounces of opium powders and tinctures." Many soldiers returned home addicted from morphine, or with war wounds that opium relieved. "Even if a disabled soldier survived the war without becoming addicted, there was a good chance he would later meet up with a hypodermic-wielding physician," Courtright wrote.

The Civil War has long been blamed as the catalyst for the spread of drug addiction in America. The drug was widely used as a painkiller during the U.S. Civil War. As a result, an estimated 400,000 soldiers became addicted. By 1895, morphine and opium powders had led to an addiction epidemic that affected roughly 1 in 200 Americans.

After the civil war, during the 1870s, Physicians raised concerns with morphine addiction, also known as "narcomania." Therefore, in 1898, A German pharmaceutical company synthesized heroin from morphine and introduced it as a cough and cold remedy. It is considered less addictive than morphine. All legal narcotics were banned in 1923 under the U.S. Treasury Department's Narcotics Division.

## **3 Uses of morphine**

### **3.1 Directions - dosage, how many times**

Morphine is available as a prescription in cases of severe pain, as fast-acting & slow-acting tablets, capsules, dissolving granules, injection or suppository. The amount of morphine in these prescriptions vary from between 5mg to 200mg of morphine.

The dosage depends on the type of morphine prescribed, as the types differ in the amount of morphine. Dosage would vary for each person, as the amount of morphine depends on the intensity of the pain,

as there can be dangerous side-effects that could harm the person. Previous responses, such as allergies, to painkillers must be considered to minimize the risks that could happen. In cases of pain that are expected to last for a short time, fast-acting prescriptions are used, whereas slow-acting prescriptions, such as some tablets and granules, are released slowly into the body between 12 to 24 hours to treat long-term pain with the pain relief lasting longer.

Usually, fast-acting prescriptions would be taken 4-6 times a day, preferably at the same time every day and evenly spaced. On the other hand, slow-acting prescriptions are usually recommended to take 1 to 2 times a day. Although morphine can be taken on an empty stomach, it must always be alongside a full glass of water.

### **3.2 Cautions & emergency**

Slow-releasing morphine tablets or capsules should not be broken, crushed, chewed or sucked as it is supposed to be slowly released into the body without the whole dose of morphine being released in one go. If the whole dose of morphine is released in one go, it can lead to a potential, fatal overdose.

Morphine is not suitable for all people, therefore it is extremely important to tell your doctor of any negative experiences with morphine or other medicine, as well as if you have a history with alcohol or other medical conditions that could increase the risk of taking morphine. If you are pregnant or trying to get pregnant, it is strongly advised to not take morphine.

Although morphine is generally viewed with many dangers, if taken under a doctor's supervision, morphine is considered safe. Therefore, it must be taken exactly as the medication is prescribed by following the exact dosage and time period. As morphine can interact with other medications, morphine must not be taken with alcohol as it can result in additional side effects.

Nausea is a common side-effect when taking morphine, especially as a withdrawal symptom, hence it is recommended to take morphine with food to help reduce the nausea. Immediate medical attention is required if any intense side-effects, such as fainting, chest pain, seizures, trouble breathing, throat tightness, hallucinations, or abdominal soreness and tenderness. Therefore, it is extremely important to stop taking morphine as it can become dangerous and life-threatening. Instead of suddenly quitting Morphine, it is recommended to slowly reduce the dosage to avoid intense withdrawal symptoms.

### **3.3 Usage of morphine in extreme cases of pain**

Morphine is used to treat severe pain, such as post-surgery, a serious injury, or pain from cancer or a heart attack etc. As it is a strong painkiller, it is often used when non-opioid medications don't provide enough pain relief. Other causes such as major trauma, surgery, labor pain, and cancer pain, use morphine to relieve the intense pain. However, as there can be increased risks that follow the use of morphine in some cases, morphine is only used when other forms of pain relief have not been very successful or are not tolerated.

Morphine does not always work for everyone, as pain is unique and different for each individual. Furthermore, different pain-relief medicines will work distinctly for each case. Hence, as an alternative to morphine, your doctor may also advise you to make lifestyle changes to help the discomfort of chronic pain, such as physical fitness, relaxation and overall health management.

## **4 Effects of morphine**

### **4.1 Advantages and disadvantages of morphine**

<b>Advantages</b>	<b>Disadvantages</b>
By intaking morphine, it will majorly help to relief pain	Getting skin rash that itchy, red, swollen, blistered
Multiple ways of intake morphine. This includes tablets, drinking liquid or an injection.	Tightness around chest or throat
It's relatively cheap when compared to other medicines that do the same type of jobs.	Trouble talking or breathing
It's fast acting - this means that it will quickly nullify your pain.	Swelling facial body part
Wide therapeutic window - Meaning that this can be used in a lot of medical fields.	Feeling tired and have low energy (due to low blood pressure)

## **5 Ethical issues regarding morphine**

### **5.1 Palliative Care**

The ethical issues regarding morphine in the medical field are often challenged by various physicians globally. Palliative care is specialized treatment for those cases who suffer from serious illnesses or lethal illnesses. In nordic countries like Finland, Sweden, Norway and Denmark, morphine and alternative opioids are used in palliative care. Although this establishes some ethical considerations, a medical regulation called "double effect" avoids this concept from being unethical. Double effect is when doctors use treatment for a virtuous intent, to mitigate symptoms of patients who are otherwise deteriorating. The patients are informed of the side-effects of the procedure with opioids, including death. However, several physicians believe double effects should be more willingly accepted by the therapeutic society. This is on account of double effect as with morphine, and applying it in palliative care will alleviate symptoms and the side-effect of death is rare.

### **5.2 Risk of addiction**

As discussed in section 2.1 of this essay, morphine is a narcotic analgesic drug. This means that with all its benefits in diminishing pain, there is a significant risk of addiction. As patients continue using morphine, their body's tolerance develops, therefore leading to their body to demand more to treat the same amount of pain. This induces the patient to need more and more morphine to treat the pain in the body, causing them to become addicted to it. Once the patient is released from treatment, they will experience withdrawal symptoms because of the addiction they developed in the hospital. This is unscrupulous as the hospital has done further harm to the patient after the treatment. If the patient has acquired an addiction because of treatment of opioids, the hospital becomes much more liable to lawsuits from the patients' families.

As morphine is an opioid, there is a high potential for the cause of addiction in some individuals, even at prescriptions taken. As they continuously build a tolerance to morphine and get addicted, there can be a risk of overdose. In some cases, if individuals were to get addicted, they would prioritise the morphine over their mundane life. Addiction can cause life-threatening health problems, such as unconsciousness, overdose, and even death.

Unpleasant withdrawal symptoms will be experienced by those who have been ingesting morphine for a long period of time. As the body builds a tolerance to it, the body feels the need to rely on morphine in order to function at the same level of function. It is recommended to talk to your physician and reduce the dose gradually to avoid withdrawal symptoms.

### **5.3 Organ donation**

Organ donation is a fundamental part of the therapeutic realm. Each day, in the United States of America, 20 people die only because of standing by for a fresh organ to become feasible. The scarcity of organs has led to the World Medical Association to revise the prerequisites of becoming an organ donor. Organs from casualties of overdose are now classed as increased risk organs. This is because of the enhanced compromise in the organ donor's life to have caught drug-based diseases like Hepatitis C or HIV. However, every organ is analyzed for diseases before transplanting to reduce the risk of any autoimmune reactions in the receiver's body. Unless physicians are cognizant of the organ donor's infection, there is an infinitesimal chance of contracting a disease through a transplant. In a transplant, the drug cravings are not carried to the organ receivers body. This is due to drug cravings being a psychological issue. As long as the brain isn't being transplanted, the cognitive or neurological issues will not be transferred to the receiver's body. Ethically, organ donations from overdose victims of morphine or any other opioid are safe and much like any other organ. As long as the organ isn't infected by pre-existing diseases, there isn't a significant chance of transferring any addictive behavior or diseases across a transplant.

## **6 Reference**

Anon, 2021. *MORPHINE. HEALTHDIRECT*

Available at: <https://www.healthdirect.gov.au/morphine>

Dhaliwal, A. & Gupta, M., 2021. *PHYSIOLOGY, OPIOID RECEPTOR*

Available at: <https://www.ncbi.nlm.nih.gov/books/NBK546642/>

Willstätter, R., 2020. *ALKALOID ENCYCLOPÆDIA BRITANNICA*

Available at: <https://www.britannica.com/science/alkaloid>

Gerlbrich, T., 2013. *HYDROGEN BONDED HELICAL CHAIN INTRAMOLECULAR*

Available at: [https://researchgate.net/figure/Hydrogen-bonded-helical-chain-Intramolecular-and-intermolecular-O-HO-bonds-are-drawn\\_fig2\\_235896877](https://researchgate.net/figure/Hydrogen-bonded-helical-chain-Intramolecular-and-intermolecular-O-HO-bonds-are-drawn_fig2_235896877)

Anon, 2022. *MORPHINE*. Wikipedia.

Available at: <https://en.wikipedia.org/wiki/Morphine>

Anon, *ACUTE PAIN MANAGEMENT IN THE FIELD.*

Available at: <https://www.dvcipm.org/site/assets/files/1083/chapt26.pdf>

Anon, *MORPHINE. NHS choices.*

Available at: <https://www.nhs.uk/medicines/morphine/>

Ghoshal, M., 2019. *WHAT YOU NEED TO KNOW ABOUT MORPHINE SIDE EFFECTS Healthline.*

Available at: <https://www.healthline.com/health/pain-relief/morphine-side-effects#overdose>

Anon, 2020. Opioid addiction: Medlineplus genetics. *MedlinePlus.*

Available at: <https://medlineplus.gov/genetics/condition/opioid-addiction/>

Flescher, A.M., 2018. *THE ORGAN SHORTAGE CRISIS IN AMERICA. The Organ Shortage Crisis in America | Georgetown University Press.*

Available at: <http://press.georgetown.edu/book/georgetown/organ-shortage-crisis-america>

Ungar, L., *LIFE OUT OF TRAGEDY: ORGANS DONATED BY OVERDOSE VICTIMS ARE SAVING LIVES: Volunteers of America.*

Available at: <https://www.voamid.org/life-out-of-tragedy-organs-donated-by-overdose-victims-are-saving-lives>

Vainio, A., 2009. *USE OF MORPHINE AND OTHER OPIOIDS IN THE NORDIC COUNTRIES. Taylor & Francis.*

Available at: <https://www.tandfonline.com/doi/abs/10.1080/028418698430142>

Anon, *HOW AND WHEN TO TAKE MORPHINE. NHS choices.*

Available at: <https://www.nhs.uk/medicines/morphine/how-and-when-to-take-morphine/>

Anon, *MORPHINE: BASIX, SIDE EFFECTS & REVIEWS. GoodRx.*

Available at: <https://www.goodrx.com/morphine/what-is>