Understanding the Stereochemistry of Morphine

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Stereochemistry and isomers:

Stereochemistry is the study of three-dimensional chemistry which assesses the arrangement of atoms within a compound which affect the properties of a molecule. Isomers and more specifically stereoisomers are molecules which are built of the same atoms just arranged differently.

Potency, Extraction and Use Differences

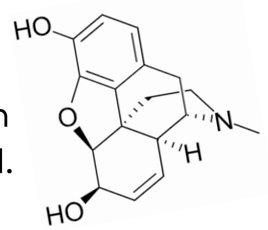
The differences use wise is that (-)morphine is an analgesic (painkiller) and triggers the opioid receptors in the brain whereas (+)morphine is a potent painkiller for mice, but in humans, acts an anti analgesic and counteracts the effects of other opioids by inducing pro inflammatory compounds. Plus, the two are derived differently with (-)Morphine being derived naturally while (+) is only derived artifically.

What is Morphine:

Morphine is a naturally derived medicine made from the opium plant that is broadly used to treat pain as well as traumatic shock, internal hemorrhage, typhoid fever, and more.

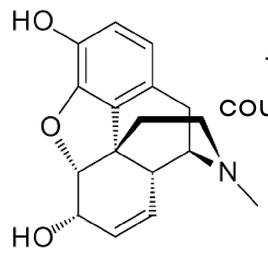
(+)Morphine

(+) Morphine is one of the two main stereoisomers of Morphine. This isomer specifically has its amine group located behind the planer portion of the compound.



(-)Morphine

(-)Morphine is the alternative stereoisomer we looked into, this isomer differs from its positive counterpart due to its amine group being located in front of the planer portion of the compound.



Morphine within the Human Body

Morphine targets the central nervous system and pain receptors in it. Like other Opioids it blocks these pain receptors which can also lower anxiety and stress related to the pain.

It targets the nervous system by triggering the nervous system to release endorphins, the body's natural pain killers. Prolonged use of opioids will cause the body to lower its production of opioids which makes withdrawals from the drugs incredibly difficult as the body is no longer producing its own pain killers.

Structural differences

(+) and (-) Morphine differs structurally by the placement of the amine group, whether it is behind or in-front of the planer portion of the compound.

Stability Differences

Due to the only change in the enantiomer stemming from the changing of the amine group from being in front or behind the rest of the compound, the relative stability of the compounds does not change since the proximity of the hydrogens stemming from the rings does not change between the two compounds.

However, it is noted that due to (+)-morphine not reacting with mu-opioid receptors, the compound is considered pharmalogically more unstable as a drug compared to its counterpart.