



# Al-Mustaql University

## College of Science



# Drug Stereochemistry

Third Year Students / 2<sup>nd</sup> Semester

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Relation Between Stereochemistry and Drug action, *continued*

By

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# Methamphetamine Stereochemistry

- ▶ Methamphetamine is a chiral compound with two enantiomers, **d-methamphetamine** and **L-methamphetamine** which are a fine example of how molecules that vary only in their chirality can have very different biological effects. **Chiral molecules have non-superimposable mirror images.** As you'll see, the two compounds are very different medically despite having only a subtle structural difference.

**L-methamphetamine**  
is found in Vicks Vapor Inhalers.

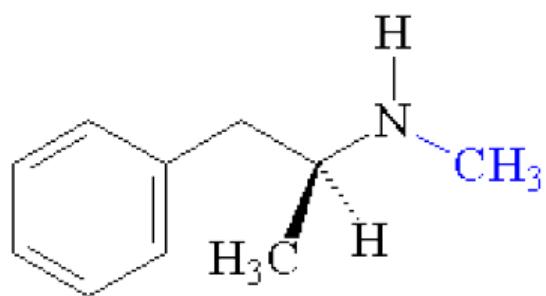


**D-methamphetamine**  
the street drug known as crystal  
meth(highly addictive).

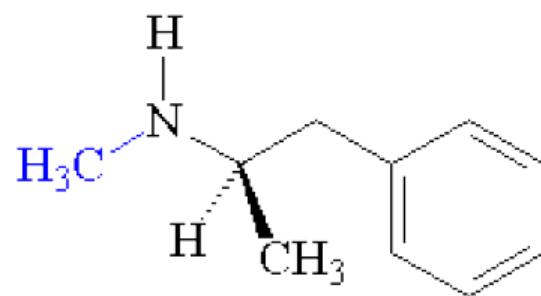


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# Methamphetamine Optical Isomers structure

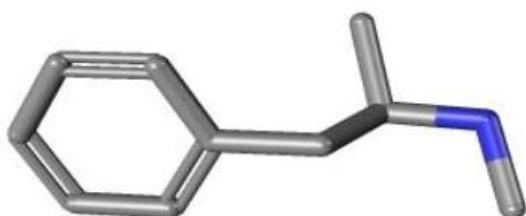


D-methamphetamine

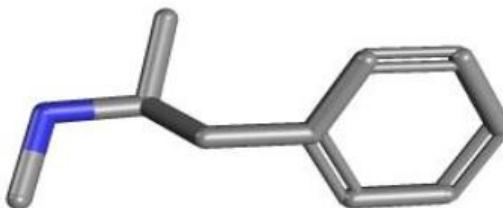


L-methamphetamine

# 3D Structure of Methamphetamine



or D-methamphetamine



L-methamphetamine

# Methamphetamine biological effects

## D-methamphetamine

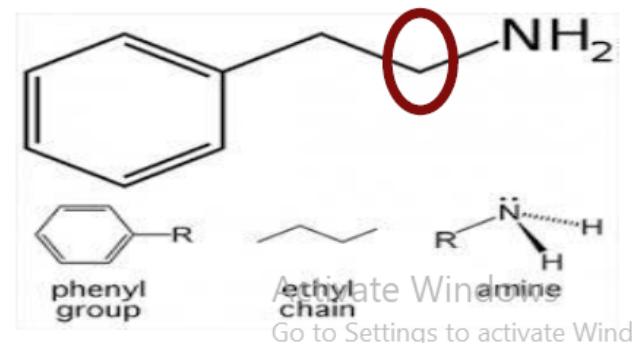
- The vast majority of meth abusers and addicts use dextromethamphetamine.
- it increases alertness, concentration, energy, and in high doses, can induce euphoria, enhance self-esteem, and increase libido.
- These traits make d-methamphetamine is so addictive to its users.(illegal)

## L-methamphetamine

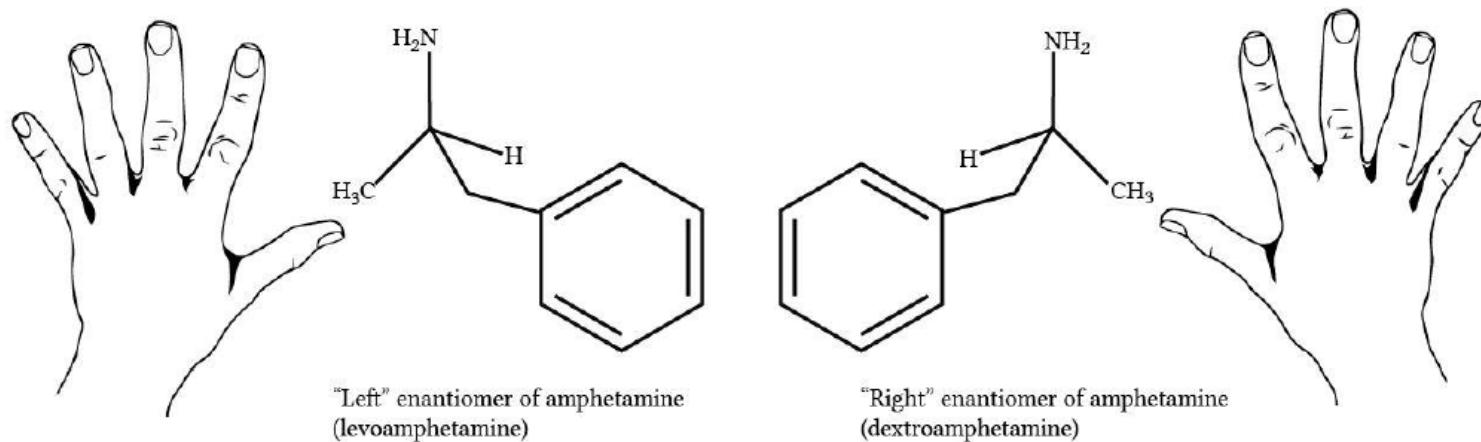
- has no mind-altering effect
- serves as a common ingredient in nonprescription nasal decongestants
- has little activity in the central nervous system, so it is not thought to possess an addiction potential anywhere near that of the d-methamphetamine isomer.
- Among its few physiological effects is vasoconstriction, which makes it useful for nasal decongestion.(legal)

# Amphetamine Stereochemistry

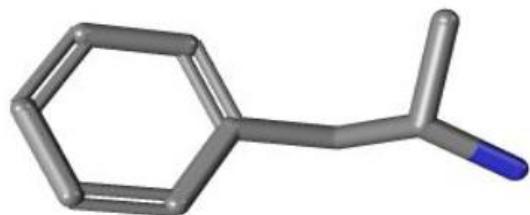
- ▶ The carbon atom adjacent to the primary amine is a stereogenic center, and amphetamine is composed of a racemic 1:1 mixture of two enantiomeric mirror images. This racemic mixture can be separated into its optical isomers\_ Optical isomers were given their name because they were first able to be distinguished by how they rotated plane-polarized light\_:\_ levoamphetamine and dextroamphetamine.



# Amphetamine Optical Isomers Structure



# 3D Structure of Amphetamine



L-amphetamine



D-amphetamine

# Amphetamine Biological effects

- ▶ **Dextroamphetamine**
- ▶ is used to treat attention deficit hyperactivity disorder (ADHD) and narcolepsy (a sleep disorder),
- ▶ sometimes prescribed off-label for its past medical indications, such as depression and obesity.
- ▶ It is also used as an athletic performance and cognitive enhancer, and recreationally as an aphrodisiac and euphoriant.
- ▶ **Levoamphetamine**
- ▶ is a central nervous system (CNS) stimulant known to increase wakefulness and concentration in association with decreased appetite and fatigue.
- ▶ Pharmaceuticals that contain levoamphetamine are currently indicated and prescribed for the treatment of attention deficit hyperactivity disorder (ADHD), obesity, and narcolepsy in some countries.

