



Methamphetamine *d*- and *l*-Isomers

Uncontrolled use of methamphetamine poses a serious health risk in the United States today. If abuse is suspected, urine drug tests are available to help clinicians detect its presence and intervene in order to optimize patient outcomes.

Methamphetamine has 2 chiral isomers, *d*-methamphetamine and *l*-methamphetamine. A chiral molecule is non-superimposable on its mirror image. Individual enantiomers are often designated as either *d* for right-handed or *l* for left-handed. The different isomers have different biological properties. The *d*-form of the drug is a powerful CNS stimulant and the *l*-form has low CNS activity, and consequently, a low abuse potential, but is an effective vasoconstrictor. The *d*-form is present in Desoxyn, a rarely prescribed treatment for ADHD or obesity. Over-the-counter products, such as the Vicks inhaler contain the *l*-form.

Both, *d*- and *l*-forms will register a positive methamphetamine result by both immunoassay and LC/MS/MS. To determine the percentage of *d*-isomer in a specimen, an additional chiral analysis must be done.

A chiral analysis will report the percentage of the *d*-form. A *d*-methamphetamine result of less than 20% of the total is consistent with the following:

1. Use of Vicks Vapor Inhaler containing *l*-Methamphetamine (also known as levmetamfetamine).
2. A prescription for Selegiline. This drug is marketed as Elepryl, Zelapar, or the Emsam Patch and is prescribed for treating Parkinson's disease and major depressive disorder. Selegiline is metabolized by the body to produce *l*-Methamphetamine.

A result of greater than 20% *d*-methamphetamine is consistent with the following:

1. A prescription for Desoxyn or Desoxyn Gradumet.
2. A prescription for Benzphetamine. This drug is marketed as Didrex, and is prescribed for obesity. Benzphetamine is metabolized by the body to produce *d*-Methamphetamine.
3. The *d*-Methamphetamine is from an illicit production source (i.e. crystal meth)

Genotox chooses to release the results showing a confirmed positive for Methamphetamine without performing the isomer test by default because the confirmation test for Methamphetamine is performed by LC-MS/MS and delivers a highly accurate quantitative result. False-positive results from common medications such as pseudoephedrine do not occur. Additionally, testing positive for Methamphetamine for a legitimate reason is something that a patient should be able to support with a valid prescription and/or explanation.