

LONG-TERM AND SHORT-TERM HEALTH EFFECTS OF MDMA USE

3,4, methylenedioxymethamphetamine (MDMA), or as it is more commonly known, Ecstasy, is a potent psychoactive drug. Use of this drug has a high likelihood of resulting in serious long-term and short-term health consequences for the user. Though the drug has been illegal for more than 15 years, it still carries the perception that it is a safe drug offering only desirable side effects. Much has been presented in the popular media about “Rave” parties and the easy access to MDMA at these events. The primary means of taking MDMA is orally, just like taking an aspirin or a vitamin. This easy access and non-invasive administration further enforces the perception that MDMA is safe. It is not safe. It has a high potential to leave users unable to reliably perform tasks requiring short-term memory and concentration. This poses a serious problem for service members working in situations where safety is dependent on the reliable functioning of others. Users risk permanent brain damage and serious potential acute harm and side effects for desired effects that last for at most a few hours.

Metabolism and action of MDMA

In the brain, MDMA produces effects by stimulating specific types of neurons (or brain cells) to release serotonin. Serotonin is a neurotransmitter or a chemical that some neurons use to communicate signals. Not only does MDMA cause neurons to release all of their stored serotonin, it also blocks the mechanisms by which the nerve cells can remove serotonin from their surroundings. This results in a dramatic increase in serotonin levels in the brain and dramatic stimulation of these cells. Since these types of neurons are in parts of the brain involved in memory and mood, this produces the effects that people report.

MDMA is usually taken orally, though it can be smoked or injected. Once the drug is in the body, the body begins to break down or metabolize the drug. Enzymes, mainly in the liver, interact with MDMA molecules and transform them so they can be excreted from the body. This is one of the first risks to taking MDMA. About 10% of the population (this varies for different ethnic populations) is genetically deficient in an enzyme called CYP2D6, which is involved in breaking down MDMA. In other words, a user has a 1 in 10 chance of not being able to metabolize MDMA properly and that dose of MDMA will have a greater impact and may lead to toxic side effects (Ellenhorn’s Medical Toxicology 2nd edition, Matthew Ellenhorn ed., 1997).

Several medications (in particular fluoxetine) stop CYP2D6 from functioning. Individuals taking medications as directed by their doctor, could be at risk of not being able to metabolize MDMA properly. They may experience toxic effects with smaller than expected doses of MDMA.

Even without problems with CYP2D6, MDMA has been shown to have what is referred to as “non-linear pharmacokinetics” (de la Torre et al. BR. J. Pharmacol 49(2):104-109, 2000). In other words, the concentration of MDMA measured in the blood of volunteers went up more than would be expected for a given dose. Again this means that smaller doses may have more effect and become toxic faster than can be predicted.

Short-Term effects of MDMA

MDMA use carries with it significant risks of acute, or short-term, side effects some of which can be life threatening. These may include increased blood pressure, increased heart rate,

seizures, muscle spasms, insomnia and possibly death. These effects could easily leave individuals unfit to perform tasks that are a part of most military personnel's daily routine.

Once MDMA is taken and while the body is trying to metabolize the drug, MDMA will have effects on the brain. Approximately half an hour after taking a dose of MDMA, users report feelings of peacefulness, empathy and energy. They claim to feel connected and energetic but not wired or edgy. Self reported effects also include an increase in their ability to talk about anything (Time, June 5, 2000). In controlled studies, MDMA is found to produce heightened mood, increased self-confidence, moderate derealization and intensification of sensory perception (Liechti et al., *Neuropsychopharmacology* 22:513-521, 2000). MDMA is reported to be impairing, or alters a users psychomotor performance, but not to produce hallucinations or psychoses (Cami et al. *Journal of Clinical Psychopharmacology* 20(4), 2000).

Dangerous acute or short-term side effects include a range of problems. Users may be more prone to harm from much more common sources while under the influence of MDMA because they are not aware of hazards around them. Impaired users are more likely to be in auto accidents (or prosecuted for driving under the influence of drugs) or assaulted. Sleep deprivation both from the night out and from the let down from the drug puts users at risk for injuries on the job and again in auto accidents. Inability to sleep, edginess and paranoia can persist for weeks after taking the drug.

Since MDMA is illegal, the available drug has been illicitly produced. It is not manufactured in controlled circumstances regulated by the FDA. Users have no guarantee of the purity or identity of what they are taking. Users are at high risk of injury not only from the MDMA, but also from bad MDMA preparations containing highly poisonous compounds or by-products of manufacture. Manufacturers of MDMA are not concerned with the user's health; they are concerned with getting the user's money.

MDMA has been shown to produce significant increases in blood pressure and heart rate as well as increases in circulating levels of stress hormones (Mas et al, *Journal of Pharmacology and Experimental Therapeutics* 290(1):136, 1999). These are all risk factors for heart disease and may increase the risk of heart disease in chronic MDMA users.

Though rare, MDMA itself can produce a dangerous side effect that is similar to a syndrome known as "serotonin syndrome". This is characterized by uncontrollable increases in body temperature and instability in blood pressure (either excessively high or excessively low). This is often accompanied by seizures and muscles rigidity. Medical treatment attempts to control these symptoms, but this syndrome is often life threatening (Ellenhorn's *Medical Toxicology* 2nd edition).

Long-Term Effects

This action of the drug also produces what may be the most serious damaging effect of MDMA use, brain damage. The stimulation that results from the presence of high levels of serotonin exhausts neurons. A brain imaging study supported by the National Institute for the Study of Drugs of Abuse (NIDA) found significant losses of serotonin transporters in individuals after MDMA use. These changes have been related to the death of the involved nerve endings.

Controlled studies conducted to measure memory losses and cognitive function, show MDMA users have significant memory losses and cognitive impairment that persisted for weeks after dosage. Growing evidence indicates that this brain damage is permanent (Mathias, NIDA News Release December 2, 1999). In other words, MDMA use may leave the user with a permanently impaired memory and a permanent inability to effectively concentrate or understand.

MDMA is not a safe drug.