MDMA (Ecstasy) Toxicity: Mechanism and Clinical Findings

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Mechanism

Sympathomimetic
Simba-mime
MDMA is a sympathomimetic, meaning its effects mimic those of the sympathetic nervous system. These effects are mediated via neurotransmitters such as norepinephine, dopamine, serotonin, and epinephrine.

Increases Release and Blocks Reuptake of Catecholamines
Cat-cola letting lose, chained re-uptake tube
MDMA exerts its sympathomimetic action by both inreasing the release of catecholamines (namely norepinephrine and dopamine) at the synaptic cleft, and blocking their reuptake into presynaptic vesicles.

Clinical Presentation

Euphoria
U-flowers
MDMA produces characteristic feelings of euphoria in users, hence why it is frequently used by partygoers. This is typically experienced within an hour or two of ingestion.

Increased Alertness
Up-arrow Alerting-alarm
MDMA causes alertness in users, this is mediated by its sympathomimetic effects via catecholamines such as norepinephrine and dopamine.

Extreme Hyponatremia Leading to Altered Mental Status
Hippo-salt-shaker with delta-sign-halo
One of the findings of MDMA intoxication is profound hyponatremia leading to altered mental status. This is mediated by two main causes: One is significantly increased fluid intake, as MDMA can cause dry mouth and its use is associated with a party environment where users are dancing for long periods of time and sweating. The other cause is increased ADH secretion, which in addition to mediating the sensation of thirst causes retention of free water which dilutes sodium. The level of alteration due to hyponatremia can range from delirium to seizure and coma.

Acute Liver Injury
Liver-injured by acute-angle-protractor
Hepatotoxicity is also a potential complication of MDMA intoxication. Even in the absence of other toxic symptoms (neurologic dysfunction, rhabdomyolysis), hepatic fibrosis and necrosis can result from MDMA intoxication. This may manifest as a range from mildly elevated AST and ALT, to jaundice and florid liver failure.

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Serotonin Syndrome

Silver-tonic Savage

Serotonin syndrome may be seen in cases of MDMA toxicity. It is a potentially life-threatening condition characterized by a combination of abnormal neuromuscular activity, altered mental status, and autonomic dysfunction caused by massive serotonin release. These phenomena may manifest as tremor, myoclonus, muscle rigidity, agitation, delirium, tachycardia, diaphoresis, hyperthermia, and hypertension as well as many other signs and symptoms.

Rhabdomyolysis

Rabbit-muscle-lights

Rhabdomyolysis may be seen in MDMA toxicity as a result of neuromuscular dysfunction. Rhabdomyolysis is characterized by skeletal muscle necrosis and release of its cellular constituents into the circulation. It is characterized on labs by profoundly elevated serum creatine kinase (CK).

Hypertensive Urgency/Emergency

emergency-hiker-BP

One of the more commonly seen features of MDMA toxicity is hypertension, which can range from a mild elevation in blood pressure to hypertensive urgency and emergency, leading in some cases to myocardial infarction, aortic dissection, and intracranial hemorrhage.

Arrhythmia

Broken Arrhythmia-drum

Arrhythmia is frequently seen in MDMA toxicity and is a result of the exessive sympathetic stimulation with which it is associated. The arrhythmia seen as a result of toxicity can range from profound tachycardia to atrial fibrillation and even ventricular fibrillation, especially in the case of a myocardial infarction.

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