

# Ketamine: Recognizing the Neuroprotective and Psychedelic Potential for Medical Advancements

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## DESCRIPTION

Ketamine, a versatile and multifaceted drug, has garnered significant attention in recent years for its diverse applications and potential therapeutic benefits. Originally developed as an anesthetic in the 1960s, ketamine has evolved to become a valuable tool in fields such as psychiatry, pain management, and experimental research. This article aims to provide a comprehensive overview of ketamine, discussing its history, pharmacology, various uses, and emerging therapeutic applications.

## History and pharmacology

Ketamine, chemically known as (RS)-2-(2-Chlorophenyl)-2-(methylamino)cyclohexanone, was first synthesized in 1962 by Calvin Stevens, a scientist at Parke-Davis Laboratories. Initially used solely as a veterinary anesthetic due to its hallucinogenic side effects, ketamine gained popularity as a dissociative anesthetic in human medicine during the Vietnam War. It served as a versatile anesthetic option due to its rapid onset, unique pharmacological properties, and minimal respiratory depression. Ketamine primarily acts as an antagonist of the N-methyl-D-Aspartate (NMDA) receptor, which plays a crucial role in neuronal communication and synaptic plasticity. By blocking this receptor, ketamine induces a dissociative state, characterized by feelings of detachment, analgesia, and altered perceptions. Additionally, it modulates other neurotransmitter systems, including glutamate, dopamine, and serotonin, contributing to its diverse effects.

## Medical uses

Ketamine's medical applications extend beyond its traditional role as an anesthetic. In recent years, it has gained recognition as a potential treatment for various psychiatric disorders, such as depression, anxiety, and Post-Traumatic Stress Disorder (PTSD). Research suggests that ketamine's rapid-acting antidepressant effects may stem from its ability to enhance synaptic plasticity and promote the growth of new neurons in the brain. Furthermore, ketamine infusion therapy has shown promise in

managing treatment-resistant depression. Studies have reported a significant reduction in depressive symptoms within hours or days of ketamine administration, providing relief to individuals who have not responded to conventional antidepressant medications. In the realm of pain management, ketamine's analgesic properties have been harnessed for chronic pain conditions, including neuropathic pain, cancer-related pain, and Complex Regional Pain Syndrome (CRPS). Its unique mechanism of action, distinct from opioids, allows for effective pain relief without the risk of respiratory depression or addiction associated with traditional analgesics. Ketamine has also demonstrated potential in alleviating acute suicidal ideation. In emergency settings, administration of low-dose ketamine has shown rapid reduction of suicidal thoughts, providing a temporary reprieve and buying time for further intervention and treatment.

## Emerging therapeutic applications

Beyond its established uses, ongoing research is exploring ketamine's potential in various fields. One notable area of investigation is its role in treating substance use disorders. Preliminary studies have shown promising outcomes in reducing cravings and relapse rates in individuals with alcohol, cocaine, and opioid dependence. Ketamine-assisted psychotherapy is being explored as a tool to facilitate the psychological aspects of addiction treatment, enhancing insight, and promoting behavioral change.

Furthermore, ketamine's impact on postoperative recovery is under scrutiny. Studies suggest that perioperative administration of ketamine may attenuate postoperative pain, reduce opioid consumption, and alleviate the risk of chronic pain development. The potential neuroprotective effects of ketamine have also sparked interest, particularly in the context of Traumatic Brain Injury (TBI) and neurodegenerative diseases. Ketamine's ability to mitigate neuroinflammation, prevent excitotoxicity, and promote neurogenesis offers a promising avenue for further exploration. Ketamine's remarkable versatility and expanding therapeutic potential make it an intriguing substance in the medical field. From its origins as an anesthetic

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to its emerging applications in psychiatry, pain management, and experimental research, ketamine continues to challenge conventional treatment approaches and inspire novel therapeutic strategies. However, further research is necessary to optimize its use, refine dosing protocols, and better understand the long-term

effects and potential risks associated with its administration. As ongoing investigations unfold, the future may hold even greater insights into ketamine's multifaceted properties, offering new hope for individuals suffering from a wide range of conditions.