

# Atropine

## From Plant Derivative to Essential Medicine Applications and Market Trends

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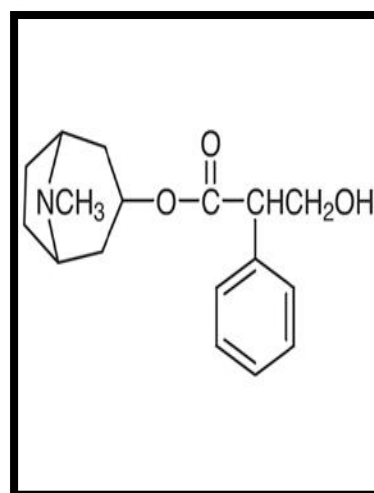
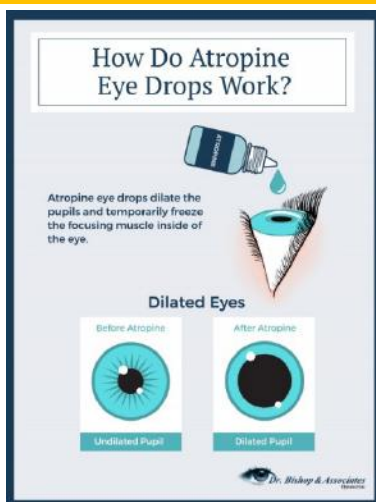
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### Introduction

Atropine is a tropane alkaloid with multiple medical uses due to its action as a competitive antagonist at muscarinic acetylcholine receptors. Its chemical formula is  $C_{17}H_{23}NO_3$  with a molecular weight of **289.37 g/mol**. Atropine's structure includes a tropane ring with hydroxyl, methoxy, and ester groups. It inhibits the parasympathetic nervous system, increasing heart rate, reducing respiratory and gastrointestinal secretions, and causing pupil dilation. Medically, it treats bradycardia, reduces preanesthetic secretions, serves as an

antidote for organophosphate poisoning, dilates pupils for eye exams, and manages gastrointestinal disorders. Toxicity can result in anticholinergic syndrome, with symptoms like dry mouth, blurred vision, tachycardia, and confusion. Historically, atropine has been used for both medicinal and toxic purposes, notably derived from plants like *Atropa belladonna*. Proper dosing and administration routes, including oral, intravenous, and ophthalmic, are crucial to avoid adverse effects.

### Structure



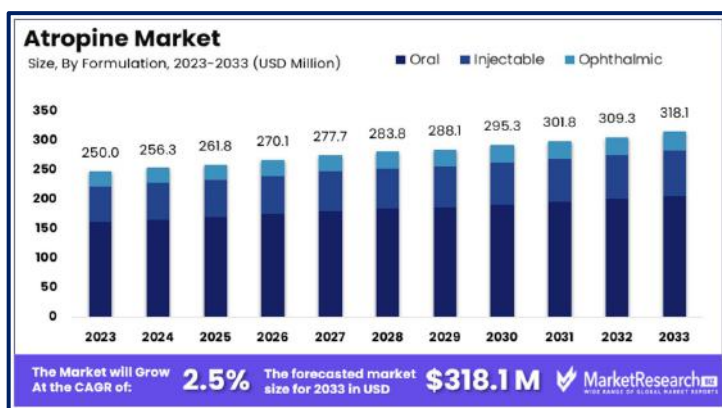
### Industrial Synthesis of Atropine

The industrial production of atropine involves several steps, typically starting from natural sources or through chemical synthesis. Atropine is a tropane alkaloid derived from plants of the Solanaceae family, such as *Atropa belladonna* (deadly nightshade), *Datura stramonium* (jimsonweed), and others.

The industrial production of atropine involves cultivating and harvesting plants like *Atropa belladonna* and *Datura stramonium*, focusing on the aerial parts with the highest alkaloid content. After drying and grinding the plant material, solvents such as ethanol or methanol are used for extraction, followed by filtration and concentration of the extract. The extract undergoes acid-base treatment to convert alkaloids into water-soluble salts, which are then separated from impurities through liquid-

liquid extraction (Pejić *et al.*, 2020). The alkaloids are freed with a base and further extracted into an organic solvent. The organic phase is concentrated, cooled to induce crystallization, and the crude atropine is purified through recrystallization. Alternatively, atropine can be synthesized chemically by reducing tropinone to tropine, esterifying it with tropic acid, and purifying the product through similar crystallization processes. The final atropine undergoes rigorous quality control tests, including HPLC and NMR, to ensure purity and compliance with pharmaceutical standards. Finally, pure atropine is formulated into various pharmaceutical preparations like tablets, injectables, and eye drops according to medical requirements.

### Current Market Trends of Atropine Medicines



The Global Atropine Market size is expected to be worth around USD 318.1 Million by 2033, from USD 250 Million in 2023, growing at a CAGR of 2.5% during the forecast period from 2024 to 2033.

### Growing Demand in Ophthalmology Drives Market Growth

Atropine's application in ophthalmology is another significant growth driver for its market. Used extensively to dilate pupils during eye examinations and surgeries, atropine addresses the needs arising from the increasing prevalence of eye disorders, particularly among the aging population. According to the National Eye Institute, the number of people suffering from age-related macular degeneration in the

U.S. is expected to double from 11 million in 2020 to 22 million by 2050. This demographic shift not only boosts the demand for ophthalmic procedures but also elevates the need for atropine, supporting its market expansion. The interconnected rise of both age-related eye conditions and the requirement for diagnostic and surgical interventions in ophthalmology propels the Atropine Market forward.

### Use in Anesthesia and Emergency Care Drives Market Growth

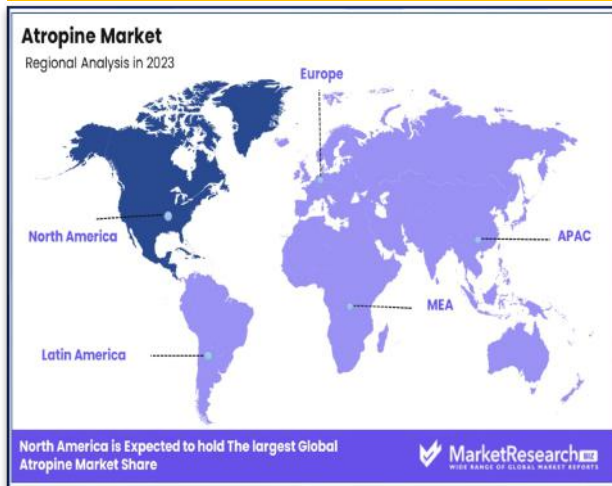
Atropine's vital role in anesthesia and emergency care also catalyzes its market growth. It is essential in managing the side effects of various anesthetics and in treating emergency conditions such as bradycardia

during surgical procedures. The Centres for Disease Control and Prevention (CDC) reported over 51 million inpatient surgical procedures in the United States alone in 2018, reflecting a substantial demand for atropine.

This demand is poised to grow as the volume of surgical and emergency procedures continues to rise globally. The increase in medical emergencies and surgical interventions creates a consistent need for atropine, ensuring its

steady market demand. As surgeries become more frequent and complex, the reliance on atropine for effective patient management during these critical conditions enhances its market potential.

### Regional Analysis



Europe holds a significant 25% market share due to its robust healthcare systems and active pharmaceutical sector. The Asia Pacific region, rapidly expanding, commands a 20% share driven by improving healthcare infrastructure and increased access to medical treatment. The Middle East & Africa, with a smaller yet growing 10% share, benefits from gradually improving healthcare systems and investments in medical research. Latin America also maintains a 10% share, supported by ongoing improvements in healthcare infrastructure and regulatory frameworks.

### Reference

1. <https://marketresearch.biz/report/atropine-market/>
2. Pejić, M., Janković, M., Đordjević, S., & Koturević, B. (2020). Extraction and identification of atropine from “legal high” plant species. In *Thematic conference proceedings of international significance [Elektronski izvor]/International Scientific Conference "Archibald Reiss Days", Belgrade, 18-19 November 2020.* (pp. 713-720). Belgrade: University of Criminal Investigation and Police Studies.