

# alfa-Aminocaproic acid

## Table of Contents

summary

Chemical Properties

- Solubility

- Molecular Characteristics

- Physical Properties

- Chemical Reactivity

Mechanism of Action

Therapeutic Uses

- Clinical Applications

  - Surgical Procedures

  - Trauma Management

  - Off-Label Uses

- Mechanism of Action

Dosage and Administration

- Adult Dosage

- Pediatric Dosage

- Administration Guidelines

- Storage Instructions

- Monitoring and Precautions

Safety and Side Effects

Research and Development

- Future Directions in Research

- Screening Techniques in Metabolic Engineering

- Applications of Aminocaproic Acid

Check <https://storm.genie.stanford.edu/article/1187032> for more details

Stanford University Open Virtual Assistant Lab

The generated report can make mistakes.

Please consider checking important information.

The generated content does not represent the developer's viewpoint.

## summary

alfa-Aminocaproic acid, also known as aminocaproic acid, is a synthetic amino acid classified as an antifibrinolytic agent. It plays a crucial role in medical settings by inhibiting fibrinolysis—the process that leads to the breakdown of fibrin in blood clots—making it a vital therapeutic option for managing severe bleeding in various clinical scenarios. Its notable applications include its use during major surgical procedures, trauma management, and in patients with specific bleeding disorders, where it significantly reduces blood loss and the need for blood transfusions.[\[1\]\[2\]\[3\]](#).

The compound has a well-defined mechanism of action, primarily involving the reversible blockade of plasminogen binding sites, which effectively inhibits the activity of plasmin, the enzyme responsible for clot degradation. Research has shown that aminocaproic acid exerts its effects at varying concentrations, enhancing its utility in promoting hemostasis in situations where bleeding control is critical.[\[4\]\[5\]\[6\]](#). Additionally, its biochemical interactions and structural dynamics have been explored through advanced scientific methods, providing insights that inform its clinical use and efficacy.[\[1\]\[6\]](#).

Despite its widespread use, aminocaproic acid is not without controversy. While generally well tolerated, it can lead to side effects ranging from gastrointestinal discomfort to more severe reactions such as confusion and seizures in susceptible individuals.[\[7\]\[8\]](#). Furthermore, concerns regarding its off-label use and potential interactions with other medications underscore the importance of careful monitoring and clinical judgment during its administration.[\[7\]\[9\]](#).

Overall, alfa-aminocaproic acid represents an important advancement in the management of bleeding disorders and surgical complications, with ongoing research aimed at optimizing its applications and enhancing patient outcomes in diverse medical contexts.[\[10\]\[11\]](#).

## Chemical Properties

### Solubility

The solubility of alfa-aminocaproic acid in water is particularly noteworthy due to its ability to form hydrogen bonds with water molecules, aided by its hydroxy and amine groups[\[1\]](#). Additionally, its solubility increases with temperature, which enhances its utility in various biochemical and pharmaceutical applications. The compound can also dissolve in other polar solvents, making it versatile for diverse chemical reactions[\[1\]](#).

### Molecular Characteristics

Alfa-aminocaproic acid, also known as 6-aminocaproic acid, is an organic compound with a molecular formula of  $C_6H_{13}NO_2$  and a molecular weight of 131.17 g/mol[\[12\]\[13\]](#). The compound features two functional groups: an amine ( $-NH_2$ ) and

a carboxylic acid (-COOH), which classifies it as an alpha-amino acid. Its structural formula highlights its polar nature, contributing to its solubility and reactivity in biochemical processes[1].

## Physical Properties

Alfa-aminocaproic acid appears as white flakes and is highly soluble in water[14]. It has a melting point of 113°C and a boiling point of 246°C, indicating its thermal stability under standard conditions[14]. The pKa of the compound is approximately 2.54, which suggests its acidic characteristics and influences its behavior in different pH environments[14].

## Chemical Reactivity

Alfa-aminocaproic acid undergoes typical reactions associated with amino acids, such as peptide bond formation during protein synthesis. Its reactivity can also be influenced by changes in the overall charge of the molecule under different pH conditions, which further enhances its biological and chemical applicability[1][13].

## Mechanism of Action

Alfa-aminocaproic acid, commonly known as aminocaproic acid, functions primarily as an antifibrinolytic agent. Its mechanism of action involves the inhibition of fibrinolysis, which is the process of breaking down fibrin in blood clots. This is achieved by preventing the binding of plasminogen to fibrin, thus inhibiting its conversion to plasmin, the enzyme responsible for fibrin degradation[4][5].

At lower doses, aminocaproic acid exerts its inhibitory effects mainly by blocking the activation stage of plasminogen[6]. However, at higher concentrations, its efficacy is augmented not only by this blockade but also by inactivating the enzymatic activity of plasmin itself[6]. This dual action significantly reduces the breakdown of clots, thereby promoting hemostasis in clinical situations where bleeding needs to be controlled[15].

Additionally, the exact biochemical interactions and structural dynamics of aminocaproic acid with plasminogen and plasmin have been explored through methods such as microcalorimetry and spectroscopy. These studies have provided insights into how the molecular structure of aminocaproic acid influences its reactivity and binding affinity, which are critical for its role in hemostatic processes[1][6]. Overall, aminocaproic acid serves as an important therapeutic agent in managing conditions that require the stabilization of blood clots.

## Therapeutic Uses

Alfa-aminocaproic acid, commonly referred to as aminocaproic acid, is primarily known for its role as an antifibrinolytic agent. It is effective in clinical settings, particularly for the management of severe bleeding by inhibiting the fibrinolytic process, thus stabilizing clots and preventing excessive blood loss during surgeries[2][3].

# Clinical Applications

Aminocaproic acid is utilized in various medical scenarios, including:

## Surgical Procedures

The compound is frequently employed during major surgeries, such as orthopedic operations, to significantly reduce blood loss and the necessity for blood transfusions[3][16]. Its application has been particularly noted in total knee and hip replacement surgeries[3]. Additionally, it is indicated for managing excessive postoperative bleeding and is beneficial in cardiac surgeries, where it helps mitigate the risks associated with acute hemorrhages[17][18].

## Trauma Management

In emergency situations, aminocaproic acid serves as a reliable therapeutic option for severe traumatic bleeding, functioning by halting the fibrinolysis process to protect the thrombus that has formed[2]. This makes it a critical component in the acute management of trauma patients[19].

## Off-Label Uses

Beyond its approved applications, aminocaproic acid is often used off-label for a variety of conditions. These include controlling bleeding in patients with severe thrombocytopenia, managing oral bleeding in patients with coagulation disorders, and reducing risks of hemorrhage during dental procedures for patients on anticoagulation therapy[20][5]. It is also noted for its utility in preventing recurrent hemorrhage in specific patient populations, such as those with traumatic hyphema[20].

## Mechanism of Action

The mechanism through which aminocaproic acid operates involves the reversible blockade of plasminogen binding sites, thereby inhibiting the action of plasmin, the enzyme responsible for fibrinolysis. This action effectively preserves clots, making it particularly useful in situations where blood loss is a concern, such as in major surgeries or severe trauma[21][22].

## Dosage and Administration

### Adult Dosage

For adults, the recommended dosage of alfa-aminocaproic acid is 5 grams (g) or 4 teaspoonfuls as an initial dose during the first hour of treatment. This is followed by a maintenance dose of 1 g or 1 teaspoonful every hour for up to 8 hours or until the bleeding has been effectively controlled[23][7].

## Pediatric Dosage

In the case of children, the dosage and administration must be determined by a healthcare provider based on individual needs[\[23\]\[7\]](#).

## Administration Guidelines

Alfa-aminocaproic acid can be administered in oral dosage forms, either as a solution or tablets. It is crucial to follow a fixed schedule for this medication. If a dose is missed, patients should contact their doctor or pharmacist for guidance on how to proceed[\[23\]\[7\]](#).

## Storage Instructions

The medication should be stored in a closed container at room temperature, away from heat, moisture, and direct light, and should not be frozen. It must be kept out of the reach of children, and any outdated or unnecessary medication should be disposed of appropriately, as advised by a healthcare professional[\[23\]\[7\]](#).

## Monitoring and Precautions

Regular monitoring by a healthcare provider is essential while using alfa-aminocaproic acid, as blood tests may be required to ensure the medication is working properly and to check for any unwanted side effects[\[7\]\[8\]](#). Patients should only take this medication as prescribed and should not exceed the recommended dose or duration of treatment, as this may increase the risk of adverse effects[\[7\]\[24\]](#).

## Safety and Side Effects

Aminocaproic acid, while generally well tolerated, may cause a range of side effects, some of which may not require medical attention as they could subside as the body adjusts to the medication. Commonly reported side effects include gastrointestinal discomfort, such as nausea, vomiting, and abdominal pain[\[9\]\[25\]](#). Other side effects that may occur include confusion regarding time, place, or person, ringing in the ears, decreased vision, diarrhea, and unusual mental changes, including hallucinations and persistent false beliefs[\[7\]\[23\]\[22\]](#).

Serious side effects, although less common, can occur and require immediate medical attention. These include symptoms like sudden weakness or numbness in limbs, fast or slow heartbeat, coughing up blood, rust-colored urine, decreased urine output, fainting, and seizures[\[8\]\[17\]](#). Patients with a history of blood clots, disseminated intravascular coagulation, hematuria, or kidney disease should use aminocaproic acid with caution, as it may exacerbate these conditions[\[7\]\[23\]\[22\]](#).

Interactions with other medications, food, alcohol, or tobacco can also affect the safety and efficacy of aminocaproic acid. It is advisable to consult with a healthcare professional about potential interactions and the proper use of the medication[\[7\]\[23\]](#). If any side effects are persistent or bothersome, patients should seek guidance from

their healthcare provider, and any serious adverse events can be reported to the FDA[\[9\]\[8\]\[17\]](#).

## Research and Development

### Future Directions in Research

Ongoing research continues to explore the potential of aminocaproic acid and its derivatives in various medical applications, particularly in managing bleeding disorders associated with severe thrombocytopenia and other conditions. The versatility of aminocaproic acid in different clinical scenarios underscores the need for further studies to optimize its use and expand its therapeutic applications[\[10\]](#). As research in metabolic pathways advances, the integration of aminocaproic acid into engineered systems presents opportunities for enhanced medical interventions and improved patient outcomes.

### Screening Techniques in Metabolic Engineering

Research in metabolic engineering has highlighted the importance of efficient screening techniques for the development of novel biochemical pathways. Screening may involve the detection of expression of selectable markers, allowing for the survival of specific cells while others die, which can be critical in the identification of successful modifications. Among the preferred methods are visual (colorimetric) assays that are optimal for compounds with suitable light absorption properties, facilitating rapid and sensitive screening processes[\[26\]](#).

More sophisticated methodologies have emerged, including high-throughput high-performance liquid chromatography-mass spectrometry (HPLC-MS), solid-phase microextraction (SPME), and gas chromatography-mass spectrometry (GC-MS). These advanced techniques, often employed in tandem with automated screening robots, enable rapid sample analysis and quantification of a wide range of compounds produced through enzymatic pathways[\[26\]](#).

### Applications of Aminocaproic Acid

Aminocaproic acid has garnered attention for its applications in clinical settings, particularly as an antifibrinolytic agent in severe traumatic bleeding and various surgical contexts. Its ability to inhibit fibrinolysis has made it a reliable choice for preventing excessive blood loss during and after surgical procedures[\[2\]\[21\]](#). Clinical trials have demonstrated its efficacy in reducing blood transfusion requirements and improving coagulation profiles in pediatric patients undergoing open-heart surgery[\[10\]](#).

The drug is typically administered at the first sign of bleeding, with dosages tailored to the severity of the condition. Initial treatment often involves intravenous administration, followed by oral doses as needed. Monitoring through blood tests is crucial to ensure the drug's effectiveness and safety during treatment[\[11\]\[23\]](#).



# References

- [1]: [Lysine - Solubility of Things](#)
- [2]: [.alpha.-Aminocaproic acid | Drug Information, Uses, Side Effects ...](#)
- [3]: [6-Aminocaproic Acid \(EACA\) CAS No.: 60-32-2](#)
- [4]: [alpha-Aminocaproic acid\(327-57-1\) - ChemicalBook](#)
- [5]: [Amicar, \(aminocaproic acid\) dosing, indications, interactions ...](#)
- [6]: [Aminocaproic Acid - an overview | ScienceDirect Topics](#)
- [7]: [Aminocaproic Acid | Drug Information, Uses, Side Effects, Chemistry](#)
- [8]: [Pharmacokinetics and pharmacodynamics of αaminocaproic acid ...](#)
- [9]: [Activated Factor Seven \(aFVII\) versus Aminocaproic Acid for ...](#)
- [10]: [Aminocaproic Acid: A Comprehensive Guide for Patients](#)
- [11]: [The Efficacy and Safety of Epsilon-Aminocaproic Acid for ...](#)
- [12]: [Aminocaproic Acid - StatPearls - NCBI Bookshelf](#)
- [13]: [Reduction of bleeding after heart operations through the ...](#)
- [14]: [Aminocaproic Acid: MedlinePlus Drug Information](#)
- [15]: [Epsilon-aminocaproic acid in the treatment of patients with acute ...](#)
- [16]: [Aminocaproic Acid Action Pathway - SMPDB](#)
- [17]: [Hemostatic, Thrombolytic, Erythropoietic & Leukopoietic Meds](#)
- [18]: [Aminocaproic acid \(oral route\) - Mayo Clinic](#)
- [19]: [Aminocaproic acid \(Oral\) Advanced Patient Information - Drugs.com](#)
- [20]: [Aminocaproic Acid | Saint Luke's Health System](#)
- [21]: [Aminocaproic Acid Dosage Guide + Max Dose, Adjustments](#)
- [22]: [Aminocaproic acid \(Amicar\) - Uses, Side Effects, and More - WebMD](#)
- [23]: [What are the side effects of Aminocaproic Acid? - Patsnap Synapse](#)
- [24]: [Aminocaproic acid - Wikipedia](#)
- [25]: [US8404465B2 - Biological synthesis of 6-aminocaproic acid from ...](#)
- [26]: [Aminocaproic acid Uses, Side Effects & Warnings - Drugs.com](#)