The amount of albumin solution given will depend upon the clinical condition of the patient and the response to treatment. The following doses have been suggested:

- acute hypovolaemic shock: an initial dose of 25 g for adults (for example, 500 mL of a 5% solution or 100 mL of a 25% solution) and up to about 1 g/kg for children
- hypoproteinaemia: a maximum of 2 g/kg daily
- neonatal hyperbilirubinaemia: 1 g/kg before exchange transfusion

The rate of infusion should be adjusted according to the indication and patient response, but in general, suggested rates of infusion are up to 5 mL/minute (5% solution) or 1 to 2 mL/minute (20% solution). In plasmapheresis the albumin infusion rate should be adjusted according to the rate of removal.

Albumin solutions should not be used for parenteral nutrition.

◊ References.

1. Nicholson JP, *et al.* The role of albumin in critical illness. *Br J Anaesth* 2000; **85:** 599–610.
2. Matejtschuk P, *et al.* Production of human albumin solution: a continually developing colloid. *Br J Anaesth* 2000; **85:** 887–95.
3. Haynes GR, *et al.* Albumin administration–what is the evidence of clinical benefit? A systematic review of randomized controlled trials. *Eur J Anaesthesiol* 2003; **20:** 771–93.
4. Mendez CM, *et al.* Albumin therapy in clinical practice. *Nutr Clin Pract* 2005; **20:** 314–20.
5. McLeod BC. Therapeutic apheresis: use of human serum albumin, fresh frozen plasma and cryosupernatant plasma in therapeutic plasma exchange. *Best Pract Res Clin Haematol* 2006; **19:** 157–67.
6. Kobayashi K. Summary of recombinant human serum albumin development. *Biologicals* 2006; **34:** 55–9.

Preparations

Ph. Eur.: Human Albumin Solution;
USP 31: Albumin Human.

Proprietary Preparations (details are given in Part 3)

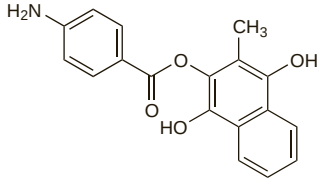
Arg.: Buminate; Zenalb†; ***Austral.:*** Albumex; ***Austria:*** Albuminativ; ***Braz.:*** Albumax†; Albuminar; Beribumin; Blaubimax; Blaubumin†; Plasbumin; Zenalb†; ***Canad.:*** Plasbumin; ***Chile:*** Plasbumin; ***Cz.:*** Flexbumin; ***Denm.:*** Octalbin; ***Fin.:*** Albuminativ; Octalbin; ***Fr.:*** Octalbine; Vialebex; ***Ger.:*** Humanalbin; ***Gr.:*** Zenalb; ***Hong Kong:*** Albuminar; Albutein; Biseko; Buminate; Kamapharm; Plasbumin; ***Indon.:*** Albapure; Alburaas; Albutein; Farmin; Fimalbumin; Octalbin; Plasbumin; ***Israel:*** Albuminar; Egg Plus; Plasbumin†; ***Ital.:*** Albital; Albuman†; Alburex; Albutein; Plasbumin; ***Jpn:*** Medway; ***Malaysia:*** Albutein; Buminate; Plasbumin†; Zenalb; ***Mex.:*** Albital†; Albumar†; Albumyn†; Biomina†; Buminate†; Hi-Bumin†; Octalbin; Probialbumin†; Seralbumin†; Vanderbumin; ***Neth.:*** Albuminativ†; Cealb; Octalbine; ***NZ:*** Albumex; ***Philipp.:*** Albumax; Albuminar; Albutein; Plasbumin; ***Pol.:*** Biseko; ***Port.:*** Flexbumin; ***Rus.:*** Plasbumin (Плазбумин); ***S.Afr.:*** Albusol; ***Singapore:*** Albutein; Plasbumin†; Zenalb; ***Spain:*** Octalbin; Plasbumin; ***Swed.:*** Albuminativ; ***Switz.:*** Albuman; ***Thai.:*** Alburaas; Albutein; Buminate; Zenalb; ***Turk.:*** Alba; Albuman; Albuminar; Cealb; Plasbumin; Zenalb; ***UK:*** Alba†; Albutein; Zenalb; ***USA:*** Albumarc; Albuminar; Albutein; Buminate; Plasbumin.

Multi-ingredient: ***Denm.:*** Pharmalgen Albumin; ***Swed.:*** Tisseel Duo Quick.

Aminaphthone

Aminaftona; Aminaftone; Aminaphtone; Aminonaphthone. 2-Hydroxy-3-methylnaphtho-1,4-hydroquinone 2-(4-aminobenzoate); 3-Methylnaphthalene-1,2,4-triol 2-(4-aminobenzoate).

$C_{18}H_{15}NO_4$ = 309.3.
CAS — 14748-94-8.



Profile

Aminaphthone is a haemostatic. Daily doses of 150 to 225 mg orally have been used.

Preparations

Proprietary Preparations (details are given in Part 3)

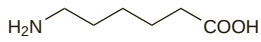
Braz.: Capilarema; ***Ital.:*** Capillarema; ***Port.:*** Capilarema; ***Spain:*** Capilarema†.

Aminocaproic Acid *(BAN, USAN, rINN)*

Acide aminocaproïque; Ácido aminocapróico; Ácido aminocaproico; Acidum aminocaproicum; Aminokaproninhappo; Aminokaprono rūgštis; Aminokapronsav; Aminokapronsyra; CL-10304; CY-116; EACA; Epsilon Aminocaproic Acid; JD-177; Kwas ε-aminokapronowy; Kyselina aminokapronová; NSC-26154. 6-Aminohexanoic acid.

Аминокапроновая Кислота

$C_6H_{13}NO_2$ = 131.2.
CAS — 60-32-2.
ATC — B02AA01.
ATC Vet — QB02AA01.



Pharmacopoeias. In *Eur.* (see p.vii) and *US.*

Ph. Eur. 6.2 (Aminocaproic Acid). A white or almost white, crystalline powder or colourless crystals. Freely soluble in water; slightly soluble in alcohol. A 20% solution in water has a pH of 7.5 to 8.0.

USP 31 (Aminocaproic Acid). A fine, white, odourless or practically odourless, crystalline powder. Soluble 1 in 3 of water and 1 in 450 of methyl alcohol; slightly soluble in alcohol; practically insoluble in chloroform and in ether; freely soluble in acids and in alkalis. Its solutions are neutral to litmus. Store in airtight containers.

Adverse Effects

Adverse effects associated with aminocaproic acid include dose-related gastrointestinal disturbances, dizziness, tinnitus, headache, nasal and conjunctival congestion, and skin rashes. Aminocaproic acid may cause muscle damage. This has usually occurred with high doses given for prolonged periods; renal failure may develop. Thrombotic complications have been reported, although they are usually a consequence of inappropriate use. If aminocaproic acid is given by rapid intravenous injection it can produce hypotension, bradycardia, and arrhythmias. There have been reports of a few patients suffering from convulsions, dry ejaculation, or cardiac and hepatic damage.

Effects on the blood. Very high doses of aminocaproic acid (36 g or more daily) have been given intravenously in the management of subarachnoid haemorrhage (see Stroke, p.1185). One study[1] reported rebleeding and excessive intra-operative bleeding and suggested that this was due to an antiplatelet effect of the aminocaproic acid. However, a comment on this report[2] pointed out that any antiplatelet effect was independent of its antifibrinolytic action and that this effect could only aggravate rebleeding, if it occurs, rather than causing it. However, early surgical intervention is now used to manage subarachnoid haemorrhage, and in a series of 307 patients treated with high-dose short-term aminocaproic acid before early surgery it was found that, compared with older reports in the literature, there was a low rate of rebleeding without an apparent increase in adverse effects.[3]

1. Glick R, *et al.* High dose ε-aminocaproic acid prolongs the bleeding time and increases rebleeding and intraoperative hemorrhage in patients with subarachnoid hemorrhage. *Neurosurgery* 1981; **9:** 398–401.
2. Kassell NF. Comment. *Neurosurgery* 1981; **9:** 401.
3. Leipzig TJ, *et al.* Reducing the risk of rebleeding before early aneurysm surgery: a possible role for antifibrinolytic therapy. *J Neurosurg* 1997; **86:** 220–5.

Effects on the kidneys. Adverse renal effects of aminocaproic acid are rare but have included renal arterial thrombosis, glomerular capillary thrombosis, and renal pelvic or ureteral obstruction caused by upper urinary tract thrombosis.[1] Cases of acute renal failure associated with myopathy are described under Effects on the Muscles, below.

1. Manjunath G, *et al.* Epsilon-aminocaproic acid and renal complications: case report and review of the literature. *Clin Nephrol* 2002; **58:** 63–7.

Effects on the muscles. There have been cases of reversible myopathy,[1-4] associated with daily doses of aminocaproic acid ranging from 10 to 49 g and treatment durations of about 1 to 3 months. In some patients myoglobinuria or acute tubular necrosis also occurred. Suggested mechanisms for the reaction have included a direct dose-related effect on the muscle fibre[2] or a defect in aerobic energy provision induced by aminocaproic acid.[3]

1. Brown JA, *et al.* Myopathy induced by epsilon-aminocaproic acid. *J Neurosurg* 1982; **57:** 130–4.
2. Vanneste JAL, van Wijngaarden GK. Epsilon-aminocaproic acid myopathy. *Eur Neurol* 1982; **21:** 242–8.
3. Van Renterghem D, *et al.* Epsilon amino caproic acid myopathy: additional features. *Clin Neurol Neurosurg* 1984; **86:** 153–7.
4. Seymour BD, Rubinger M. Rhabdomyolysis induced by epsilon-aminocaproic acid. *Ann Pharmacother* 1997; **31:** 56–8.

Precautions

As for Tranexamic Acid, p.1081.

The range of adverse effects that have been noted with aminocaproic acid indicates that caution is required in patients with renal or cardiac disorders. Should treatment be prolonged, it is advisable to monitor creatine phosphokinase values for signs of muscle damage.

Renal impairment. High anion gap metabolic acidosis developed in a 65-year-old woman with sepsis and acute renal failure who received aminocaproic acid for a haemorrhagic coagulopathy.[1] The acidosis improved temporarily after haemodialysis and resolved on withdrawal of aminocaproic acid and systemic alkalinisation. Although the dose of aminocaproic acid had been reduced because of renal impairment, it was suggested that more conservative dosing and close monitoring may be indicated in such patients. Hyperkalaemia has been attributed to the use of aminocaproic acid in a few patients with chronic renal failure.[2]

1. Budris WA, *et al.* High anion gap metabolic acidosis associated with aminocaproic acid. *Ann Pharmacother* 1999; **33:** 308–11.
2. Nzerue CM, Falana B. Refractory hyperkalaemia associated with use of epsilon-aminocaproic acid during coronary bypass in a dialysis patient. *Nephrol Dial Transplant* 2002; **17:** 1150–1.

Interactions

Retinoids. Aminocaproic acid should be used with caution in patients receiving oral *tretinoin* (see Antifibrinolytics, p.1619).

Pharmacokinetics

Aminocaproic acid is readily absorbed when given orally and peak plasma concentrations are reached within 2 hours. It is widely distributed and is rapidly excreted in the urine, mainly unchanged, with a terminal elimination half-life of about 2 hours.

Uses and Administration

Aminocaproic acid is an antifibrinolytic used similarly to tranexamic acid (p.1081) in the treatment and prophylaxis of haemorrhage associated with excessive fibrinolysis. It has also been used in the prophylaxis of hereditary angioedema (below).

A plasma concentration of about 130 micrograms/mL is considered to be necessary for effective inhibition of fibrinolysis and the recommended dosage schedules are aimed at producing and maintaining this concentration for as long as is necessary. For the treatment and prophylaxis of **haemorrhage**, aminocaproic acid may be given orally in an initial dose of 4 to 5 g, followed by 1 to 1.25 g every hour. Alternatively, the same dose may be given intravenously as a 2% solution; the initial dose (4 to 5 g) should be given over one hour followed by a continuous infusion of 1 g/hour. Up to 8 hours of treatment is often sufficient. Should treatment need to be extended, then the maximum dose over 24 hours should not normally exceed 24 g.

In patients with **haemophilia** (p.1048) who undergo dental extraction, aminocaproic acid has been given in an initial dose of 6 g orally immediately after the procedure, followed by 6 g orally every 6 hours for up to 10 days.

Care is required when aminocaproic acid is used in patients with renal impairment and dosage should be reduced.

Hereditary angioedema. In the management of hereditary angioedema (p.1081), antifibrinolytic drugs may be used as an alternative to androgens for the prophylaxis of attacks. The usual oral dose of aminocaproic acid in such patients is 1 g three or four times daily. It has also been used intravenously for acute attacks, and anecdotal reports suggest it may be modestly helpful, but there is no published evidence suggesting significant benefit.[1]

1. Zuraw BL. Current and future therapy for hereditary angioedema. *Clin Immunol* 2005; **114:** 10–16.

Preparations

USP 31: Aminocaproic Acid Injection; Aminocaproic Acid Syrup; Aminocaproic Acid Tablets.

Proprietary Preparations (details are given in Part 3)

Arg.: Ipsilon; ***Austral.:*** Amicar†; ***Braz.:*** Ipsilon; ***Canad.:*** Amicar†; ***Fr.:*** Hexalense†; ***Hung.:*** Aceprami; ***India:*** Hemocid; ***Ital.:*** Caprolisin; ***Mex.:*** Amicar†; ***NZ:*** Amicar†; ***Port.:*** Epsicaprom; ***Spain:*** Caproamin; ***USA:*** Amicar; ***Venez.:*** Caproamin.

Multi-ingredient: ***Braz.:*** Eaca Balsamico; Expectovac†; Ginurovac†; ***Spain:*** Caprofides Hemostatico.