Aminophylline

Brand names	Generics
Medication error potential	Look-alike, sound-alike drug names. Aminophylline may be confused with ampicillin and amitriptyline.[1] Failure to correctly convert between aminophylline and theophylline can result in medication error.
Contraindications and warnings	**Contraindications:** Patients with a history of hypersensitivity to theophylline or other components in the product including ethylenediamine.[2] **Warnings:** Use with extreme caution as theophylline may exacerbate active peptic ulcer disease, seizure disorders, hypothyroidism, and/or cardiac arrhythmias (not including bradyarrhythmias).[2]
Infusion-related cautions	Rapid administration may result in toxic serum concentrations[3] that may be associated with circulatory failure.[4] Avoid extravasation. (See Appendix E.)
Dosage	Aminophylline products contain varying amounts of theophylline (check manufacturers' information). All of the doses in this monograph are reported as **THEOPHYLLINE** unless otherwise noted. Regardless of disease, therapy should be individualized using serum theophylline concentrations. **Apnea and bradycardia of prematurity (usual targeted serum concentration range of 6–12 mg/L)** **Loading dose (LD):** 4–6 mg/kg over 20–30 minutes[3-10] If the patient is already receiving theophylline, a serum concentration must be obtained and the LD based on that concentration[11] using the equation: LD (mg/kg) = (desired concentration − measured concentration)/2 (See the Comments/Other section for more information about the equation.) **Initial maintenance dose:** 2–4 mg/kg/day divided q 12 hr[3-6] or 3.3–7.5 mg/kg/day divided q 8 hr[7-10] **Diuretic:** Adjunctive therapy in critically ill children unresponsive to furosemide or in those who are diuretic-dependent. Low-dose aminophylline as a single loading dose of 3 mg/kg over 30 minutes[12] or a loading dose of 3 mg/kg over 20 minutes followed by 0.5 mg/kg/hr.[13] **Severe acute asthma (usual "therapeutic" range 5–15 mg/L):** The role of IV aminophylline in acute asthma is controversial. Many *adult*[14-17] and pediatric[18-20] patients who respond to beta-agonist and systemic glucocorticoid experience no additional benefit from aminophylline.[21-23] A retrospective study of 47 children (3–18 years of age) with severe asthma who were admitted to the intensive care unit and who had failed systemic corticosteroids and inhaled albuterol received aminophylline. Patients receive 6 mg/kg loading dose of aminophylline followed by a continuous infusion of 1–1.2 mg/kg/hr. Thirty-one of 49 children had serum theophylline concentration >10 mg/mL. Use of aminophylline was associated with a longer length of hospital stay and time to resolution of symptoms when compared to those not receiving aminophylline.[41] However, studies suggest that the addition of aminophylline may be beneficial in critically ill children with severe acute asthma and impending respiratory failure who are unresponsive to aggressive beta-agonist and systemic glucocorticoids.[14-17] *Loading*[24,25] *and maintenance*[26] *doses should be based on ideal body weight in children who are overweight or obese. (See Appendix B.)* **LD (*no* theophylline in the past 24 hours):** 5–6 mg/kg over 20–30 minutes[2,27,28] **LD (theophylline in the past 24 hours):** A theophylline serum concentration must be obtained and the LD estimated based on the following equation (see the Comments section): LD (mg/kg) = (desired concentration – measured concentration)/2[11]

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Dosage *(cont.)*	**Maintenance dose (initial dose to achieve a target serum concentration of 10 mg/L)** **Infants 6–52 weeks:** [0.008 (age in weeks) + 0.21] = mg/kg/hr[28,29] **Children 1 to <9 years:** 0.8 mg/kg/hr[28] **Children 9 to <12 years:** 0.7 mg/kg/hr[28] **Children 12–16 years (smoker):** 0.7 mg/kg/hr[28] **Children 12–16 years (nonsmoker):** 0.5 mg/kg/hr[28]
Dosage adjustment in organ dysfunction	Infants up to 3 months of age eliminate 50% of theophylline unchanged in the urine; hence, the dosage should be decreased in these infants.[5,28,30] The dose should also be reduced in patients with cardiac failure, hepatic dysfunction, acute hepatitis, or sustained high fever and asphyxiated neonates.[2,28,31,32]
Maximum dosage	Individualize dosage based on serum concentrations and clinical response.[2] Not to exceed 900 mg/day unless serum theophylline concentration indicates the need for larger doses.[28]
Additives	None
Suitable diluents	D5W, D10W, D20W, LR, NS, R, ½NS, D5NS, D5½NS, D5¼NS, D-LR, D-R, D-SL, D5LR. Stable in dextran 6% in D5W, dextran 6% in NS.[33]
Maximum concentration	25 mg/mL (commercially available)[33]
Preparation and delivery	*Parenteral products should be visually inspected for particulate matter and discoloration before use. Refer to appropriate references for more information on compatibility with other drugs and solutions; compatibility following Y-site delivery, and suggested storage and extended stability.*[33] **Stability:** Store at room temperature.[33] **Compatibility:** For PN compatibility information, see Appendix D.[34] **Photosensitivity:** Protect from light.[33]
IV push	Not recommended
Intermittent infusion	≤25 mg/mL (commercially available) over 15–30 minutes[2] not to exceed 0.36 mg/kg/min or 25 mg/min[2]
Continuous infusion	≤25 mg/mL.[2] Normally diluted to 1 mg/mL (commercially available).
Other routes of administration	Should not be given IM.[2]
Comments	**Significant adverse effects:** Whenever a patient receiving theophylline develops nausea or vomiting, particularly repetitive vomiting, or other signs or symptoms consistent with theophylline toxicity (e.g., tachycardia, arrhythmias, seizures), the infusion should be stopped and a serum theophylline concentration measured immediately.[28,35]