Amikacin Sulfate

Brand names

Amikin

Medication error potential

ISMP's *Confused Drug Names* lists confusion of Amikin with Kineret.[1]

Contraindications and warnings

U.S. boxed warning: Patients with impaired renal function and those receiving large doses or prolonged therapy have an increased risk for nephrotoxicity and ototoxicity (i.e., vestibular and auditory), of which ototoxicity may be irreversible.[2] The risk of toxicity can also be increased by elevations in serum concentrations; concurrent use of medications known to be nephro-, neuro-, or oto-toxic; dehydration; and advancing age.[2] Observe closely for signs or symptoms of toxicity.[2] (See Rare Adverse Effects and Monitoring in the Comments section.)

Contraindications: Known hypersensitivity to amikacin or other aminoglycosides.[2]

Other warnings: Aminoglycosides can cause neuromuscular blockade and potentiate the effects of neuromuscular blockers.[2,5,6] (See Appendix C for specific information.)

Infusion-related cautions

None

Dosage

Although use has been questioned in pediatric patients, the following equation is recommended in *adult* obese patients receiving aminoglycosides.[7-10]

Dosing weight = IBW + 0.4 (TBW – IBW). (See Appendix B.)

Loading dose: Aminoglycoside loading doses have been advocated.[2,11-14] Limited data are available, but some advocate an initial amikacin dose of 10–17 mg/kg in neonates and infants.[14]

Neonates: Many studies using various dosing methods for aminoglycosides (mostly studied with gentamicin) have been reported in neonates. Most reports have based recommendations on weight and postnatal age (PNA)[15-21] or gestational age.[22-37] Use of dose and interval equations based on area-under-the-curve (AUC) has also been recommended in the preterm neonate.[38,39] Although very few studies have been conducted using high-dose extended-interval amikacin in premature neonates, traditional dosing (7.5 mg/kg/dose) has become less commonly recommended with large dose, extended-interval regimens becoming accepted practice. PNA, at which any of these aminoglycoside regimens are applicable, has not been well studied, but the few studies delineating a PNA have generally been ≤7 days of age.[18,22,24-27,28,31,34,38]

Maintenance dose

Based on age and weight

Traditional dosing: 7.5 mg/kg/dose q 12–24 hr. Interval based on PNA and weight.[2,14,40,41]

PNA	<2000 g	≥2000 g
<7 days	15 mg/kg q 48 hr[21]	15 mg/kg q 24 hr[21]
≥7 days	15 mg/kg q 24 hr[21]	17.5 mg/kg q 24 hr[21]

*Until 4 weeks of age

Based on WGA

≤28 WGA	29–36 WGA	≥37 WGA
15–20 mg/kg q 36–42 hr[42-44]	14–20 mg/kg q 24–36 hr[42-44]	15–15.5 mg/kg q 24 hr[42-45]

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Dosage *(cont.)*	**Infants and children:** 15–22.5 mg/kg/day divided q 8–12 hr[2,21,40] or 1260 mg/m^2/day divided q 8 hr[46] or 15–20 mg/kg once daily[21,49-56] **Cystic fibrosis:** 15–30 mg/kg/day divided q 6–12 hr[68-70]
Dosage adjustment in organ dysfunction	Based on traditional dosing: If CrCl is >50 mL/min, give a normal dose; if CrCl is 30–50 mL/min, give q 12–18 hr; if CrCl is 10–29 mL/min, give q 18–24 hr; and if CrCl is <10 mL/min, give q 48–72 hr.[57]
Maximum dosage	1.5 g/day.[2] Individualize dosage based on serum concentrations.[2]
Additives	The 250-mg/mL product contains sodium bisulfate.[58] (See Appendix C for specific information about sulfite hypersensitivity.)
Suitable diluents	D5¼NS, D5½NS, D5W, LR, or NS[2,58]
Maximum concentration	10 mg/mL[58]
Preparation and delivery	**Delivery system issues:** The mixing of amikacin sulfate with beta-lactam antibiotics in vitro can result in substantial inactivation of the aminoglycoside.[2] (See Appendix C for more specific information.) **Compatibility:** See Appendix D for PN compatibility information.[59]
IV push	Rapid infusion is not recommended.[58] Although not recommended, aminoglycosides have been given over 15 seconds,[60] 1 minute,[61] and 3–5 minutes.[62,71]
Intermittent infusion	Over 30–60 minutes.[2,58] Infusion over 1–2 hours is recommended in infants.[2]
Continuous infusion	Not recommended. Aminoglycosides have been given by continuous infusion,[63,64] but nephrotoxicity may occur more frequently.[64]
Other routes of administration	Undiluted product for IM use[2,58]
Comments	**Rare adverse effects:** Aminoglycosides accumulate in renal cortical tissue and may damage proximal tubule cells leading to oliguric renal failure. Risk of nephrotoxicity may be influenced by type of aminoglycoside, dose, duration (cumulative dose), frequency of therapy, and elevated serum concentration.[2,3] It is also increased by advancing age, preexisting renal or hepatic dysfunction, decreased renal perfusion, hypoalbuminemia, and dehydration.[2,3] Concurrent administration of nephrotoxic medications may increase the risk of toxicity and should be avoided.[2] Cochlear and/or vestibular ototoxicity has been associated with aminoglycoside antibiotics.[4] Total AUC may be a better indicator of ototoxic risk than either peak or trough serum concentration.[47,48] Use cautiously with other drugs known to cause ototoxicity. Aminoglycosides may potentiate the curare-like effects on the neuromuscular junction and should be used with caution in patients with neuromuscular disorders because they may aggravate muscle weakness.[2,72] Aminoglycosides may enhance the respiratory depressant effect of neuromuscular-blocking agents and may prolong blockade.[2,6] Neuromuscular blockade may be reversed by administration of calcium salts.[2] **Monitoring:** Because large variability exists in patient response to therapy, individualize dosage based on serum concentrations, clinical response, and renal function. Recommended peak and trough serum amikacin concentrations are ≤35 mg/L and ≤10 mg/L, respectively.[2] Although serum concentration monitoring has become routine practice in many institutions, not all patients require monitoring.[73,74]