

Intraventricular (IVT) or Intrathecal (IT) Use of Antibiotics

Used for central nervous system (CNS) infections:

- Ventriculitis
- Meningitis
- Shunt or reservoir infections
- Suppurative intracranial infections (brain abscess, subdural empyema, epidural abscess)

General principles

- No antibiotic is approved by the Food and Drug Administration (FDA) for IVT or IT administration
- Use is generally reserved for life-threatening infections
- Goal is to achieve a concentration in the CSF that is not achievable with systemic therapy alone
- Attaining target levels in the CSF is variable; measuring CSF concentration allows for individualization
- Doses must be prepared in a preservative-free medium to prevent toxicity
- IVT/IT antimicrobials should be given with concomitant systemic therapy
- Duration of treatment is highly individualized and depends on clinical condition

Commonly used IVT/IT antimicrobials

Medication (concentration)	Usual Dose	Monitoring parameters	Comments
Vancomycin (5 mg/ml)	5-20 mg/day	Target CSF levels 5-10x higher than the minimum inhibitory concentration (MIC)	Accumulation can occur with daily therapy
Gentamicin (10 mg/ml)	1-8 mg/day	Target concentrations are not defined; some clinicians recommend levels 5-30x higher than the MIC	Accumulation can occur with daily therapy
Amphotericin B (0.5 mg/ml)	0.1-0.5 mg/day	Unknown	Deoxycholate formulation preferred; liposomal may be used if not tolerated

References:

1. Bayston R. Epidemiology, diagnosis, and prevention of cerebrospinal fluid shunt infections. *Neurosurg Clin N Am*. 2001 Oct;12(4):703-8.
2. Kaufman BA. Infections of cerebrospinal fluid shunts. *Infections of the Central Nervous System*, Ed. WM Scheld, RJ Whitley, DT Durack. Philadelphia: Lippincott-Raven, 1997. 555-577, print.
3. Al-Jeraisy M, Phelps SJ, Christensen ML, Einhaus S. Intraventricular vancomycin in pediatric patients with cerebrospinal fluid shunt infections. *J Pediatr Pharmacol Ther* 2004 Jan;9(1):36-42.
4. Wen DY, Bottini AG, Hall WA, Haines SJ. The intraventricular use of antibiotics. *Neurosurg Clin N Am* 1992;3(2):343-54.
5. LeBras M, Chow I, Mabasa V, Ensom M. Systematic review of efficacy, pharmacokinetics, and administration of intraventricular aminoglycosides in adults. *Neurocritical Care* 2016;25:492-507.
6. Tunkel AR, Hartman BJ, Kaplan SL, et al. Practice guidelines for the management of bacterial meningitis. *Clin Infect Dis*. 2004;39:1267–84.

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