

# Ciprofloxacin

Formulations available <sup>1</sup>		
Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Ciprofloxacin (Accord, Teva, Wockhardt)	Tablet 100 mg, 250 mg, 500 mg, 750 mg	Ciprofloxacin (as hydrochloride). Some brands of tablets disperse in water within 2–5 minutes. Owing to the tablet's bulk, it is quite difficult to see the particles, but the dispersion flushes via an 8Fr NG tube without blockage. <sup>2</sup> Actavis (previously Alparma) brand tablets can be crushed. <sup>3</sup>
Ciproxin (Bayer)	Tablet 100 mg, 250 mg, 500 mg, 750 mg	Ciprofloxacin (as hydrochloride). The 750 mg tablets have been crushed and mixed with 50 mL of water and delivered via gastric tube. <sup>4</sup>
Ciproxin (Bayer)	Suspension 250 mg/mL	Granules for suspension. Very thick non-aqueous granular suspension. High risk of tube blockage with fine-bore tubes. <sup>2</sup>
Ciprofloxacin (Hospira)	Solution for Infusion 2 mg/mL	Ciprofloxacin (as lactate). No specific data on enteral tube administration are available for this preparation.
Ciproxin (Bayer)	i.v. infusion 2 mg/mL (100 mL, 200 mL)	Ciprofloxacin (as lactate). No specific data on enteral tube administration are available for this preparation.

## Site of absorption (oral administration)

Absorption mainly occurs from the small intestine.<sup>5–7</sup> Peak plasma concentration occurs 60–75 minutes following an oral dose.<sup>5–8</sup> There is case report evidence that ciprofloxacin is absorbed when delivered into the jejunum but that plasma concentrations may be lower; it is recommended that the higher end of the dose range be used.<sup>9</sup>

## Alternative routes available

Parenteral route available.

## Interactions

The interaction between ciprofloxacin and enteral feeds is well established. Ciprofloxacin binds to divalent ions in the feed. In a study using Pulmocare (high in calcium and magnesium compared to Osmolite and Ensure), the absorption of ciprofloxacin was significantly reduced when Pulmocare was administered immediately following a dose of ciprofloxacin; however, the plasma level achieved was still above the MIC for many important pathogenic bacteria.<sup>4</sup>

When ciprofloxacin, levofloxacin and ofloxacin were added directly to enteral feeds, a loss of dose was observed for all antibiotics; however, the losses were 83%, 61% and 46%, respectively.<sup>10</sup> A reduction in absorption was also noted when the enteral feed was resumed immediately following dosing. The standard fibre feed contained less than half the electrolyte content of Pulmocare; the mean peak level was 44%.<sup>11</sup>

The absorption of ciprofloxacin can be as much as halved by enteral feeds such as Ensure, Jevity, Osmolite, Pulmocare and Sustacal.<sup>12</sup> It is advised not to administer feeds containing dairy products within 1-2 hours of ciprofloxacin.<sup>12</sup>

## Health and safety

Standard precautions apply.

## Suggestions/recommendations

- For severe infections use the intravenous route.
- Disperse the tablets in water immediately prior to dosing.
- It is recommended that the upper end of the dose range be used.<sup>12</sup>
- Although there is no evidence that a break in feeding is beneficial, it would appear logical to administer the dose during a break in feeding where possible.
- The upper end of the dose range should be also be used for intrajejunal administration.
- The patient should be monitored closely for signs of treatment failure.<sup>12</sup>
- Alternatively, the patient could be transferred to an alternative quinolone as the scale of the interaction appears less, although there are fewer publications relating to these antibiotics.

## Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Allow a break in feeding if possible.
4. Place the tablet in the barrel of an appropriate size and type of syringe.
5. Draw 20 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
6. Flush the medication dose down the feeding tube.
7. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 20 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

## Intrajejunal administration

Administer as above. See notes above.

## References

1. *BNF 67*, March 2014.
2. BPNG data on file, 2004.
3. Personal communication, Alparma (now Actavis); 21 January 2003.

4. Cohn SM, Sawyer MD, Burns GA, *et al.* Enteric absorption of ciprofloxacin during tube feeding in the critically ill. *J Antimicrob Chemother* 1996; 38: 871–876.
5. Ciprofloxacin (Teva), Summary of Product Characteristics; December 2011.
6. Ciprofloxacin (Accord), Summary of Product Characteristics; March 2014.
7. Ciproxin (Bayer), Summary of Product Characteristics; September 2013.
8. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.
9. Adams D. Administration of drugs through a jejunostomy tube. *Br J Intensive Care* 1994; 4(1): 10–17.
10. Wright DH, Pietz SL, Konstantinides FN, Rotschafer JC. Decreased in vitro fluoroquinolone concentrations after admixture with an enteral feeding formulation. *JPEN J Parenter Enteral Nutr* 2000; 24: 42–48.
11. Mimos O, Binter V, Jacolot A, *et al.* Pharmacokinetics and absolute bioavailability of ciprofloxacin administered through a nasogastric tube with continuous enteral feeding to critically ill patients. *Intensive Care Med* 1998; 24: 1047–1051.
12. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* <http://www.medicinescomplete.com>).