

Enrofloxacin is a synthetic 6-fluoroquinolone. The core structure is identical to nalidixic acid. As a result of gradual changes in the basic structure, antimicrobial potency and pharmacokinetics have substantially been improved, whereas unwanted effects were reduced.

Essential for the broad spectrum and the excellent antimicrobial efficacy is the fluorine substituent at position C6 and the piperazine ring at C7.

Amphoteric and zwitterionic properties make enrofloxacin lipid soluble and enhance the ability to penetrate tissues, pus and organic debris.

Enrofloxacin (1- cyclopropyl - 7 - (4 - ethyl - 1 - piperazinyl) - 6 - fluoro - 1,4 - dihydro - 4 - oxo - 3 quinolone carboxylic acid) belongs to the group of synthetic 6 - fluoroquinolones or 4 - quinolones derived from the core structure of nalidixic acid (see picture). As a result of gradual changes to the basic molecule, antimicrobial properties were considerably increased and pharmacokinetics could be substantially improved, whereas the probability of adverse effects was reduced.

Coplanar carbonyl groups (C=O) at positions 3 and 4 of the core structure are generally required for antimicrobial activity of the fluoroquinolones. They represent the binding site to the DNA gyrase complex. A fluorine atom, introduced at position 6, enhances the efficacy against Gram-negatives and broadens the spectrum against Gram-positive bacteria. The piperazine ring at position 7 further increases antimicrobial activity, especially against *Pseudomonas* organisms. The presence of a C₂H₅-group attached to the piperazine ring enhances tissue penetration and decreases central nervous system toxicity by reducing drug binding to GABA receptors in the brain. Due to the presence of carboxylic acid and one or more amine functional groups (basic), the molecule has amphoteric and zwitterionic properties. Thus, between pK_as of the acidic and basic functional groups, the substance is lipid soluble and able to penetrate tissues, pus and organic debris.

Enrofloxacin is a pale yellow, crystalline substance with a high degree of purity. In water at pH 7, it is slightly soluble. However, as it contains acidic and basic groups (betaine structure), it can readily be brought into solution when the pH values are either alkaline or acidic. Liquid formulations of Baytril for parenteral administration contain freely soluble salts of enrofloxacin in an aqueous solution. Due to the high hydrolytic stability of the active ingredient, these solutions are very stable. The tablet formulations contain enrofloxacin in its original betaine form.

References:

- (1) Altreuther P: Data on chemistry and toxicology of Baytril. *Veterinary Medical Review* 2: 87 - 89, 1987.
- (2) Brown SA: Fluoroquinolones in animal health. *J vet Pharmacol Therap* 19: 1 - 14, 1996.

Enrofloxacin

