

APPLICATION NOTE – MEASURING OFLOXACIN AND OTHER PHARMACEUTICALS WITH SMALL OPTICAL ROTATIONS

Application Need: Many pharmaceutical products, such as Ofloxacin, have a specific rotation between +1 and ± 1 and a 1% concentration, and therefore cannot be measured with a polarimeter that has a specific rotation accuracy of ± 1.0 . This note outlines the need for a highly precise polarimeter to measure these critical compounds. Accuracy of 0.005 of optical rotation is required for pharmaceutical applications.

Solution: The Reichert Polar3 polarimeter has an precision of 0.005 for optical rotations of 1° arc, making it ideal for measuring Ofloxacin and other pharmaceutical products.

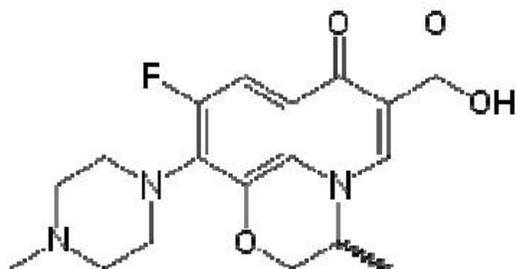
Ofloxacin Overview

Ofloxacin is a synthetic chemotherapeutic antibiotic of the fluoroquinolone drug class, considered to be a second-generation fluoroquinolone. Ofloxacin is sold under a wide variety of brand names, as well as generic drug equivalents, for oral and intravenous administration. Ofloxacin is also available for topical use in eye drops and ear drops (marketed as Ocuflax and Floxin Otic, respectively, in the United States).

Ofloxacin is a racemic mixture, which consists of 50 percent levofloxacin (the biologically active component) and 50 percent of its “mirror image,” or enantiomer, dextroflaxacin.

Like other quinolones, ofloxacin has been associated with a significant number of serious adverse drug reactions, such as tendon damage (including spontaneous tendon ruptures) and peripheral neuropathy (which may be irreversible); such reactions may manifest long after therapy had been completed, and, in severe cases, may result in life-long disabilities. Ofloxacin has also been associated with severe psychiatric adverse reactions. Therefore, it is important that pharmaceutical manufacturers be able to measure its concentration and purity accurately, because dosage is critical.

Ofloxacin



Systematic (IUPAC) name	(RS)-7-fluoro-2-methyl-6-(4-methylpiperazin-1-yl)-10-oxo-4-oxa-1-azatricyclo[7.3.1.0 ^{5,13}]trideca-5(13),6,8,11-tetraene-11-carboxylic acid
Clinical data trade names	Floxin, Ocuflax
AHFS/Drugs.com	monograph
MedlinePlus	a691005

Pregnancy cat.	C (US)
Legal status	Px-only (US)
Routes	Oral, IV, topical (eye drops and ear drops)

Pharmacokinetic data

Bioavailability	85% - 95%
Protein binding	32%
Half-life	8–9 hours
Identifiers CAS number	82419-36-1
ATC code	J01MA01 ,S01AX11, S02AA16
PubChem	CID 4583
DrugBank	APRD00502
ChemSpider	4422
UNII	A4P49JAZ9H
KEGG	D00453
ChEBI	CHEBI:7731
ChEMBL	CHEMBL4
Synonyms	(±)-9-fluoro-2,3-dihydro-3-methyl-10-(4-methyl-1-piperazinyl)-7-oxo-7H-yrido[1,2,3- de][1,4]benzoxazine-6-carboxylic acid

Chemical data

Formula	C18H20FN3O4
Mol. mass	361.368 g/mol
SMILES	eMolecules & PubChem

Ofloxacin has a specific rotation between +1° and -1° at a concentration of 10 mg per ml.

Measuring Specific Rotation

Biot's law is used to calculate the specific rotation of an optically active substance.

Biot's Law:

$$[\alpha]_{\lambda}^T = \frac{\alpha_{\lambda}^T}{c \times l}$$

$[\alpha]$	=	specific rotation
l	=	optical pathlength in dm
α	=	optical rotation
T	=	temperature
λ	=	wavelength
c	=	concentration in g/100ml

The Reichert Polar1 polarimeter has a precision of +/- 0.01° optical rotation. Below is how its relative accuracy affects a hypothetical Ofloxacin sample:

$$[\alpha]_{\lambda}^T \text{ (Specific Rotation)} = \frac{\pm 0.01}{(1)(0.01)} \text{ (UNIPOL L)}$$

$\leftarrow 10\text{mg/ml} = 0.01\text{g/ml} = 1\text{g}/100\text{ml} = 1\% = 0.01$

Using Instruments With a Specific Rotation Error of ± 1.0

You cannot successfully inspect a pharmaceutical (such as Ofloxacin) having a specific rotation between +1 and ± 1 and a 1% concentration with an instrument that has an accuracy of ± 1.0 in specific rotation.

The Reichert Polar3 polarimeter has an precision of 0.005 for Optical Rotations of 1° Arc for a total unknown of ± 0.005 under the same conditions:

$$[\alpha]_{\lambda}^T \text{ (Specific Rotation)} = \frac{\pm 0.005}{(1)(0.01)} \text{ (UNIPOL L 1000)}$$

Specific Rotation Error = ± 0.5

USP Ofloxacin

Specific rotation <782S>: between $+1^\circ$ and -1°

Test solution: 10g per ml, in chloroform

Product Recommendations:

Polar3 Polarimeter – Reichert Cat #14003000

