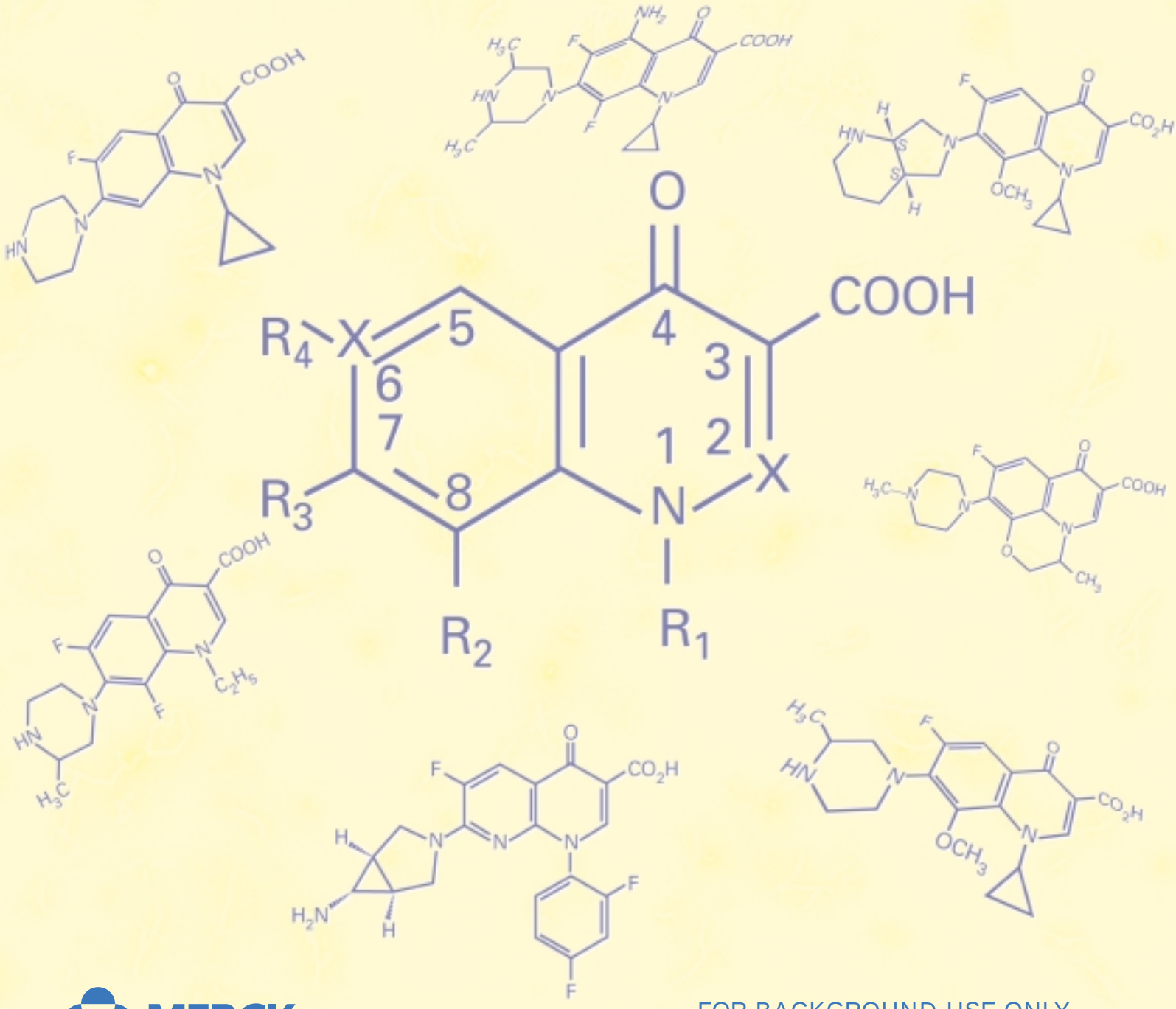
COMPARISON GUIDE

FLUOROQUINOLONES



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Introduction

This guide, for background use only, is an overview of currently marketed fluoroquinolones, with a summary of their microbiologic spectra, drug interactions and toxicities. The information was derived from the prescribing information for each product and from the current medical literature.

Table 1. Currently Marketed Fluoroquinolones

Generic Name	Brand Name	Manufacturer	Dosage Forms	FDA Approval
Nalidixic acid	NegGram®	Sanofi Winthrop	caplets, suspension	before 1982
Norfloxacin	Noroxin®	Merck	tablets	1986
Ciprofloxacin	Cipro®	Bayer	injection, tablets, oral suspension	1990 1987 1997
Enoxacin	Penetrex®	RPR	tablets	1991
Lomefloxacin	Maxaquin®	Unimed	tablets	1992
Ofloxacin	Floxin®	Ortho	injection, tablets	1992
Levofloxacin	Levaquin®	McNeil Pharm	injection, tablets	1996
Sparfloxacin	Zagam®	Bertek	tablets	1996
Alatrofloxacin/ Trovafloxacin	Trovan®	Pfizer	injection, tablets	1997
Moxifloxacin	Avelox™	Bayer Corp	tablets	December, 1999
Gatifloxacin	Tequin™	BMS	injection, tablets	December, 1999

Table 2. Fluoroquinolones that Have Been Withdrawn from the Market

Generic Name	Brand Name	Manufacturer	When Withdrawn	Why Withdrawn
Temafloxacin	Omniflox	Abbott	Approved 1992 Withdrawn 1992	severe hypoglycemia; hemolytic anemia; renal and hepatic dysfunction; allergic reactions; 3 deaths out of ~50 serious AEs
Grepafloxacin	Raxar/Vaxar	Glaxo Wellcome	Approved 1997 Withdrawn 10/99	severe cardiovascular events, including 7 deaths in which drug could not be excluded as cause
Clinafloxacin	N/A	Warner-Lambert	Submission withdrawn 12/99 (never approved)	liver toxicity, arrhythmias, phototoxicity, hypoglycemia

Table 3. FDA Approved Indications for Fluoroquinolones*

Ref.: PDR 2000 54th Edition and Prescribing Information for Tequin™ (12/99), Avelox™ (12/99), Levaquin® (2/00)

INFECTION	AVELOX	CIPRO[3]	FLOXIN	LEVAQUIN	MAXAQUIN	TEQUIN	TROVAN[12]	ZAGAM
Bone and Joint		x						
Endocarditis								
Febrile neutropenia		x[4]						
Gonorrhea (cervical and urethral)		x[3]	x			x[11]		
Intra-abdominal		x[5]					x	
Lower Respiratory Tract	x[1, 2]	x[6, 7]	x[1, 2]	x[1, 2]	x[1, 9]	x[1, 2]	x[2, 7]	x[1, 2]
Non-gonococcal Urethritis and Cervicitis due to *chlamydia trachomatis*			x					
Pelvic Infections			x[8]				x[13]	
Prostatitis		x	x					
Prophylaxis					x[10]			
Sinusitis (acute)	x	x		x		x		
Skin/Skin Structure		x	x	x			x	
UTI		x	x	x	x	x		

[1]Acute bacterial exacerbation of chronic bronchitis.

[2]Community-acquired pneumonia.

[3]Cipro Tablets only are indicated for infectious diarrhea caused by *Escherichia coli* (enterotoxigenic strains), *Campylobacter jejuni, Shigella boydii, Shigella dysenteriae, Shigella flexnerii* or *Shigella sonnei* when antibacterial therapy is indicated, typhoid fever (enteric fever caused by *Salmonella typhii*), uncomplicated cervical and urethral gonorrhea due to *Neisseria gonorrhoeae.*

[4]In combination with piperacillin sodium.

[5]Used in conjunction with metronidazole.

[6]Although effective in clinical trials, ciprofloxacin is not a drug of first choice in the treatment of presumed or confirmed pneumonia secondary to *Streptococcus pneumoniae.*

[7]Includes nosocomial pneumonia.

[8]For acute pelvic inflammatory disease due to *Chlamydia trachomatis* and/or *Neisseria gonorrhoeae.* If anaerobic microorganisms are suspected of contributing to the infection, appropriate therapy for anaerobic pathogens should be administered.

[9]Not indicated for the empiric treatment of acute bacterial exacerbations of chronic bronchitis when it is probable that *S. pneumoniae* is a causative pathogen.

[10]To reduce the incidence of urinary tract infection in transrectal prostate biopsy and transurethral surgical procedures.

[11]Also acute, uncomplicated rectal infections in women due to *Neisseria gonorrhoeae.*

[12]For the treatment of patients initiating therapy in in-patient health care facilities (i.e., hospitals and long term nursing care facilities) with serious, life- or limb-threatening infections.

[13]Including endomyometritis, parametritis, septic abortion and post-partum infections.

*Quinolones approved only for genitourinary infections (NEG GRAM, NOROXIN, PENETREX) are not included in this table or subsequent comparisons.

Table 4. Drug Interactions with Fluoroquinolones

Ref.: PDR 2000 54th Edition and Prescribing Information for Tequin™ (12/99), Avelox™ (12/99), Levaquin® (2/00)

Interacting Drug or Class	Quinolone	Clinical Significance
antacids (containing aluminum, magnesium, calcium), sucralfate, metal cations (iron), multivitamins (containing iron or zinc); Videx®	*All oral quinolones*	formation of chelates; may substantially interfere with absorption of quinolones, resulting in systemic concentrations lower than desired
antiarrhythmics (class IA, III, and other drugs that prolong QT interval)	*Avelox* *Levaquin*	extremely rare cases of Torsades de Pointes have been seen with Levaquin; the PI for Avelox recommends that Avelox be used with caution in patients with ongoing proarrhythmic conditions
caffeine	*Cipro*	interference with metabolism of caffeine; reduced clearance of caffeine and prolongation of serum half-life
cimetidine	*Levaquin*	AUC and half-life of Levaquin were significantly higher and clearance was significantly lower when administered with cimetidine; however, dosage adjustment is not recommended
cyclosporine	*Cipro*	transient elevations in serum creatinine with concomitant cyclosporine and quinolone; elevated serum levels of cyclosporine
digoxin	*Tequin*	increase in digoxin concentration in some patients; monitoring of serum digoxin concentration is recommended
glyburide	*Cipro*	severe hypoglycemia, hyperglycemia, fatalities have been reported, monitoring of serum glucose levels is recommended
non-steroidal antiinflammatory drugs (NSAIDs)	*Floxin* *Levaquin*	concomitant use with quinolone may increase risks of CNS stimulation and convulsions
phenytoin	*Cipro*	altered serum levels of phenytoin (increase and decrease)

Interacting Drug or Class	Quinolone	Clinical Significance
probenecid	*Cipro* *Maxaquin* *Tequin*	interferes with tubular secretion of quinolone; increased level of quinolone in serum
theophylline	*Cipro* *Floxin*	elevated serum concentrations of theophylline, prolonged half-life; serious and fatal reactions have been reported in patients receiving concurrent administration of intravenous Cipro and theophylline
warfarin or derivatives	*Trovan*	Trovan has been reported to enhance the effect of warfarin; prescribing information for Avelox, Cipro, Floxin, Levaquin, Maxaquin and Tequin suggest that, since some quinolones have been reported to enhance the anticoagulant effect of warfarin, prothrombin time or other tests should be watched closely if a quinolone is used with warfarin or its derivatives

Table 5. Fluoroquinolone Susceptibility

Note: The organisms listed are those for which there is a clinical indication (distinguished from in vitro activity for which clinical significance is not established).

Ref.: PDR 2000 54th Edition and Prescribing Information for Tequin™ (12/99), Avelox™ (12/99), Levaquin® (2/00)

	ORGANISM	AVELOX	CIPRO[1]	FLOXIN	LEVAQUIN	MAXAQUIN	TEQUIN	TROVAN[6]	ZAGAM
GRAM POSITIVE AEROBES	Enterococci (S. faecalis)		x		x			x	
	Staphylococcus aureus (beta lactamase producing)								
	Staphylococcus aureus	x	x	x	x		x	x	x
	Staphylococcus epidermidis		x						
	Staphylococcus saprophyticus		x		x	x			
	Staphylococcus spp.								
	Streptococcus agalactiae							x	
	Streptococcus pneumoniae	x	x[2]	x	x[4]		x	x	x
	Streptococcus pyogenes		x	x	x				
	Streptococcus spp.								
	Viridans streptococci							x	
GRAM NEGATIVE AEROBES	Acinetobacter calcoaeticus								
	Acinetobacter spp. (Mima-Herellea)								
	Citrobacter diversus		x	x		x*			
	Citrobacter freundii		x						
	Citrobacter spp.								
	Enterobacter aerogenes			x					
	Enterobacter cloacae		x		x	x*			x
	Enterobacter spp.								
	Escherichia coli		x	x	x	x	x	x	
	Haemophilus influenzae	x	x	x	x	x	x	x	x
	Haemophilus parainfluenzae	x	x		x		x		x
	Klebsiella oxytoca								
	Klebsiella pneumoniae	x	x	x	x	x	x	x	x
	Klebsiella pneumoniae subspecies pneumoniae		x						
	Klebsiella spp.								
	Moraxella catarrhalis	x	x		x	x*	x	x	x
	Morganella morganii		x						
	Neisseria gonorrhoeae		x[3]	x			x		
	Neisseria meningitidis								
	Proteus inconstans Group B								
	Proteus mirabilis		x	x	x	x	x	x	
	Proteus spp.								
	Proteus vulgaris		x						
	Providencia rettgeri		x						
	Providencia spp.								
	Providencia stuartii		x						
	Pseudomonas aeruginosa		x	x	x	x[5]		x[7]	
	Pseudomonas spp.								
	Serratia marcescens		x						
	Serratia spp.								
ANAEROBES	Bacteroides fragilis							x	
	Bacteroides fragilis group								
	Bacteroides spp.								
	Bifidobacterium spp.								
	Clostridium perfringens								
	Clostridium spp.								
	Eubacterium spp.								
	Fusobacterium nucleatum								
	Fusobacterium spp.								
	Peptococcus niger								
	Peptococcus spp.								
	Peptostreptococcus spp.							x	
	Prevotella spp.							x	
	Proprionibacterium spp.								
OTHER	Chlamydia pneumoniae	x			x		x	x	x
	Chlamydia trachomatis			x					
	Gardnerella vaginalis							x	
	Legionella pneumophilia				x		x	x	
	Mycoplasma pneumoniae	x			x		x	x	x

[1]Cipro Tablets only are indicated for infectious diarrhea caused by *Escherichia coli* (enterotoxigenic strains), *Campylobacter jejuni*, *Shigella boydii*, *Shigella dysenteriae*, *Shigella flexnerii* or *Shigella sonnei* when antibacterial therapy is indicated, typhoid fever (enteric fever caused by *Salmonella typhii*).

[2]Although effective in clinical trials, ciprofloxacin is not a drug of first choice in the treatment of presumed or confirmed pneumonia secondary to *Streptococcus pneumoniae*.

[3]Cipro Tablets only.

[4]Including penicillin-resistant strains, MIC value for penicillin ≥2µg/mL.

[5]The safety and efficacy of lomefloxacin in treating patients with *Pseudomonas* bacteremia have not been established.

[6]TROVAN is indicated for the treatment of patients initiating therapy in in-patient healthcare facilities (i.e., hospitals and long term nursing care facilities) with serious, life- or limb-threatening infections.

[7]As with other antimicrobials, where *Pseudomonas aeruginosa* is a documented or presumptive pathogen, combination therapy with either an aminoglycoside or aztreonam may be clinically indicated.

*Although treatment of infections due to this organ system demonstrated a clinically significant outcome, efficacy was studied in fewer than 10 infections.

Major Toxicities of Fluoroquinolones

This table lists the major adverse reactions with fluoroquinolones. Also listed are the contraindications, warnings, or precautions appearing in the prescribing information. "Class Warning" or "Class Precaution" indicates that the warning appears in the prescribing information for all of the products.

Ref.: PDR 2000 54th Edition and Prescribing Information for Tequin™ (12/99), Avelox™ (12/99), Levaquin® (2/00); Lipsky, BA, Baker, CA. Fluoroquinolone Toxicity; A Review Focusing on Newer Agents. *Clinical Infectious Diseases* 1999; 28:352-364.

Gastrointestinal Tract

General Statement

Gastrointestinal adverse events are the most frequently reported adverse events, occurring with all fluoroquinolones. These adverse events include nausea, vomiting, abdominal pain, diarrhea, anorexia. Incidence ranges from 2–20%.

Quinolones Class Warning

Pseudomembranous colitis has been reported with nearly all antibacterial agents and may range in severity from mild to life threatening. Therefore, it is important to consider this diagnosis in patients who present with diarrhea subsequent to the administration of antibacterial agents.

Central Nervous System

General Statement

Disturbances of the CNS are the second most commonly reported adverse events with fluoroquinolones and include headache, dizziness, sleep disorder(s), mood changes, confusion, delirium, psychosis, tremor, seizure. These occur at an overall incidence of 1–2%.

Quinolones Class Warning

Convulsions, increased intracranial pressure, and toxic psychosis have been reported in patients receiving quinolones; quinolones also cause central nervous system stimulation which may lead to: tremors, restlessness/agitation, nervousness/anxiety, lightheadedness, confusion, hallucinations, paranoia and depression, nightmares, insomnia, and rarely suicidal thoughts or acts.

Quinolones should be used with caution in any patient with a known or suspected CNS disorder that may predispose to seizures or lower the seizure threshold (e.g., severe cerebral arteriosclerosis, epilepsy) or in the presence of other risk factors that may predispose to seizures or lower the seizure threshold (e.g., certain drug therapy, renal dysfunction).

General Statement

Arthropathy has been reported in approximately 1% of patients treated with fluoroquinolones. The other most commonly reported musculoskeletal adverse reactions associated with fluoroquinolone use are tendinitis and tendon rupture. Animal studies have reported chondrotoxicity.

Quinolones Class Warning

Ruptures of the shoulder, hand, and Achilles tendons that required surgical repair or resulted in prolonged disability have been reported with quinolones.

Quinolone-class drugs produce erosions of cartilage of weight-bearing joints and other signs of arthropathy in immature animals of various species.

CARDIOVASCULAR

General Statement

Many of the fluoroquinolones have been associated with cardiovascular adverse reactions after IV or oral administration. Hypotension, tachycardia, syncope and migraines have been reported. QTc interval prolongation has been reported with some quinolones.

Contraindication—Zagam

Torsade de pointes has been reported in patients receiving sparfloxacin concomitantly with disopyramide and amiodarone. Consequently, sparfloxacin is contraindicated for individuals receiving these drugs as well as other QTc-prolonging antiarrhythmic drugs reported to cause torsade de pointes, such as class IA antiarrhythmic agents (e.g., quinidine, procainamide), class III antiarrhythmic agents (e.g., sotalol), and bepridil. Sparfloxacin is contraindicated in patients with known QTc prolongation or in patients being treated concomitantly with medications known to produce an increase in the QTc interval and/or torsade de pointes (e.g., terfenadine).

Warning—Avelox

MOXIFLOXACIN HAS BEEN SHOWN TO PROLONG THE QT INTERVAL OF THE ELECTROCARDIOGRAM IN SOME PATIENTS. THE DRUG SHOULD BE AVOIDED IN PATIENTS WITH KNOWN PROLONGATIONS OF THE QT INTERVAL, PATIENTS WITH UNCORRECTED HYPOKALEMIA AND PATIENTS RECEIVING CLASS IA (E.G., QUINIDINE, PROCAINAMIDE) OR CLASS III (E.G., AMIODARONE, SOTALOL) ANTIARRHYTHMIC AGENTS, DUE TO LACK OF CLINICAL EXPERIENCE WITH THE DRUG IN THESE PATIENT POPULATIONS.

Warning—Tequin

GATIFLOXACIN MAY HAVE THE POTENTIAL TO PROLONG THE QTc INTERVAL OF THE ELECTROCARDIOGRAM IN SOME PATIENTS. DUE TO THE LACK OF CLINICAL EXPERIENCE, GATIFLOXACIN SHOULD BE AVOIDED IN PATIENTS WITH KNOWN PROLONGATION OF THE QTc INTERVAL, PATIENTS WITH UNCORRECTED HYPOKALEMIA, AND PATIENTS RECEIVING CLASS 1A (E.G. QUINIDINE, PROCAINAMIDE) OR CLASS III (E.G. AMIODARONE, SOTALOL) ANTIARRYTHMIC AGENTS.

Precaution—Levaquin

Some quinolones have been associated with prolongation of the QT interval on the electrocardiogram and infrequent cases of arrhythmia. During post-marketing surveillance, extremely rare cases of torsades de pointes have been reported in patients taking levofloxacin. These reports generally involve patients who had concurrent medical conditions, and the relationship to levofloxacin has not been established. As with other drugs known to cause prolongation of the QT interval, the risk of arrhythmias may be reduced by avoiding use in the presence of hypokalemia, significant bradycardia, or concurrent treatment with class IA or class III antiarrhythmic agents.

Precaution—Zagam

Avoid the concomitant prescription of medications known to prolong the QTc interval, e.g., erythromycin, terfenadine, astemizole, cisapride, pentamidine, tricyclic antidepressants, some antipsychotics including phenothiazines. (See CONTRAINDICATIONS) Sparfloxacin is not recommended for use in patients with pro-arrhythmic conditions (e.g., hypokalemia, significant bradycardia, congestive heart failure, myocardial ischemia, and atrial fibrillation).

Precaution—Cipro, Floxin, Levaquin, Trovan

Because a rapid or bolus intravenous injection may result in hypotension, [CIPRO, FLOXIN, LEVAQUIN, TROVAN] INJECTION SHOULD ONLY BE ADMINISTERED BY SLOW INTRAVENOUS INFUSION OVER A PERIOD OF 60 MINUTES.

PHOTOSENSITIVITY/DERMATOLOGIC

General Statement

Photosensitivity reactions have been reported with most of the fluoroquinolones, but differences exist in severity and incidence. The most common dermatologic adverse reactions, including rash, pruritus, photosensitivity, hemorrhagic bullae, leg pigmentation, and urticaria occur at a rate of approximately 0.5–3% with the fluoroquinolones.

Contraindication—Zagam

It is essential to avoid exposure to the sun, bright natural light, and UV rays throughout the entire duration of treatment and for 5 days after treatment is stopped. Sparfloxacin is contraindicated in patients whose life-style or employment will not permit compliance with required safety precautions concerning phototoxicity.

Warning—Maxaquin and Zagam

MODERATE TO SEVERE PHOTOTOXIC REACTIONS HAVE OCCURRED IN PATIENTS EXPOSED TO DIRECT OR INDIRECT SUNLIGHT OR TO ARTIFICAL ULTRAVIOLET LIGHT (eg, SUNLAMPS) DURING OR FOLLOWING TREATMENT. THESE REACTIONS HAVE ALSO OCCURRED IN PATIENTS EXPOSED TO SHADED OR DIFFUSE LIGHT, INCLUDING EXPOSURE THROUGH GLASS OR DURING CLOUDY WEATHER. PATIENTS SHOULD BE ADVISED TO DISCONTINUE LOMEFLOXACIN THERAPY AT THE FIRST SIGNS OR SYMPTOMS OF A PHOTOTOXICITY REACTION SUCH AS A SENSATION OF SKIN BURNING, REDNESS, SWELLING, BLISTERS, RASH, ITCHING, OR DERMATITIS.

Quinolones Class Precaution

Moderate to severe phototoxicity reactions have been observed in patients exposed to direct sunlight while receiving some drugs in this class. Excessive sunlight should be avoided. Therapy should be discontinued if phototoxicity (e.g., a skin eruption) occurs.

HYPERSENSITIVITY

General Statement

Hypersensitivity reactions occur with fluoroquinolones at a rate of 0.6–1.4% (in clinical trials). The most commonly reported hypersensitivity reactions include drug fever, chills, serum sickness-like reaction, anaphylactoid reaction, anaphylaxis, angioedema, bronchospasm, and vasculitis.

Quinolones Class Contraindication

Contraindicated in persons with a history of hypersensitivity associated with the use of a specific quinolone, any member of the quinolone group of antimicrobial agents.

Quinolones Class Warning

Serious and occasionally fatal hypersensitivity (anaphylactic/anaphylactoid) reactions have been reported in patients receiving therapy with quinolones. Some reactions were accompanied by cardiovascular collapse, loss of consciousness, tingling, pharyngeal or facial edema, dyspnea, urticaria, and itching. Only a few patients had a history of hypersensitivity reactions. Serious anaphylactic reactions require immediate emergency treatment with epinephrine and other resuscitation measures, including oxygen, intravenous fluids, intravenous antihistamines, corticosteroids, pressor amines, and airway management, as clinically indicated.

Severe hypersensitivity reactions characterized by rash, fever, eosinophilia, jaundice, and hepatic necrosis with fatal outcome have also been reported extremely rarely in patients receiving quinolones along with other drugs. The possibility that these reactions were related to the quinolone cannot be excluded. Quinolones should be discontinued at the first appearance of a skin rash or any other sign of hypersensitivity.

Concentrated Urine/Crystalluria

General Statement

Crystalluria has been linked to the solubility of fluoroquinolones in urine, which is dependent on pH. Therefore, an alkaline urine should be avoided during fluoroquinolone therapy, and adequate hydration is advised.

Precaution—Cipro, Floxin, Levaquin, Maxaquin, Zagam

Adequate hydration of patients receiving [Cipro, Floxin, Levaquin, Maxaquin, Zagam] should be maintained to prevent the formation of a highly concentrated urine.

Precaution—Cipro

Crystals of ciprofloxacin have been observed rarely in the urine of human subjects but more frequently in the urine of laboratory animals, which is usually alkaline. Crystalluria related to ciprofloxacin has been reported only rarely in humans because human urine is usually acidic. Alkalinity of the urine should be avoided in patients receiving ciprofloxacin.

Hepatotoxicity

General Statement

Transient liver enzyme abnormalities occur at a rate of 2–3% in fluoroquinolone treated patients; serum transminase and alkaline phosphatase elevations are the most common. Other frequently reported hepatic adverse reactions are cholestatic jaundice, hepatitis, and hepatic failure.

Boxed Warning—Trovan

TROVAN® HAS BEEN ASSOCIATED WITH SERIOUS LIVER INJURY LEADING TO LIVER TRANSPLANTATION AND/OR DEATH. TROVAN-ASSOCIATED LIVER INJURY HAS BEEN REPORTED WITH BOTH SHORT-TERM AND LONG-TERM DRUG EXPOSURE. TROVAN USE EXCEEDING 2 WEEKS IN DURATION IS ASSOCIATED WITH A SIGNIFICANTLY INCREASED RISK OF SERIOUS LIVER INJURY. LIVER INJURY HAS ALSO BEEN REPORTED FOLLOWING TROVAN RE-EXPOSURE. TROVAN SHOULD BE RESERVED FOR USE IN PATIENTS WITH SERIOUS, LIFE- OR LIMB-THREATENING INFECTIONS WHO RECEIVE THEIR INITIAL THERAPY IN AN IN-PATIENT HEALTH CARE FACILITY (I.E., HOSPITAL OR LONG-TERM NURSING CARE FACILITY). TROVAN SHOULD NOT BE USED WHEN SAFER, ALTERNATIVE ANTIMICROBIAL THERAPY WILL BE EFFECTIVE.

Age

General Statement

Animals treated with fluoroquinolones have been reported to develop lesions in the articular cartilage; fluoroquinolones are not recommended for use in children and adolescents.

Since fluoroquinolones are reported to have a theoretical potential for causing arthropathies in children, their use in pregnant women or those who are nursing is not recommended.

Quinolones Class Warning

THE SAFETY AND EFFICACY OF QUINOLONES IN PEDIATRIC PATIENTS, ADOLESCENTS (UNDER THE AGE OF 18 YEARS), PREGNANT WOMEN, AND LACTATING WOMEN HAVE NOT BEEN ESTABLISHED.

Fluoroquinolones Comparison: Summary

Table 6. Clinical Coverage by Organism Category

Ref.: Schentag, JJ, Scully, BE. Quinolones. In: Yu, VL, Merigan, TC, Barriere, SI, eds. *Antimicrobial Therapy and Vaccines.* Philadelphia, Pa: Williams & Wilkins; 1999:875-901; *The Medical Letter on Drugs and Therapeutics* 1997;39(999):41–43; *The Medical Letter on Drugs and Therapeutics* 2000;42(1072):15–17; Gilbert DN, Moellering RC, Sande MA, *The Sanford Guide to Antimicrobial Therapy 2000.* Thirteenth ed. Hyde Park, Vt: Antimicrobial Therapy, Inc.

INFECTION	AVELOX	CIPRO	FLOXIN	LEVAQUIN	MAXAQUIN	TEQUIN	TROVAN	ZAGAM
Staphylococci*	+	+	+	+	±	+	+	+
Streptococci	+	±	–	±	–	+	+	+
Gram-negative bacilli	+	+	+	+	+	+	+	+
Pseudomonas aeruginosa	±	+	–	±	–	–	±	–
Anaerobes	±	–	–	–	–	±	+	±

Key: * Not MRSA + good activity ± fair activity – poor activity

Table 7. Drug Interactions *

Quinolones as a Class
po quinolones – antacids (containing aluminum, magnesium, calcium), sucralfate, metal cations (iron), multivitamins (containing iron or zinc), Videx®
Individual Quinolone
Avelox – antiarrhythmics (class IA, III, other drugs that prolong QT interval)
Cipro – caffeine, cyclosporine, glyburide, phenytoin, probenecid, theophylline
Floxin – NSAIDS, theophylline
Levaquin – antiarrhythmics (class IA, III, other drugs that prolong QT interval), cimetidine, NSAIDS
Maxaquin – probenecid
Tequin – digoxin, probenecid
Trovan – warfarin

Table 8. Major Toxicities

System Affected	
Cardiovascular	Genitourinary (Crystalluria)
Central Nervous System	Hepatic
Dermatologic (Photosensitivity)	Hypersensitivity
Gastrointestinal	Musculoskeletal
Safety/efficacy in children, pregnancy not established	

*See Table 4 (pages 4 and 5) for more details

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MEDICAL SERVICES

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