OCULAR PHARMACOLOGY II

Miotics, Glaucoma Meds, Antibiotics, Corticosteroids, NSAIDS Antivirals, Antihistamines

Christopher J. McDevitt, M.D.

CHOLINERGIC AND ANTICHOLINERGIC MEDS

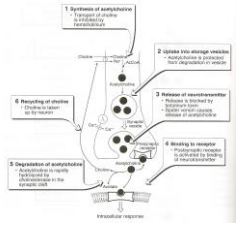
CHOLINERGIC DRUGS

- Direct agonists
- Indirect agonist
- Antagonist

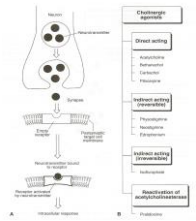
Table 16-2 Miotics

Generic Name	Trade Name	Strengths
Cholinergic drugs		
Carbachol	Isopto Carbachol	1.5%, 3%
Pilocarpine HCl	Isopto Carpine	0.25%, 1%, 2%, 4%
	Available generically	0.5%, 1%, 2%, 3%, 4%, 6%
Pilocarpine HCl ointment	Pilopine HS gel	4%
Cholinesterase inhibitors		
Physostigmine	Available generically	1 mg/mL ampule
Echothiophate iodide	Phospholine Iodide	0.125%

CHOLINERGIC NEURON



CHOLINERGIC AGONISTS



CHOLINERGIC DRUGS

- Direct agonist:
- Miosis, accomodation
- Increase aqueous outflow decrease IOP
- **Acetlycholine 1% carbachol 0.01% intracameral use** constrict pupil anterior segment surgery
- **Acetylcholine** rapid effect but short lived
- **Carbachol** 100 times more effective longer lasting 24 hours and decreases IOP

CHOLINERGIC DRUGS DIRECT AGONIST

- **Pilocarpine**:
  - lowers IOP by increasing outflow
  - Open angle glaucoma treatment
- **Side effects**:
  - Miosis older patients with cataract difficulty in scotopic conditions
  - Cataractogenesis
  - Induced myopia and accommodation problems for younger patients; slow dissolving **pilocarpine gel** at bedtime

CHOLINERGIC DRUGS: INDIRECT AGONIST CHOLINERSTERASE INHIBITORS

- **Phospholine iodide**
- No longer available for ophthalmic use in US
- More potent than direct acting use twice a day
- Physostigmine, neostigmine, edrophonium

CHOLINERGIC ANTAGONISTS

- **Atropine:** post-synaptic blockage of acetylcholine
- Pupil dilation,cycloplegia for iritis, accurate cycloplegic refraction
- Treat malignant glaucoma
- Systemic atropine given during ophthalmic surgery involving EOM manipulation to block oculocardiac reflex and prevent bradycardia and hypotension
- **Side effects** of systemic absorption of atropine eye drops:
  - Side effects treated with physostigmine
  - Other antagonists: tropicamide, cyclopentolate, homatropine, scopolamine, Flushing, tachycardia, constipation, urinary retention, delirium.

INDIRECT ACTING ANTAGONIST

- **Edrophonium test**: increases acetylcholine at neuromuscular junction
- Myasthenia gravis: antibodies to acetylcholine receptor resulting in generalized weakness, ptosis and diplopia
- Edrophonium used to diagnose myasthenia gravis
- **Neostigmine** can be given IM for the same purpose and has a longer duration of activity
- Allows clinician more time to make orthoptic measurement for desired endpoint

NEUROMUSCULAR BLOCKADE FOR GENERAL ANESTHESIA

- Globe laceration repair under general anesthetic
- Use of neuromuscular blocking drugs by anesthetist; i.e. succinylcholine is a "depolarizing" neuromuscular blocker and can cause contraction of EOMs on induction of general anesthetic and should not be used
- Exert force on open globe
- increase IOP in other cases where pressure measurement is desired such as in an examination under anesthesia

MYDIATICS AND CYCLOPLEGICS

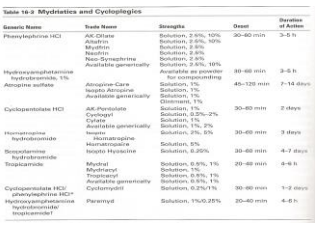


Table 16-2 Mydriatics and Cycloplegics

Generic Name	Trade Name	Strengths	Onset	Duration of Action
Phenylephrine HCl	AK-Dilate	Solution, 2.5%, 10%	30–60 min	3–5 h
	Isopto Frin	Solution, 2.5%, 10%		
	Mydfrin	Solution, 2.5%		
	Neofrin	Solution, 2.5%		
	Neo-Synephrine	Solution, 2.5%		
	Available generically	Solution, 2.5%, 10%		
Hydroxyamphetamine hydrobromide, 1%		Available as powder for compounding	30–60 min	3–5 h
Atropine sulfate	Atropine-Care	Solution, 1%	45–120 min	7–14 days
	Isopto Atropine	Solution, 1%		
	Available generically	Solution, 1%		
		Ointment, 1%		
Cyclopentolate HCl	AK-Pentolate	Solution, 1%	30–60 min	2 days
	Cyclogyl	Solution, 0.5%—2%		
	Cylate	Solution, 1%		
	Available generically	Solution, 1%, 2%		
Homatropine hydrobromide	Isopto Homatropine	Solution, 2%, 5%	30–60 min	3 days
	Homatropine	Solution, 5%		
Scopolamine hydrobromide	Isopto Hyoscine	Solution, 0.25%	30–60 min	4–7 days
Tropicamide	Mydral	Solution, 0.5%, 1%	20–60 min	4–6 h
	Mydriacyl	Solution, 1%		
	Tropicamyl	Solution, 0.5%, 1%		
	Available generically	Solution, 0.5%, 1%		
Cyclopentolate HCl/ phenylephrine HCl*	Cyclomydril	Solution, 0.2%/1%	30–60 min	1–2 days
Hydroxyamphetamine hydrobromide/ tropicamide†	Paremyd	Solution, 1%/0.25%	20–40 min	4–6 h

GLAUCOMA MEDICATIONS

ADRENERGIC DRUGS

- Norepinephrine (NE) is transmitter
- Alpha and beta receptors for NE
- Direct agonists
- Indirect agonist
- antagonists

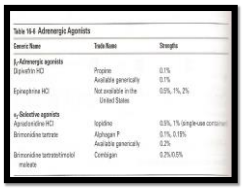


Table 16-4 Adrenergic Agonists

Generic Name	Trade Name	Strengths
β_2-Adrenergic agonists		
Dipivefrin HCl	Propine Available generically	0.1% 0.1%
Epinephrine HCl	Not available in the United States	0.5%, 1%, 2%
α_2-Selective agonists		
Apraclonidine HCl	Iopidine	0.5%, 1% (single-use container)
Brimonidine tartrate	Alphagan P Available generically	0.1%, 0.15% 0.2%
Brimonidine tartrate/timolol maleate	Combigan	0.2%/0.5%

ALPHA-ADRENERGIC DRUGS

- Alpha-1 phenylephrine Mydriasis stimulate iris dilator muscle
- Naphazoline: decongestant with rebound vasodilation and hyperemia
- Elevate systemic blood pressure
- Caution: using 10% phenylephrine **topically 5mg per drop**; MI, stroke, cardiac arrest risks
- Systemic "pressor" dose bolus IV 50-100µgram

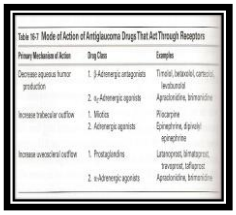


Table 16-1 Mode of Action of Antiglaucoma Drugs That Act Through Receptors

Primary Mechanism of Action	Drug Class	Examples
Decrease aqueous humor production	1. β-Adrenergic antagonists	Timolol, betaxolol, carteolol, levobunolol
	2. α_2-Adrenergic agonists	Apraclonidine, brimonidine
Increase trabecular outflow	1. Miotics	Pilocarpine
	2. Adrenergic agonists	Epinephrine, dipivefrin epinephrine
Increase uveoscleral outflow	1. Prostaglandins	Latanoprost, bimatoprost, travoprost, tafluprost
	2. α-Adrenergic agonists	Apraclonidine, brimonidine

ALPHA-2 ADRENERGIC AGONISTS

- Apraclonidine (Iopidine)
  - Pre and post YAG cap and SLT, cataract extraction to manage increased IOP
  - Prevents NE release decrease pupil size
  - Decreases aqueous production and increases outflow
  - Topical sensitivity 40% and tachyphylaxis limit long term use
- Brimonidine (Alphagan)
  - Topical sensitivity 15%
  - 0.2% with BAK
  - 0.15% with polyquad
  - 0.1% with sodium chlorite preservative Purite Alphagan-P
  - Avoid in infants less than 2 years: hypotension, hypothermia, bradycardia
  - CNS effects resulting from medication crossing the blood-brain barrier

ALPHA-2 ADRENERGIC AGONISTS

- Caution in patients using apraclonidine or brimonidine :
  - Patients taking systemic MAO inhibitors or tricyclic antidepressants
  - Hypertensive risks

INDIRECT ACTING ADRENERGIC AGONISTS

- Cocaine 4% or 10%
- Hydroxyamphetamine 1%
- Office diagnostic testing to confirm Horner syndrome
- Available through compounding pharmacies

BETA-ADRENERGIC AGONISTS

- Epinephrine not available for glaucoma treatment
- Dipiveprin (Propine) 0.1% available as generic
- Reduce aqueous production and increase trabecular outflow
- Reduced effectiveness over time

BETA-ADRENERGIC ANTAGONIST: BETA BLOCKERS

- Reduce aqueous production by up to 50%
- Inhibit the normal physiological responses of increasing pulse and BP with exertion: may be poorly tolerated in active or elderly with routine activities
- Induce bronchospasm in asthma and COPD patients

- 6 drugs:
  - Betaxolol **selective** β-1 inhibitor; 0.5% solution or 0.25% suspension (Betoptic S) less irritating
  - **Nonselective β blockers:**
  - Carteolol (Ocupress)
  - Levobunolol (Betagan)
  - Metipranolol (Optipranolol)
  - Timolol maleate (Timoptic)
  - Timolol hemihydrate (Betimol)

BETA-ADRENERGIC ANTAGONISTS

Table 16-8 β-Adrenergic Antagonists

Generic Name	Trade Name	Strengths
Betaxolol HCl	Betoptic S Available generically	0.25% 0.5%
Carteolol HCl	Ocupress Available generically	1% 1%
Levobunolol HCl	Betagan Available generically	0.25%, 0.5% 0.25%, 0.5%
Metipranolol HCl	OptiPranolol Available generically	0.3% 0.3%
Timolol hemihydrate Timolol maleate	Betimol Istalol Timoptic in Ocumeter or Ocumeter Plus container Available generically Timoptic-XE in Ocumeter or Ocumeter Plus container (gel) Available generically as Timolol gel forming solution	0.25%, 0.5% 0.5% 0.25%, 0.5% 0.25%, 0.5% 0.25%, 0.5% 0.25%, 0.5%
Timolol maleate (preservative-free)	Timoptic in OcuDose	0.25%, 0.5%
Timolol maleate/brimonidine tartrate	Combigan	Timolol maleate, 0.5%/ brimonidine tartrate, 0.2%
Timolol maleate/dorzolamide HCl	Cosopt Ocumeter Plus Available generically	Timolol, 0.5%/dorzolamide, 2% Timolol, 0.5%/dorzolamide, 2%
Timolol maleate/dorzolamide HCl (preservative-free)	Cosopt in Ocudose	Timolol, 0.5%/dorzolamide, 2%

CARBONIC ANHYDRASE INHIBITORS

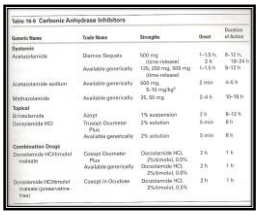
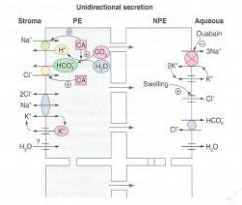


Table 16-9 Carbonic Anhydrase Inhibitors

Generic Name	Trade Name	Strengths	Onset	Duration of Action
Systemic				
Acetazolamide	Diamox Sequels	500 mg (time-released)	1–1.5 h	8–12 h, 18–24 h
	Available generically	125, 250 mg, 500 mg (time-released)	2 h 1–1.5 h	8–12 h
Acetazolamide sodium	Available generically	500 mg	2 min	4–5 h
Methazolamide	Available generically	5–10 mg/kg[1] 25, 50 mg	2–4 h	10–18 h
Topical				
Brinzolamide	Azopt	1% suspension	2 h	8–12 h
Dorzolamide HCl	Trusopt Ocumeter Plus	2% solution	5 min	8 h
	Available generically	2% solution	5 min	8 h
Combination Drugs				
Dorzolamide HCl/timolol maleate	Cosopt Ocumeter Plus	Dorzolamide HCl, 2%/timolol, 0.5%	2 h	1 h
	Available generically	Dorzolamide HCl, 2%/timolol, 0.5%	2 h	1 h
Dorzolamide HCl/timolol maleate (preservative-free)	Cosopt in Ocudose	Dorzolamide HCl, 2%/timolol, 0.5%	2 h	1 h

- Carbonic anhydrase is enzyme involving the production of aqueous humor in the ciliary body
- Topical preparations for Glaucoma treatment
- **Acetazolamide** (Diamox) oral in the management of pseudotumor cerebri

CARBONIC ANHYDRASE AND AQUEOUS HUMOR SECRETION



CARBONIC ANHYDRASE INHIBITORS

- **Topical**:
  - Dorzolamide (Trusopt); In combination with Timolol (Cosopt)
  - Brinzolamide (Azopt)

- **Systemic**:
  - Acetazolamide 4 times daily
  - Methazolamide twice daily
  - Side-effect is a systemic metabolic acidosis
  - Low potassium may also result
  - Renal stone formation 11 times higher
  - Numbness and tingling hands and feet, weight loss from anorexia
  - Skin rash

PROSTAGLANDIN ANALOGUES

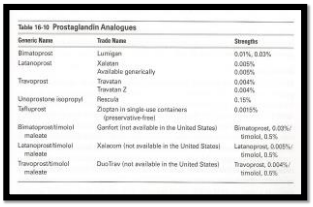


Table 16-10 Prostaglandin Analogues

Generic Name	Trade Name	Strengths
Bimatoprost	Lumigan	0.01%, 0.03%
Latanoprost	Xalatan Available generically	0.005% 0.005%
Travoprost	Travatan Travatan Z	0.004% 0.004%
Unoprostone isopropyl	Rescula	0.15%
Tafluprost	Zioptan in single-use containers (preservative-free)	0.0015%
Bimatoprost/timolol maleate	Ganfort (not available in the United States)	Bimatoprost, 0.03%/ timolol, 0.5%
Latanoprost/timolol maleate	Xalacom (not available in the United States)	Latanoprost, 0.005%/ timolol, 0.5%
Travoprost/timolol maleate	DuoTrav (not available in the United States)	Travoprost, 0.004%/ timolol, 0.5%

PROSTAGLANDIN ANALOGUES

- Latanoprost (Xalatan)
- Bimatoprost (Lumigan)
- Travoprost (Travatan)
- Tafluprost (Zioptan)
- Unoprostone (Rescula)

- Ocular side effects: darkening of iris and periocular skin
- Hypertrichosis of eyelashes
- Cystoid macular edema(CME)
- Conjunctival hyperemia
- Uveitis
- Reactivation of HSV keratitis
- Use with caution in pregnant patients since uterine contractions are mediated by prosaglandins

CORTICOSTEROIDS AND NON-STEROIDAL ANTI-INFLAMMATORIES(NSAIDS)

ANTI-INFLAMMAMATORY DRUGS

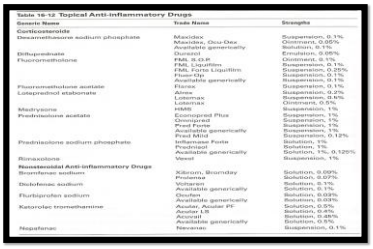


Table 16-12 Topical Anti-Inflammatory Drugs

Generic Name	Trade Name	Strengths
Corticosteroids		
Dexamethasone sodium phosphate	Maxidex Maxidex, Ocu-Dex Available generically	Suspension, 0.1% Ointment, 0.05% Solution, 0.1%
Difluprednate	Durezol	Emulsion, 0.05%
Fluorometholone	FML 0.1P FML Forte Ointm FML Forte Liquifilm FlareOp Available generically	Ointment, 0.1% Ointment, 0.1% Suspension, 0.25% Suspension, 0.1% Suspension, 0.1%
Fluorometholone acetate	Flarex	Suspension, 0.1%
Loteprednol etabonate	Alrex Lotemax Lotemax	Suspension, 0.2% Suspension, 0.5% Ointment, 0.5%
Medrysone	HMS	Suspension, 1%
Prednisolone acetate	Omnipred Plus Omnipred Pred Forte Available generically	Suspension, 1% Suspension, 1% Suspension, 1% Suspension, 1%
Prednisolone sodium phosphate	Pred Mild Inflamase Forte Prednisol Available generically	Suspension, 0.12% Solution, 1% Solution, 1% Solution, 1%, 0.125%
Rimexolone	Vexol	Suspension, 1%
Nonsteroidal Anti-Inflammatory Drugs		
Bromfenac sodium	Xibrom, Bromday	Solution, 0.09%
Diclofenac sodium	Prolensa Voltaren Available generically	Solution, 0.07% Solution, 0.1% Solution, 0.1%
Flurbiprofen sodium	Ocufen Available generically	Solution, 0.03% Solution, 0.03%
Ketorolac tromethamine	Acular, Acular PF Acuvail Available generically	Solution, 0.5% Solution, 0.4% Solution, 0.45% Solution, 0.5%
Nepafenac	Nevanac	Suspension, 0.1%

OCULAR ANTI-INFLAMMATORY DRUGS

Routes of Administration

- Local injection
- Ocular implantation
- Topical
- Systemically

Categories

- Glucocorticoids
- Non-steroidal anti-inflammatory drugs
- Mast cell stabilizers
- Antihistamines
- Antifibrotics

GLUCOCORTICOIDS/STEROIDS

- Most important effect is inhibition of arachidonic acid (AA)
- AA is converted into potent mediators of inflammation:
  - prostaglandins
  - endoperoxidases
  - leukotrienes
  - thromboxanes

- Adverse ocular effects from topical steroids:
  - Glaucoma
  - Posterior subcapsular cataract
  - Bacterial, viral infections increase
  - Fungal infection
  - Ptosis
  - Scleral melt
  - Eyelid skin atrophy

STEROIDS ADVERSE EFFECTS: SYSTEMIC ADMINISTRATION

- Suppression of pituitary–adrenal axis
- Hyperglycemia, muscle-wasting, osteoporosis
- Redistribution of fat from periphery to trunk
- Euphoria
- Insomnias
- Aseptic necrosis of the hip
- Peptic ulcer
- Diabetes mellitus
- psychosis

STEROID-INDUCED ELEVATION OF IOP

- 4% develop an IOP > than 31 mm Hg after 6 weeks
- Reduce aqueous outflow is cause of IOP rise
- Dexamethasone>prednisolone>FML
- Reversible upon discontinuation of the drug if use is less than one year
- Permanent elevations of IOP if used more than 18 months
- Loteprednol 0.2%, 0.5% have lower incidences of increased IOP
- Fluocinolone implant for chronic uveitis
- Triamcinolone 40mg/ml preservative free for intravitreal use: increased rates of cataract and need for glaucoma treatment

NONSTEROIDAL ANTI-INFLAMMATORY DRUGS (NSAIDS)

- **Flurbiprofen** 0.3% (Ocufen) first available topical NSAID used pre-op to reduce intraoperative miosis for cataract surgery
- **Diclofenac** 0.1% (Voltaren) prophylaxis and treatment of post-op inflammation and CME
- **Ketorolac** (Acular) post-op inflammation and allergic conjunctivitis treatment
- **Nepafenac** (Nevanac), **Bromfenac** (Xibrom) twice daily dosing treating postop cataract and retinal surgery inflammation
- NSAIDS have topical anesthetic properties: useful in short term management of: corneal abrasion, anterior segment procedures and refractive surgery

ANTI-ALLERGY MEDICATIONS

ANTI-ALLERGIC DRUGS: MAST CELL STABILIZERS AND ANTIHISTAMINES

Table 16-16 Drugs for Allergic Conjunctivitis

Generic Name	Trade Name	Class
Alcaftadine	Lastacaft	H_1-antagonist/mast-cell inhibitor
Azelastine HCl	Optivar, available generically	H_1-antagonist/mast-cell inhibitor
Bepotastine besilate	Bepreva	H_1-antagonist/mast-cell inhibitor
Cromolyn sodium	Crolom, available generically	Mast-cell inhibitor
Emedastine difumarate	Emadine	H_1-antagonist
Epinastine HCl	Elestat, available generically	H_1-antagonist/mast-cell inhibitor
Ketorolac tromethamine	Acular, Acular PF, Acular LS Acuvail, ketorolac, 0.5%, available generically	NSAID
Ketotifen fumarate	Zaditor (OTC), Alaway (OTC), available generically	H_1-antagonist/mast-cell inhibitor
Levocabastine HCl	Discontinued in the United States	H_1-antagonist
Lodoxamide tromethamine	Alomide	Mast-cell inhibitor
Loteprednol etabonate	Alrex	Corticosteroid
Naphazoline HCl	Ak-Con, Allalon, available generically	Decongestant
Naphazoline HCl/antazoline phosphate	Vasocon-A (OTC)	Antihistamine/decongestant
Naphazoline HCl/pheniramine maleate	Naphcon-A (OTC), Opcon-A (OTC), Visine-A (OTC)	Antihistamine/decongestant
Nedocromil sodium	Alocril	Mast-cell inhibitor
Olopatadine HCl	Patanol, 0.1%, Pataday, 0.2%	H_1-antagonist/mast-cell inhibitor
Pemirolast potassium	Alamast	Mast-cell inhibitor

MAST CELL STABILIZERS, ANTIHISTAMINES

- Human eye has approximately 50 million mast cells containing granules containing chemical mediators
- Immediate hypersensitivity reaction triggered when antigens combine with IgE on the surface of mast cells
- Mast cells release histamine and other factors
- Histamine increases capillary dilation, conjunctival swelling and injection
- Safer than steroids for chronic use

MAST CELL STABILIZERS, ANTIHISTAMINES

- **H1 antagonist**: **emedastine** (Emadine), **azelastine** (Optivar)
- **Mast cell stabilizers**: c**romyln** (Crolom), **lodoxamide** (Alomide), **pemirolast** (Alamast), **nedocromil** (Alocril) take days to weeks to reach peak efficacy
- **Mixed H1 antagonists/mast cell stabilizers**: **olopatadine** (Patanol), **ketotifen** (Zaditor, Alaway), **epinastine** (Elestat), **azelastine** (Optivar)

OPHTHALMIC ANTIBIOTICS

OPHTHALMIC ANTIBACTERIALS

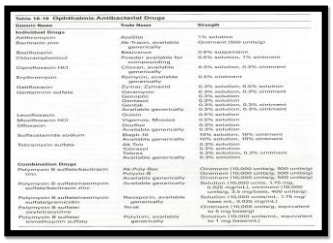


Table 18.10 Ophthalmic Antibacterial Drugs

Generic Name	Trade Name	Strength
Single Drugs		
Azithromycin	AzaSite	1% solution
Bacitracin zinc	Ak-Tracin, available generically	Ointment (500 units/g)
Bacitracin	Baticrimes	0.5% suspension
Chloramphenicol	Powder available for compounding	0.5% solution, 1% ointment
Ciprofloxacin HCl	Ciloxan, available generically	0.3% solution, 0.3% ointment
Erythromycin	Romycin, available generically	0.5% ointment
Gatifloxacin	Zymaxid	0.3% solution, 0.5% solution
Gentamicin sulfate	Garamycin	0.3% solution, 0.3% ointment
	Gentacidin	0.3% solution
	Gentak	0.3% ointment
	Available generically	0.3% solution, 0.3% ointment
Levofloxacin	Quixin	0.5% solution
Moxifloxacin HCl	Vigamox, Moxeza	0.5% solution
Ofloxacin	Ocuflox	0.3% solution
	Available generically	0.3% solution
Sulfacetamide sodium	Bleph 10	10% solution, 10% ointment
	Available generically	10% solution, 10% ointment
Tobramycin sulfate	Tobrex	0.3% solution, 0.3% ointment
	Tobradex	0.3% solution, 0.3% ointment
	Tobrex	0.3% solution, 0.3% ointment
	Available generically	0.3% solution
Combination Drugs		
Polymyxin B sulfate/bacitracin zinc	Ak-Poly-Bac	Ointment (10,000 units/g, 500 units/g)
	Polycin-B	Ointment (10,000 units/g, 500 units/g)
	Available generically	Ointment (10,000 units/g, 500 units/g)
Polymyxin B sulfate/neomycin sulfate/bacitracin zinc	Available generically	Solution (10,000 units, 1.75 mg, 400 units/mL); ointment (10,000 units/g, 3.5 mg/gram, 400 units/g)
Polymyxin B sulfate/neomycin sulfate/gramicidin	Neosporin, available generically	Solution (10,000 units/mL, 1.75 mg/mL, 0.025 mg/mL)
Polymyxin B sulfate/ trimethoprim	Polytrim	Ointment (10,000 units/g, equivalent to 6 mg base/g)
Polymyxin B sulfate/ trimethoprim sulfate	Polytrim, available generically	Solution (10,000 units/mL, equivalent to 1 mg base/mL)

OPHTHALMIC ANTIBIOTICS FLUOROQUNINOLONES

- **Fluoroquinolones**:
  - ofloxacin, levofloxacin, ciprofloxacin, moxifloxacin, gatifloxacin, besifloxacin
  - Broad spectrum: gram-positive and gram-negative
  - Older generation have good potency with gram-negative
  - Newer meds have expanding gram-positive coverage
  - Treat corneal ulcers, conjunctivitis
  - High rate of intraocular penetration

OPHTHALMIC ANTIBIOTICS SULFA DRUGS

- Sulfonamides: **sulfacetamide** ophthalmic solution and ointment
- Sensitivity reactions 5% incidence
- More effective when combined with trimethoprim or pyrimethamine
- Cross allergenicity with non-antibiotic sulfonamides is unlikely based on chemical differences but is theoretically possible
- No cross-allergenicity between sulfonamide and sulfates

OPHTHALMIC ANTIBIOTICS AMINOGLYCOSIDE; IODINE

- Aminoglycosides: gentamicin, tobramycin
- Neomycin 8 % of patients (maxitrol) develop allergy
- Erythromycin, clarithromycin, azithromycin
- Bacitracin alone or in combination with polymixin, neomycin
- Polymyxin/trimethaprim (Polytrim) may be used sulfa allergic patients

- **Iodine**:
- Topical povidone-iodine 5% **solution:** prepare surgical field and is important in prophylaxis against endophthalmitis
- Povidine iodine **scrub** damages corneal epithelium
- Iodine allergic patients do not use. Allergic to contrast media or seafood allergic probably OK to use

COMBINATION ANTI-INFLAMMATORY, ANTIBIOTIC DRUGS

Table 16-19 Combination Ocular Anti-inflammatory and Antibiotic Drugs

Generic Name	Trade Name	Preparation and Concentration
Dexamethasone/neomycin sulfate/polymyxin B sulfate	Ak-Trol, Poly-Dex, Dexacidin, Dexasporin, Maxitrol, available generically	Suspension, 0.1%; equivalent to 3.5 mg base/mL; 10,000 units/mL
	Maxitrol, Ak-Trol, Poly-Dex, available generically	Ointment, 0.1%; equivalent to 3.5 mg base/g; 10,000 units/g
Dexamethasone/tobramycin	Tobradex, available generically	Suspension, 0.1%, 0.3%
	Tobradex	Ointment, 0.1%, 0.3%
Fluorometholone/sulfacetamide	FML-S	Suspension, 0.1%, 10%
Hydrocortisone/neomycin sulfate/polymyxin B sulfate	Cortisporin suspension, available generically	Suspension, 1%; equivalent to 3.5 mg base/mL; 10,000 units/mL
Hydrocortisone/neomycin sulfate/polymyxin B sulfate/bacitracin zinc	Ak-Spore, Cortisporin ointment, available generically	Ointment, 1%; equivalent to 3.5 mg base/g; 5000 units/g; 400 units/g
Loteprednol etabonate/tobramycin	Zylet	Suspension, 0.5%, 0.3%
Neomycin sulfate/polymyxin B sulfate/prednisolone acetate	Poly-Pred, available generically	Suspension; equivalent to 0.35% base; 10,000 units/mL; 0.5%
Prednisolone acetate/gentamicin sulfate	Pred G	Suspension; equivalent to 0.3% base; 1%
	Pred-G S.O.P.	Ointment; equivalent to 0.3% base; 0.6%
Prednisolone acetate/sulfacetamide sodium	Blephamide, available generically	Suspension, 0.2%, 10%
	Blephamide S.O.P.	Ointment, 0.2%, 10%
Prednisolone sodium phosphate/sulfacetamide sodium	Vasocidin, available generically	Solution, 0.25%, 10%
	Ak-Cide	Ointment, 0.5%, 10%

ANTI-VIRAL MEDICATIONS

ANTIVIRAL DRUGS

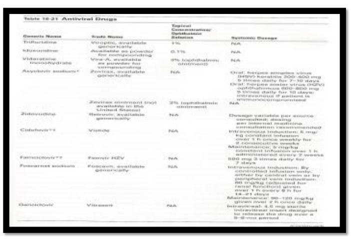


Table 16-21 Antiviral Drugs

Generic Name	Trade Name	Topical Concentration/ Ophthalmic Solution	Systemic Dosage
Trifluridine	Viroptic, available generically	1%	NA
Idoxuridine	Available as powder for compounding	0.1%	NA
Vidarabine monohydrate	Vira-A, available as powder for compounding	3% (ophthalmic ointment)	NA
Acyclovir sodium*	Zovirax, available generically	NA	Oral: herpes simplex virus (HSV) keratitis 200–400 mg 5 times daily for 7–10 days Oral: herpes zoster virus (HZV) ophthalmicus 600–800 mg 5 times daily for 10 days; intravenous if patient is immunocompromised
	Zovirax ointment (not available in the United States)	3% (ophthalmic ointment)	NA
Zidovudine	Retrovir, available generically	NA	Dosage variable per source consulted; dosing per internal medicine consultation recommended
Cidofovir††	Vistide	NA	Intravenous induction: 5 mg/kg constant infusion over 1 h once weekly for 2 consecutive weeks Maintenance: 5 mg/kg constant infusion over 1 h administered every 2 weeks
Famciclovir††	Famvir HZV	NA	500 mg 3 times daily for 7 days
Foscarnet sodium	Foscavir, available generically	NA	Intravenous induction: By controlled infusion only, either by central vein or by peripheral vein induction; 60 mg/kg (adjusted for renal function) given over 1 h every 8 h for 14–21 days Maintenance: 90–120 mg/kg given over 2 h once daily
Ganciclovir	Vitrasert	NA	Intravitreal: 4.5 mg sterile intravitreal insert designed to release the drug over a 5–8-mo period

(Continued)

ANTIVIRAL DRUGS TOPICAL

- **Trifluridine** (Viroptic) herpes simplex keratitis
- **Acyclovir** 3 % ointment not available in US. 5% dermatological ointment not approved for ophthalmic use
- **Ganciclovir gel** 0.15% (Zirgan) approved for treatment of HSV keratitis

ANTIVIRAL DRUGS SYSTEMIC

- **Acyclovir** (Zovirax) used to treat ocular HSV and HZV; 400mg twice daily prevents recurrence of epithelial and stromal keratitis
- **Valacyclovir** (Valtrex) HZV but not HSV infections
- **Famciclovir** (Famvir) HZV reduces duration of post herpetic neuralgia
- **Ganciclovir** CMV retinitis intravitreal insert release drug over 5-8 month period