

The mainstay of dry eye treatment is the use of artificial tears, gels or ointments. These can be used several times a day. In general for mild to moderate dry eye this is all that is needed. Punctal plugs may also be placed in the lower or upper eyelids. In severe dry eyes other agents like mild steroid eye drops or cyclosporin eye drops may be considered. The use of oral agents (salagen) is also possible.

Artificial Tears



Tear replacement by topical artificial tears and lubricants is currently the most widely used therapy for dry eye. The goal of using tear substitutes is to increase humidity at the ocular surface and to improve lubrication. In addition, artificial tears smooth the corneal surface of dry eye patients, an effect that contributes to improved vision.

The use of artificial tears has obvious limitations. Natural tears have a complex composition of water, salts, hydrocarbons, proteins, and lipids, which artificial tears cannot completely substitute. In addition, the integrity of the three-layered lipid, aqueous, and mucin structure, vital to the effective functioning of the tear film, cannot be reproduced by these artificial components.

The major constituents of artificial tears are hydrogels. Hydrogels make the artificial tears more viscous so they stay on the eye for longer time. The mucous adhesive property of hydrogels also help in prolonging the time tears stay on the eye. Hydrogels are actually polymers that are endowed with the property of swelling up in water and retaining the moisture. The following hydrogels have been used in artificial tears: Hydroxypropyl Methylcellulose (HPMC), Carboxy Methylcellulose (CMC), Polyvinyl Alcohol (PVA) & Carbopol. The question of which artificial tear preparations are preferable, is best answered by the patient themselves. There isn't one artificial tear that works well for everybody. You can try different products and see which works well for you.

The Preservative Dilemma

Traditionally, there have been two types of artificial tears: tears packaged in a bottle that contain a preservative (multi-dose bottles) and tears packaged in individual droppers that must be discarded immediately after one use and are preservative-free (single-dose units). These preservative-free, single-dose units were developed for individuals with a sensitivity to preservatives.

In general it is a good idea to avoid preservatives as they can by themselves cause damage to the eye surface. Benzalkonium chloride (BAC) is the preservative used most frequently. BAC preserved eyedrops may be fine for mild dry eyes but are better avoided for more severe forms of dry eyes. Recently launched artificial tears are claimed to have gentler preservatives (Tears Naturale, Genteal). Preservative free artificial tears are available in single use vials. They are undoubtedly

preferable to preserved tears, but affordability could become an issue as preservative free tears are more expensive. A recent study showed that refrigeration of opened preservative free tears in closed zip-lock plastic bags for 12 hours does not have a significant effect on the solution. Storage of preservative free artificial tears for 12 hours in a refrigerator, therefore seems to be reasonable (Optom Vis Sci 2001;78:37-9).

The tonicity of tears of patients with Dry eyes is higher than normal. The hypertonic tears draw water out of the cells, damaging them. If there is extensive surface damage, it may be reasonable to try HYPOTONIC artificial tears to neutralize the dry eye hypertonicity.

Artificial Tears	
Hydroxypropyl Methylellulose (HPMC) Artificial Tears	
<u>Bion Tears</u>	0.3% HPMC, 0.1% Dextran 70. (bicarbonate & zinc help mucus & surface cells) Preservative-Free. \$13.99 for 28 single-use vial pack
<u>Tears Naturale Forte</u>	0.3% HPMC, 0.1% Dextran 70, 0.2% Glycerin Polyquad 0.001% as preservative. \$12.99 for 30 ml bottle
<u>Tears Natural II</u>	0.3% HPMC, 0.1% Dextran 70 Polyquad 0.001% as preservative. \$12.99 for 30 ml bottle
<u>Tears Natural Free</u>	0.3% HPMC, 0.1% Dextran 70 Preservative-Free. \$9.99 for 36 Re-Closable vial pack
<u>Genteal</u>	0.3% HPMC GenAqua (Sodium Perborate) as preservative. \$8.99 for 15 ml bottle. Genteal is also available as Preservative Free single-use vials
<u>Genteal Mild</u>	0.2% HPMC GenAqua (Sodium Perborate) as preservative. \$8.99 for 15 ml bottle
<u>Visine tears</u>	0.2% HPMC, 0.2% Glycerin, 1% Polyethylene Glycol 400 Benzalkonium Chloride (0.01%) as preservative. \$5.49 for 15 ml bottle. Visine is also available as Preservative Free single-use vials
Carboxyl Methylcellulose (CMC) Artificial Tears	
<u>Refresh Tears</u>	0.5% CMC Purite as preservative. \$7.99 for 15 ml bottle. <u>Refresh Plus Tears</u> also has 0.5% CMC, but is <u>preservative free</u> & comes in single use vials.
<u>Refresh Liguigel</u>	1% CMC Purite as preservative. \$11.99 for 30 ml bottle. <u>Refresh Celluvisc</u> also has 1% CMC, but is <u>preservative free</u> & comes in single use vials .
<u>Thera Tears</u>	0.25% CMC, HYPOTONIC Preservative Free. \$10.99 for 32 Single-Use Container pack.
Polyvinyl Alcohol (PVA) Artificial Tears	
<u>Murine Tears</u>	0.5% Polyvinyl Alcohol , 0.6% Povidone. (has Bicarbonate) Benzalkonium Chloride (0.01%) as preservative. \$5.99 for 30 ml bottle. Manufactured by Ross (Abbott Labs)
<u>Hypotears</u>	1% Polyvinyl Alcohol , 1% Polyethylene Glycol 400. HYPOTONIC Benzalkonium Chloride (0.01%) as preservative. \$14.99 for 30 ml bottle. Hypotears is also available as Preservative Free single-use vials
<u>Akwa Tears</u>	1.4% Polyvinyl Alcohol. HYPOTONIC Benzalkonium Chloride (0.005%) as preservative. \$4.99 for 15 ml bottle.
<u>Tears Again</u>	1.4% Polyvinyl Alcohol.
Glycerine Artificial Tears & Others	

Computer Eye Drops	1% Glycerin Benzalkonium Chloride (0.01%) as preservative.
Moisture Eyes	1% Propylene Glycol, 0.3% Glycerin Benzalkonium Chloride (0.01%) as preservative. \$10.99 for 30 ml bottle.
Similasan homeopathic	Belladonna HPUS 6X alkaloids, Euphrasia, Mercurius sublimatus. Sodium silver chloride complex 0.001% as preservative. \$8.99 for 10 ml bottle.
Eye Ointments & Gels	
Refresh PM ointment	57.3% White Petrolatum, 42.5% Mineral Oil Preservative Free. \$8.99 for 3.5 g tube.
Hypotears ointment	85% White Petrolatum, 15% Mineral Oil Preservative Free. \$10.99 for 3.5 g tube.
Tears Naturale PM ointment	56.8% White Petrolatum, 42.5% Mineral Oil Preservative Free. \$9.99 for 3.5 g tube.
Lacrilube ointment	White Petrolatum, Mineral Oil Chlorobutanol (0.5%) as Preservative. \$9.49 for 3.5 g tube. Manufactured by Allergan
Genteal Gel	0.3% Hydroxypropyl Methylcellulose, Carbopol 980 GenAqua (Sodium Perborate) as preservative. \$8.99 for 10 ml bottle.
Tears Again NIGHT & DAY Gel	1.5% Carboxy Methylcellulose Dissipate (stabilized oxyborate complex) as a preservative. \$8.79.
New on the Market	
Refresh Endura	Castor oil, polysorbate-80, Carbomer 1342 & Glycerin Preservative Free. \$14.99 for 20 single-use vial pack. More Info 
Systane	Polyethylene Glycol 400 0.4% (lubricant), Propylene Glycol 0.3% (lubricant), Hydroxypropyl Guar (Gel forming Matrix) Polyquaternium-1 as preservative. \$9.99 for 15 ml bottle. More Info 

Which Artificial Tear should you use?

Minor Dry Eyes: Refresh Tears, Murine Tears, Genteal mild, Akwa Tears , Bion Tear

Moderate Dry Eyes: Non-preserved tears preferable. Tears Naturale forte, Genteal Tears

Severe Dry Eyes: Genteal gel. Refresh Liquigel, Celluvisc

In moderate or severe dry eyes preservative free ointment like Lacrilube, Tears Naturale or Refresh PM can be used especially at bedtime.

The question of which artificial tear preparations are preferable, is best answered by the patient themselves. There isn't one artificial tear that works well for everybody. Patients can try different products and see which works well for them. For mild dry eye, try something that comes in a reusable container. On the other hand, if you are already taking eyedrops such as glaucoma drops (which have preservatives), use a unit-dose preservative-free drop.

It is worth remembering that when eyedrops containing preservatives are used frequently, some patients develop a condition called 'medicamentosa'. This condition mimics a severely irritated dry eye. The treatment is to stop all eyedrops and switching to non-preserved eyedrops.

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