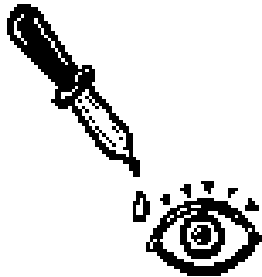




A PHARMACY CONTINUING EDUCATION PROGRAM

W-F Professional Associates, Inc. 400 Lake Cook Rd., Suite 207 Deerfield, IL 60015 847-945-8050

April 2011 "Dry Eye Syndrome (DES)"



**THIS MONTH
"DRY EYE
SYNDROME"**

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Dry Eye Syndrome is extremely common, and is an area that we, as practitioners, are required to consult patients about on an increasing basis. This lesson provides 1.25 hours (0.125 CEUs) of credit, and is intended for pharmacists in all practice settings. **The program ID # for this lesson is 707-000-11-004-H01-P. Pharmacists completing this lesson by April 30, 2014 may receive full credit.**

To obtain continuing education credit for this lesson, you must answer the questions on the quiz (70% correct required), and return the quiz. Should you score less than 70%, you will be asked to repeat the quiz. Computerized records are maintained for each participant.

If you have any comments, suggestions or questions, contact us at the above address, or call toll free 1-800-323-4305. (In Alaska and Hawaii phone 1-847-945-8050). **Please write your ID Number (the number that is on the top of the mailing label) in the indicated space on the quiz page** (for continuous participants only).

The objectives of this lesson are such that upon completion the participant will be able to:

1. Describe the lacrimal apparatus of the eye.
2. Recognize the symptoms of DES.
3. List causes associated with DES.
4. Describe complications associated with DES.
5. Discuss drugs used to treat DES.

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INTRODUCTION

Dry eye syndrome (DES), also termed keratoconjunctivitis sicca (eye dryness affecting the cornea and conjunctiva), keratin sicca (decreased quantity and quality of tears) or xerophthalmia (dry eye), is not a specific disease entity. Rather it is a disorder caused by a wide range of factors and is characterized by various symptoms. This disorder results from insufficient production of tears, high rate of tear evaporation or poor quality of tears which are needed for lubrication of the eye. The consequences may range from subtle but constant irritation, to permanent ocular damage to the cornea and conjunctiva.

LACRIMAL APPARATUS

To assist in the understanding of DES, it is important to review the anatomy and physiology of the lacrimal apparatus of the eye. The word lacrimal is derived from the Latin word lacrima meaning tears. The lacrimal apparatus is that system which is responsible for the production and drainage of tears into the nasal cavity. This consists of many parts including: glands, lakes, ducts, puncta, canals, sacs and nasolacrimal ducts.

LACRIMAL GLANDS

There are two types of lacrimal glands: the main one is located in the upper and outer parts of the eyes sockets. This gland constantly secretes aqueous tears that contain a small amount of sodium chloride to make the liquid isotonic. Tears drain into the conjunctiva, which is a membrane that covers the inside of the eyelid, and the front of the white portion of the eye (sclera). The accessory lacrimal glands are located within the conjunctiva mainly to secrete enough tears to lubricate the conjunctiva and to prevent it from drying out as a result of evaporation. The lacrimal glands secrete additional tears when the eye is irritated.

MEIBOMIAN GLANDS

These glands secrete an oily liquid that plays an important role in preventing evaporation of tears.

LACRIMAL SACS

These are empty spaces that are connected to the lacrimal canals. It is the place where tears drain. Each sac is covered by a delicate muscle that squeezes and forces tears to be released during blinking.

LACRIMAL LAKES

Once produced by the glands, tears flow into canals. After bathing the eye ball, tears collect in the lacrimal sac, which is a small open area of the conjunctiva.

LACRIMAL DUCTS

Lacrimal ducts are tubes that allow delivery of tears from the lacrimal glands into the top portion of the conjunctiva.

LACRIMAL PUNCTA AND CANALS

The puncta is a small opening in the inner portion of the eyelid which connects to narrow tubes called lacrimal canals. Tears secreted by the glands enter the lake and then pass through the puncta, into the canals and then into the lacrimal sacs.

THE EYELID

The eyelids assist the lacrimal apparatus to spread tears evenly on the surface of the eyeball as blinking occurs.

TEARS AND THEIR CONSTITUENTS

Tears consist of water, oil, protein, electrolytes, antimicrobial agents, and a growth substance. The aforementioned substances constitute about 1.8% of tears, which is slightly alkaline in nature. Isotonicity is similar to physiologic saline solution. The tear film that covers the eyeball is composed of three layers: outer, middle and inner.

The outermost layer of tears contains fatty substances mostly made of cholesterol esters and wax monoesters which are produced and released by the meibomian glands located at the edges of the eyelids. The main function of the oily materials is to smooth the tear surface and to retard evaporation of the aqueous middle layer.

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April 2011

The middle layer is made of water and electrolytes and is produced by the lacrimal glands. It comprises about 90% of the thickness of the tear film. It consists of electrolytes, glucose to promote corneal metabolism, and an antimicrobial agent known as lysozyme to protect the eye from infection. The main function of this layer is to clean the eye, wash away foreign particles like dust, pollen, and irritants such as smoke and pollutants.

The inner most layer consists of mucus produced by goblet cells which assist the spreading of tears evenly over the surface of the eye. The mucus achieves this function by acting as a surfactant and by changing the hydrophobic surface of the cornea to a hydrophilic one.

INCIDENCE OF DRY EYE SYNDROME (DES)

DES is a common disorder which may occur at any age and in healthy individuals. It has been estimated that about 20% of the population in the US seeks advice from an ophthalmologist due to dry eye symptoms. It has been reported that 20 to 30 million people in the US are affected by this disorder, especially those over the age of 40. All races are equally affected by DES. It is more common among women than men, most likely due to use of make up and hormonal changes during menopause. Dry eye syndrome is the most common complaint of contact lens wearers. Sjogren's syndrome, a major cause of DES, affects about 4 million people in the US. As the population ages, incidence of DES undoubtedly increases.

CAUSES OF DES

DES occurs in the presence of:

1. Inadequate amounts of tears produced by the lacrimal and associated glands.
2. Imbalance in the composition of tears (i.e. lack of oil) that results in increased rate of evaporation of tears from the surface of the eyes.

There are many factors that contribute to DES. Some of these cannot be resolved, such as: aging and menopause; others such as chronic underlying diseases, aftermath of strokes, and congenital diseases that result in incomplete closure of the eyelids, may be corrected.

AGING

DES is a normal sign of the aging process especially in postmenopausal women. As the patient becomes older, the amount of tears produced diminishes. Reduced tear production usually begins around age 40. It has been estimated that the volume of tears produced by the glands in the eye diminishes by 60% by the age of 65 compared to that produced at age 18.

OCCCLUSION OF LACRIMAL AND ASSOCIATED GLANDS

The occlusion may be due to infectious ocular disorders, trauma, chemical burns and atrophy of the glands.

HORMONAL FLUCTUATION

DES is more common among women than men due to hormonal changes that take place during menopause, pregnancy, lactation and menstruation.

CONDITIONS THAT REDUCE QUALITY OR QUANTITY OF TEARS

1. Sjogren's Syndrome: this is a chronic, auto-immune disease that results in the destruction of moisture-producing glands in the entire body including the lacrimal and meibomian glands, mouth, nose and vagina. It is common in postmenopausal women. It has been estimated that 90% of Sjogren's patients are women. The disorder is characterized by flare-ups and remissions throughout the patient's life.
2. Eyelid Disorders: Blinking is a process necessary for continuous spreading of a thin film of tears all over the surface of the eye. Any condition that interferes with blinking will result in inadequate distribution of tears, and ultimately in quick evaporation and a feeling of dryness in the eye. Examples of eyelid disorders that affect lubrication include: ectropion, blepharitis and meibomitis.
 - a. Ectropion is a condition where the eyelids are turned out. As such, the inner surface of the eye becomes exposed to the environment, resulting in rapid evaporation of tears and ultimately DES. Moreover, the eyeball will become incapable of blinking properly, resulting in failure to spread tears on the surface of the eye. Aging may contribute to this condition due to sagging of the connective tissue. It is also encountered in children with Down's Syndrome, in adults who suffered from Bell's Palsy, and with presence of scars due to burns in areas surrounding the eyelids. Ectropion can cause pain, damage to the eye, aggravation of DES and conjunctivitis.
 - b. Entropion is the turning in of the edges of the eyelids causing the eyelashes to irritate the surface of the eye. This disorder may be congenital, but in older patients the cause is usually due to spasms in the area surrounding the lower eyelid causing it to turn inward.
 - c. Blepharitis is an inflammatory condition that affects the hair follicles of the eyelashes. It occurs at the eyelid margins. At its onset, blepharitis may be acute and may subside with proper treatment within a few days to four

weeks. It varies in severity and may become chronic. The inflammation is caused by bacterial infection (overgrowth of skin microbial flora). Symptoms include: irritation, itching, crusting at the eyelid margin, burning and meibomitis.

- d. Meibomitis causes a reduction in the amount of oil produced, resulting in poor quality of tears, and rapid evaporation. The chronicity of blepharitis may be due to a toxic reaction to the waste material produced by the invading microorganisms.
1. External Styes (hordeolum) are infections of the sebaceous glands located on the eyelid, resulting in diminished production of oil and subsequent poor tear quality. The main causes are bacterial infection (*Staphylococcus aureus*) and clogging of the sebaceous glands underneath the eyelashes.
2. Vitamin A Deficiency leads to destruction of goblet cells which secrete mucin, a substance that allows the spreading of tears over the surface of the eye. In addition to DES, this condition may cause damage and dryness of both the cornea and conjunctiva.
3. Other factors that may reduce the production of tears include: diabetes, rheumatoid arthritis, lupus erythematosus, Parkinson's disease and hypothyroidism.

CONTACT LENS WEAR

Contact lens wearers often complain of DES, mostly as a result of:

1. The lens is capable of absorbing tears, or
2. As a foreign object in the eye, lenses invariably will rub against the conjunctiva causing irritation and exacerbation of DES. The chronic wearing of contact lenses may decrease the sensitivity of the epithelial nerves which normally stimulate the production of tears. Moreover, preservatives included in contact lens solutions may induce allergy which may detrimentally affect the quality of tears. Rubbing the eyes while wearing lenses may irritate the conjunctiva and facilitate DES.

USE OF COSMETICS

Eye-make up may cause irritation to the eyelid. Inadvertent introduction of eyeliner, eye-shadow or mascara into the eye may interfere with the production of the adequate quality of tears, triggering DES. Lagophthalmos (incomplete closure of an eyelid) may occur following LASIK eye surgery.

USE OF MEDICATIONS

A number of medications may be associated with exacerbating DES. These drugs include: antihistamines, oral contraceptives, antidepressants, Antiparkinson drugs, diuretics, beta-blockers, certain antihypertensives, decongestants and any medication that contains atropine or atropine-like drugs. Discontinuation of these usually results in restoration of normal tear production.

LOW BLINKING RATE

Blinking occurs in order to spread tears over the eye surface in order to keep the eyes well lubricated and healthy. Blinking can occur voluntarily, but normally it is an involuntary reflex. Normally an individual with healthy eyes blinks almost 10,000 times daily. The globus pallidus of the basal ganglia in the brain controls involuntary blinking, and occurs at a rate of between 5 to 30 times per minute. The cornea and conjunctiva must be moistened constantly otherwise they dry up. Low blinking rate will deprive these two structures from being moistened, resulting in DES. Furthermore, blinking protects the eye by sweeping away foreign particles such as dust and irritants.

EXCESSIVE COMPUTER USE, READING AND WATCHING TV

Staring at close objects for prolonged periods of time such as when reading, watching TV and using a computer tend to reduce the blinking rate. This not only leads to increased evaporation rate of tears at the eye surface but to eye fatigue and strain. It has been reported that computer use may reduce the blinking rate from 22 per minute to 7 per minute. Ideally computer users should take short breaks to avoid fatigue and slowing of blinking rate. To reduce evaporation on the eye surface, it is suggested that the computer screen be placed in a position below that of the eye level. This will allow the upper eyelid to cover more area of the eye surface which is otherwise exposed and vulnerable to evaporation and drying out. The glow caused by a computer or TV screen and reading in bright light for long periods of time is stressful to the eyes.

ENVIRONMENTAL FACTORS

Humidity level indoors and outdoors as well as the presence of irritants such as smoke and pollutants can contribute to DES. Air conditioning and dry heating systems play a role in causing DES. Likewise, hot, dry, windy and dusty climates can cause dryness of the surface of the eye. Air travel can aggravate DES.

SYMPTOMS ASSOCIATED WITH DES

Symptoms can be acute or chronic, mild or severe. In its severe form, DES can cause considerable suffering. The patient may have difficulty keeping the eyes open, thereby interfering with work and driving. The following are some typi-

cal symptoms:

- Burning, stinging, and itching in the eye which provokes rubbing, thereby worsening the condition.
- Eye pain
- Redness
- Persistent feeling of dryness and the presence of gritty substance in the eyes
- Frequent blinking
- Blurred vision
- Sensitivity to light
- Photophobia
- Irritation and discomfort upon wearing contact lenses
- Double vision
- Formation of crust that causes the eyelids to stick together upon waking
- Fatigued eyes
- Paradoxically, individuals with DES can periodically experience excessive tearing. This effect occurs when the eyes are dry due to insufficient lubrications, emotion, irritation or entrance of a foreign body into the eye. In such a case the eye will send a signal via the nervous system for more lubrication. As a result large amounts of tears, known as reflex tears, are provided and the eyes become flooded with tears. These reflex tears are mostly water and lack the quality of normal tears. These tears wash the debris away, but fail to coat the surface of the eyes properly. Within a short time, the eyes become dry again and the cycle repeats itself.

COMPLICATIONS ASSOCIATED WITH DES

Initially the symptoms appear to be mild, but if left untreated or if the cause is not eliminated, the symptoms will increase in frequency and intensity. The dry eye sensation and feeling of grittiness may worsen into burning and pain. The eyes appear to be red and crusty upon awakening. Gradually the eye surface may become damaged and lead to serious conditions such as ulceration of the cornea and conjunctiva.

CORNEAL ULCER (ULCERATIVE KERATITIS)

This is an inflammatory or infectious condition that involves the epithelial layer and corneal stroma. It is a common ocular disorder caused by a number of factors such as dry eye syndrome, contact lenses, trauma and chemical injuries. Infective corneal ulcer can be due to bacteria, virus, fungi, and Chlamydia. The bacterial corneal ulcer is caused by *Staphylococcus aureus*, *Streptococcus viridians*, *E. coli* and *Enterococci* among others.

Viral corneal ulcers are caused mostly by Herpes simplex, Herpes zoster and adenoviruses.

Fungal corneal ulcers usually are deep and severe. The main offending microorganisms are *Candida*, *Aspergillus* and *Fusarium*.

Corneal ulcers are characterized by severe pain due to the involvement of the nerves, tearing, squinting, impairment of vision and redness of the eye.

In order to relieve symptoms, patients should be advised to remove contact lenses, apply cool compresses to the affected eye and avoid rubbing.

CONJUNCTIVITIS (PINK EYE)

This is an inflammation or infection of the outermost layer of the inner surface of the eyelid. It is caused by DES, allergy and infection. Inflammation caused by DES may lead to infection. Symptoms include: blurred vision, pain, formation of crust on the eyelid overnight, increased lacrimation, itching and redness in the eye.

PREVENTION

DES cannot be completely prevented. However, there are certain steps that can be taken to decrease its intensity. Proper hygiene can assist in the prevention of DES complications. Keeping the eyes clean can minimize acquiring the conditions such as blepharitis that may trigger DES. Wearing glasses can protect the eyes from wind, dust and hot air. As explained earlier, computer screens should be placed in a position where they are below eye level. Avoidance of a polluted environment and places where people smoke is helpful. The use of an air filter may reduce the amount of dust or pollen. Additional moistening of the eyes may be achieved by using humidifiers. The presence of moisture in the air will reduce the amount of evaporation from the surface of the air and keeps the eyes more comfortable. Air conditioning as well as heating systems reduce the humidity from the air. Sitting under or in front of fans should be avoided as this can increase evaporation rate. Reduction of contact lens wearing time is recommended. The use of artificial tears and lubricants will provide relief. Frequent breaks while reading, watching TV or using a computer can be helpful.

TREATMENT

Before the start of treatment, it is essential to identify the cause(s). DES caused by complicating ocular or systemic diseases should have medical attention to eliminate the underlying disorders. Patients, who encounter physical eyelid conditions or incomplete blink, should consult with an ophthalmologist who may perform corrective surgery. Eyelid problems stemming from inflammation or infection such as blepharitis should be treated by using antibiotics or a combination of antibiotics and corticosteroids. Eye drops are usually used during the day and ointments at night. Keeping tears in the eyes for a longer time may be achieved by partially or completely blocking the tear ducts (puncta), the opening through which tears drain. Punctal plugs are implants of silicone or collagen and are inserted into the tear ducts for the purpose of blocking them, thereby keeping the tears or artificial lubricants inside the eyes for a longer time. This procedure, which is reversible, usually is reserved for severe cases of DES. The plugs can be removed by an ophthalmologist. Artificial tear inserts may also be utilized. The insert resembles a contact lens and is placed into the eye once or twice daily. These inserts contain cellulose which upon dissolving will act as a tear stabilizer due to the thickness of the tears produced. The thick cellulose will prolong the presence of the tear film in the eyes. Care must be exercised when inserts are placed into the eyes to avoid corneal abrasion. The most commonly used drugs are artificial tears and ocular emollients.

ARTIFICIAL TEARS

Artificial tears are preparations intended to act as a tear substitute in order to compensate for reduced amounts of tears produced by the lacrimal and other glands in the eye. The ingredients contained in such preparations usually consist of high molecular weight compounds and water soluble polymers. The artificial tears are capable of coating the surface of the eye and act as a protectant to soothe the surface. Furthermore, they prevent irritation and excessive tearing which may be caused by external stimuli such as dust, smoke, pollens, wind, low humidity and the sun. Additionally, instilling artificial tears into the eyes promotes wetting of the cornea and conjunctiva and increases the volume of liquids in the eye which include tears secreted by the lacrimal glands. This tends to relieve DES symptoms. The recommended dosage of such preparations is one to two drops twice daily. Using these medications for six or more times daily may be counterproductive as the artificial tears may wash away the natural tears. Moreover, those products should not be used beyond 72 hours unless advised by an ophthalmologist. If redness, pain, feeling of dryness, excessive tearing, vision impairment or any other unusual symptoms persist, the use of the medication should be discontinued and medical advice should be sought.

The main components of artificial tears include: polyvinyl alcohol, povidone, dextran, and cellulose derivatives such as carboxymethylcellulose, hydroxyethylcellulose, hydroxypropyl methylcellulose and methylcellulose.

Polyvinyl alcohol (PVA) is a water-soluble synthetic polymer which is capable of acting as an emulsifying and adhesive agent when dissolved in water. Its solution is excellent at film forming. It is odorless, translucent, nontoxic, degradable and has a high degree of flexibility. However, its solution is less viscous than cellulose derivatives.

Carboxymethylcellulose (CMC) is a cellulose derivative which is often used as its sodium salt. It is widely used in various products due to its ability to act as a thickening agent and emulsion stabilizer. It is highly viscous, nontoxic and non-allergenic.

Hydroxyethylcellulose (HEC) is a gelling and thickening agent which is soluble in cold water, but like other cellulose derivatives, is insoluble in most organic solvents.

Hydroxypropyl methylcellulose (HPMC) is a semisynthetic, inert, nontoxic isoelastic polymer found in the solid form, but forms a colloid when dissolved in water. Heating a solution of HPMC to a critical temperature will not cause the solution to congeal. One advantage of HPMC is that its water solubility aids in visual clarity when used in ophthalmic solutions. Furthermore, when the solution is instilled into the eye it swells and absorbs water. As such, it enhances the thickness of the tear film and prolongs the lubricant time of the eye drops.

Methylcellulose is a hydrophilic powder which is derived from cellulose. Unlike other cellulose derivatives, methylcellulose does not dissolve in hot water, but is soluble in cold water. Once it dissolves in cold water and is placed in a refrigerator, it gives a very clear, viscous solution or gel depending on the concentration of the methylcellulose. It is nontoxic, and nonallergenic. The main disadvantage of solutions of cellulose derivatives is the formation of crust on the eyelids, but they can be easily washed away.

Povidone or polyvinylpyrrolidone (PVP) is a synthetic polymer which exists as a white hygroscopic powder. It is soluble in water and forms a solution which has an excellent wetting property.

Dextran 70 in solution acts as a lubricant when instilled into the eyes. It is effective for combating DES. Its main adverse reactions are stinging upon instillation and blurred vision. Both of these effects are transient.

OCULAR DEMULCENTS

These preparations are often used for treating DES as they contain soothing ingredients such as lanolin, mineral oil, paraffin, white petrolatum, and white or yellow wax. These substances are formulated as ophthalmic ointments which when applied into the eyes, they tend to form a thin film that soothes the eye tissue. Ophthalmic ointments provide relief from burning, irritation and discomfort due to DES. Once applied into the eyes, these preparations will temporarily form a film on the surface of the eye, causing temporary blurred vision. As a result, such preparations should be used at bedtime.

PRESCRIPTION MEDICATIONS

In addition to using over-the-counter drugs to treat DES, there are medications that require prescriptions. These contain cyclosporine, corticosteroids, nonsteroidal anti-inflammatory drugs and antibiotics.

CYCLOSPORINE

Cyclosporine is an immunosuppressant agent when administered systemically. It is widely used for post-organ transplantation to reduce the activity of the immune system and avoid organ rejection. However, the drug is used for a wide range of disorders including topical application for treating DES. Cyclosporine is a peptide that has been isolated from the growth of a fungus. Restasis[®] is an example of an ophthalmic product that contains cyclosporine and is used for treating DES. Due to its very poor solubility in water, Restasis[®] is formulated as an emulsion. It was introduced onto the market in 2002 as an ophthalmic emulsion having a concentration of 0.05% cyclosporine. The vehicle contains glycerin, castor oil, polysorbate 80, carbomer copolymer type A, water and sodium hydroxide to adjust pH. Restasis[®] Ophthalmic Emulsion is the only FDA approved prescription medication for the treatment of DES. It is used to reduce eye surface inflammation caused by chronic DES, thereby enhancing tear production. Restasis[®] has no effect on the amount of tears in patients who are using anti-inflammatory eye drops or puncta plugs. Unlike artificial tears, Restasis[®] does not provide instant relief. It is intended for long-term therapy. Combating inflammation results in the production of tears characterized by not drying up as quickly as tears produced by other means. Since Restasis[®] is an anti-inflammatory eye drop, it should not be used in the presence of eye infection and in patients who had a history of ocular herpes simplex. Contact lens wearers should remove the lenses before instilling the drops. Adverse effects of Restasis[®] include: a transient burning sensation in the eyes, redness, discharge, itching and blurred vision. The recommended dose is one drop in each eye twice daily.

CORTICOSTEROID OPHTHALMIC DROPS

Corticosteroids are widely used by ophthalmologists for the treatment even though the FDA has not yet approved their use in DES. These should not be used in the presence of bacterial, mycobacterial, viral infections or history of ophthalmic herpes simplex and in cases of sensitivity to the drug. Examples include: Lotemax[®], Alrex[®] and Vexol[®].

NONSTEROIDAL ANTI-INFLAMMATORY EYE DROPS

These medications can reduce inflammation that may accompany DES. Examples are: Voltaren[®] Ophthalmic, and Nevanac[®].

ANTIBIOTICS

These are used in the presence of infection (blepharitis, meibomitis, sty) that may inflame the eye and cause DES. They are usually applied as an ophthalmic ointment at bedtime. The most commonly used antibiotics are erythromycin, bacitracin and neomycin.

NONPRESCRIPTION ALTERNATIVES

Over-the-counter medications for treating DES are available in two forms:

1. Aqueous based
2. Oil based

EXAMPLES OF AQUEOUS BASED OPTIONS

- AquaSite[®] Preservative Free: Available in unit dose and contains Dextran 70, 0.1% and polyethylene glycol 400, 0.2%.
- Bausch and Lomb Moisture Eyes[®]: contains propylene glycol, 1% and glycerin, 0.3%.
- Blink Tears[®] Lubricating Eye Drops: contains polyethylene glycol 400, 0.25%.
- Bion Tears[®]: contains Dextran 70, 0.1%, hydroxypropyl methylcellulose 2910, 0.3%.
- Clear Eyes[®]: contains Hydroxypropyl methylcellulose, glycerin, sodium chloride, borate buffer.
- GenTeal[®]: contains carboxymethylcellulose sodium, 0.25%, hypromellose, 0.3%.
- HypoTears[®]: contains polyethyleneglycol 400, 0.1%.
- Murine Tears[®]: contains polyvinyl alcohol, 0.5%, povidone, 0.6%.
- Systane[®] Lubricant Eye Drops: contains polyethylene Glycol 400, 0.4%, propylene glycol 0.3%.
- ears Natural Eye Drops[®]: contains Dextran 70, 0.1%, hydroxypropyl methyl cellulose, 0.3%.

OIL-BASED EXAMPLES

The following are formulated in an ophthalmic ointment form.

- Bausch and Lomb Moisture Eyes PM[®]: contains white petrolatum, 80%, mineral oil, 20%.
- HypoTears Lubricant Eye Ointment[®]: contains mineral oil, white petrolatum.
- Lacri-Lube S.O.P[®]: contains mineral oil 42.5%, white petrolatum 56.8%.
- Refresh PM[®]: contains mineral oil 41.5%, white Petrolatum 56.8%.

SUMMARY

Dry eye syndrome is a common condition caused by many factors some of which cannot be avoided. DES can lead to serious damage to the cornea and conjunctiva. The initial symptoms are usually mild, but if left untreated the symptoms intensify and the condition may become chronic. The most important step in therapy is identifying the cause(s) and then treat. Over-the-counter and prescription drugs may be used in the treatment.

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FUTURE TOPICS FOR THIS YEAR

Healthcare Reform & Impact on Pharmacy;
Restless Leg Syndrome;
Vaccine Update;
New Drugs Released in Last Year.

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This initiative will streamline processes for practitioners to ensure they are maintaining professional CE requirements. CPE Monitor™ is expected to save pharmacists, pharmacy technicians, state boards of pharmacy, and CE providers time & money.

To get a head start on this, take a look at the website that has been set up www.MyCPEMonitor.net .

Or, if you have questions, feel free to email me. We'll all survive this new procedure together.

Bill Feinberg (bill@wfprofessional.com)

Fill in the information below, answer questions and return **Quiz Only** for certification of participation to:
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LESSON EVALUATION

Please fill out this section as a means of evaluating this lesson. The information will aid us in improving future efforts. Either circle the appropriate evaluation answer, or rate the item from 1 to 7 (1 is the lowest rating; 7 is the highest).

1. Does the program meet the learning objectives?

- | | | |
|--|-----|----|
| Describe the lacrimal apparatus of the eye | Yes | No |
| Recognize the symptoms of DES | Yes | No |
| List causes associated with DES | Yes | No |
| Describe complications associated with DES | Yes | No |
| Discuss drugs used to treat DES | Yes | No |

2. Was the program independent & non-commercial Yes No

	Yes	No				
	Poor			Average		Excellent
3. Relevance of topic	1	2	3	4	5	6 7

4. What did you like most about this lesson? _____

5. What did you like least about this lesson? _____

Please Select the Most Correct Answer

- Which statement below is true regarding the main lacrimal gland?
 - Located within the conjunctiva
 - Secretes an oily liquid
 - Located in the upper & outer part of the eye socket
 - Solution produced by the lacrimal gland is hypotonic
- What is incorrect about tears?
 - Outermost layer contains fatty substances
 - They are slightly acidic
 - They contain electrolytes
 - Innermost layer contains mucin
- Which one of the following is not a contributing factor of DES?
 - Age
 - Ectropion
 - Low blinking rate
 - Weight
- Entropion is:
 - Turning in of edge of the eyelids
 - Due to bacterial infection
 - Due to vitamin deficiency
 - Another form of Bell's Palsy
- Artificial tear inserts contain:
 - Enzymes
 - Cholesterol
 - Antibacterials
 - Cellulose

- Which of the following should be avoided to assist in the prevention of DES?
 - Use of humidifiers
 - Reduce contact lens wearing time
 - Sitting under or in front of fans
 - Placing computer above eye level
 - C & D
- How often should artificial tears be used?
 - At bedtime only
 - Twice daily
 - Once in morning
 - Six or more times daily
- What is true about methylcellulose?
 - Dissolves in cold water
 - Dissolves in hot water
 - Its solution is allergenic
 - Its solution becomes cloudy upon placing it in a refrigerator
- The main disadvantage of cellulose solution is:
 - Burning upon placing into eyes
 - Limitation of use to night time
 - Formation of crust on the eyelids
 - Impairment of vision for at least one hour
- The main ingredient in Restasis[®] is:
 - Dextran
 - Cyclosporine
 - Methylprednisolone
 - Carboxymethyl cellulose

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