

Dry Eye Disease Epidemiology and Pathogenesis

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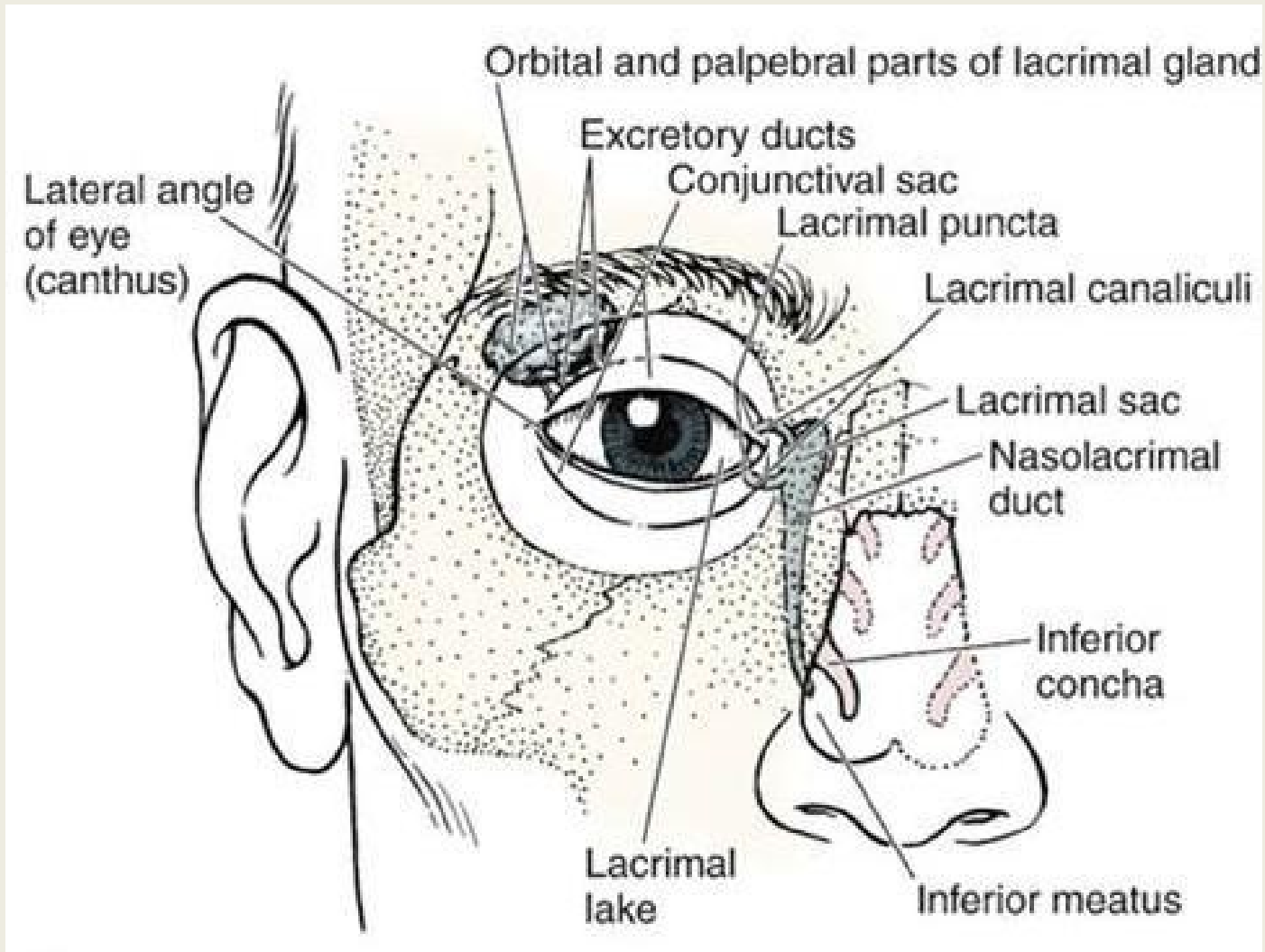
Outline

- Definition
- Anatomy
- Epidemiology
- Causes and Risk factors
- Pathophysiology
- Summary

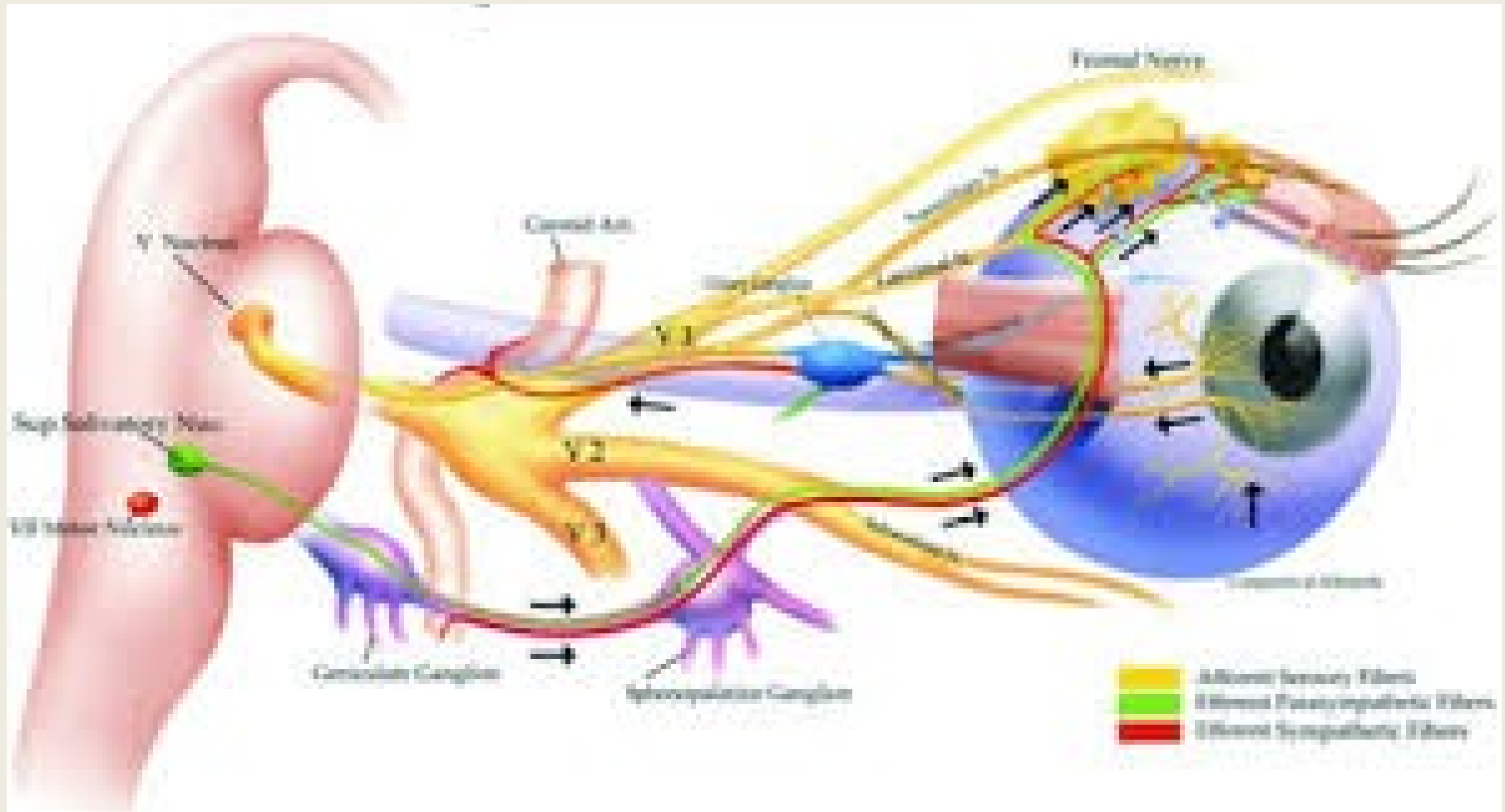
Definition

- A **multifactorial** disease of the
- **tears and ocular surface** that results in
- symptoms of **discomfort, visual disturbance, and tear film instability** with
- **potential damage** to the ocular surface. It is accompanied by
- **increased osmolarity** of the tear film and
- **inflammation of the ocular surface.**

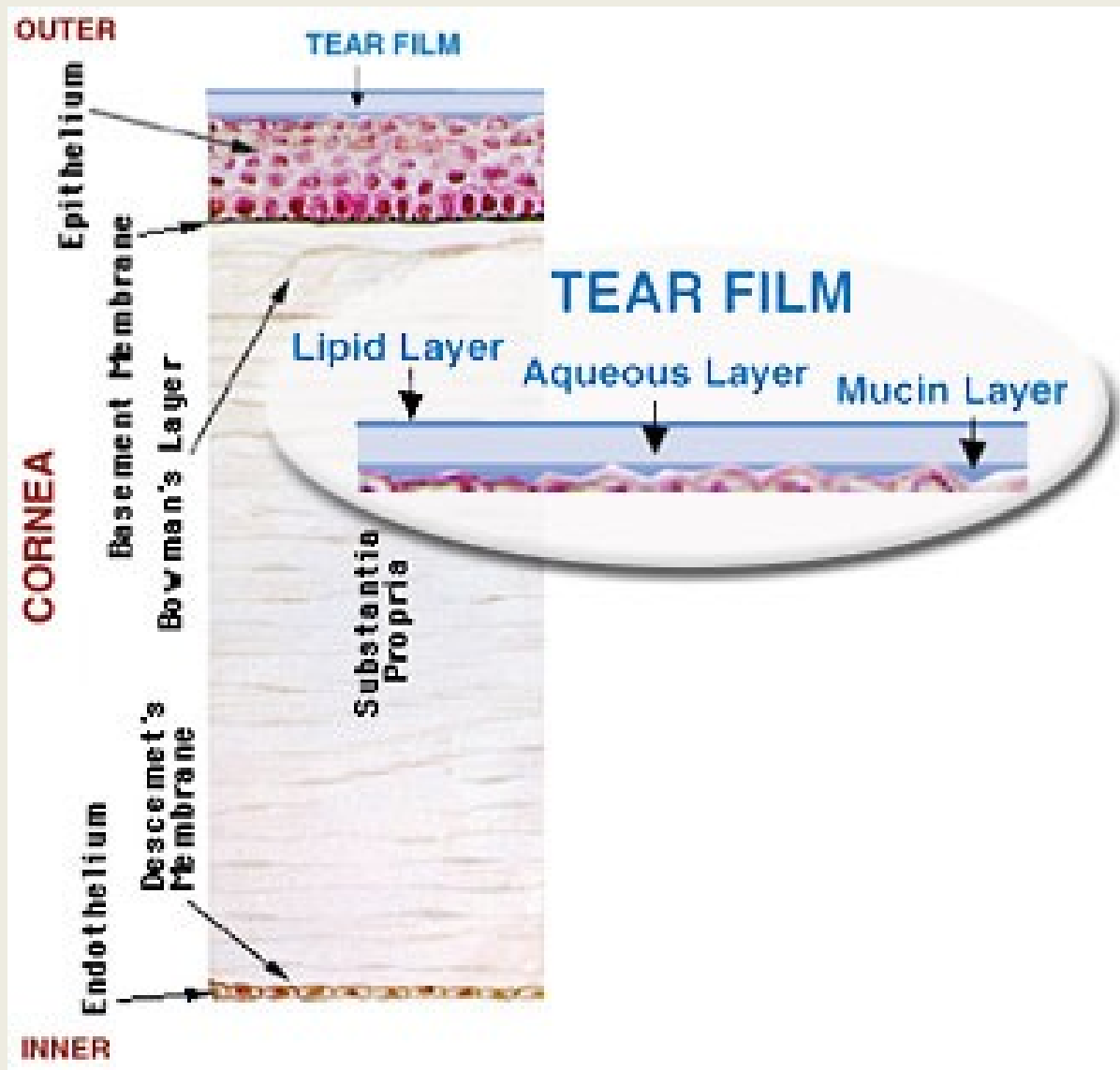
Lacrimal Systems



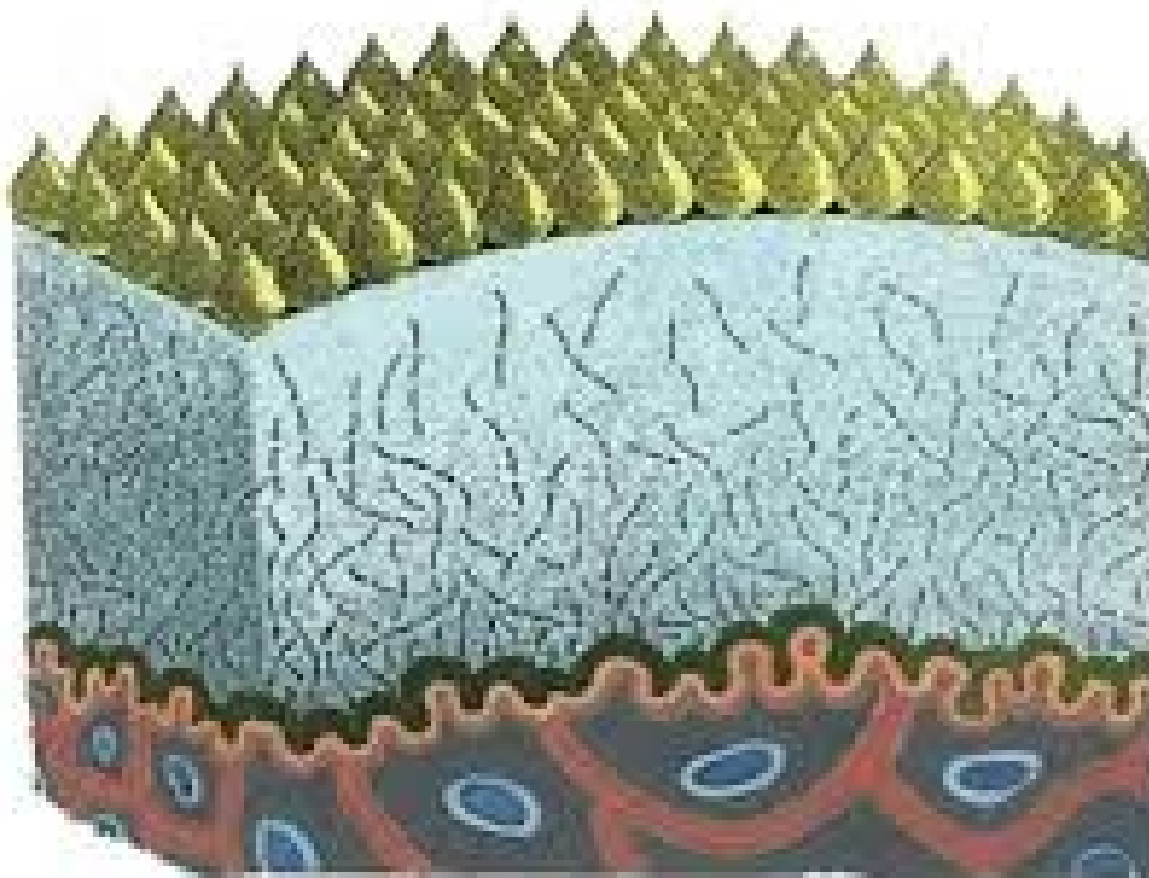
Lacrimal Functional Unit



Tear Film



Tear Film



← Lipid layer

← Aqueous layer

← Mucous layer

← Glycocalyx

← Corneal & conjunctival epithelia

Epidemiology

Challenges

- No single diagnostic test can be performed in the field or in the clinic to reliably distinguish individuals .
- No consensus on which combination of tests should be used to define the disease, either in the clinic or for the purposes of a research protocol.
- lack of correlation between patients, irritative ocular symptoms and the results of selected clinical tests
- Lack of repeatability of many of the clinical tests in common use

Study	N	Age range	Dry eye assessment	Prevalence
US Studies				
Saltbury Eye Study ¹⁸	2420	≥ 65 y	At least 1 of 6 symptoms (dryness, gritty/sandiness, burning, redness, crusting on lashes, eyes stuck shut in morning), occurring at least often.	14.6%
Beaver Dam ⁹	3722	≥ 48 y	"For the past 3 months or longer have you had dry eyes?" (if needed, described as foreign body sensation with itching, burning, sandy feeling, not related to allergy.)	14.4%
Women's Health Study ⁷	36995	≥ 49 y	Severe symptoms of dryness and irritation, either constantly or often, and/or the physician's diagnosis of dry eye as volunteered by the patient.	7.8%
Physician's Health Studies I and II ^{8,14}	25655	≥ 50, 55 y	Severe symptoms of both dryness and irritation either constantly or often and/or the physician's diagnosis of dry eye as volunteered by the patient.	
Australian Studies				
Blue Mountains ¹⁰	1075	≥ 50 y	At least 1 of 4 symptoms regardless of severity, or at least 1 symptom with a moderate to severe ranking (dryness, grittiness, itchiness, discomfort).	16.6% (at least 1 symptom) 15.3% (3 or more symptoms)
Melbourne Visual Impairment Project ¹¹	926	≥ 40 y	At least 1 of 6 "severe" symptoms, not attributed by the subject to hay fever (discomfort, foreign body, itching, tearing, dryness, photophobia).	5.5%
Asian Studies				
Shihool ¹²	2038	≥ 65 y	At least 1 of 6 symptoms, often or all of the time (dryness, gritty/sandiness, burning, sticky, tearing, redness, discharge, eyes stuck shut in morning).	33.7%
Sumatra ¹³	1058	≥ 21 y	At least 1 of 6 symptoms, often or all of the time (dryness, gritty/sandiness, burning, redness, crusting on lashes, eyes stuck shut in morning).	27.5%

Epidemiology

- In Indonesia, the prevalence of dry eye symptoms was 27.5%¹
- A hospital based survey in Enugu, Nigeria showed a prevalence of 19.2% in a cross-sectional study²
- A study done on kitchen staff in Kumasi, showed a high prevalence of 46.6%³

¹Lee A J, et al. Br J Ophthalmol. 2002;86:1347-51.

²Onwubiko SN. Cont Lens Anterior Eye. 2014 Jun;37(3):157-61.

³Kumah DB et al. J Ghana Sci Assoc. 2009;11(1)

Epidemiology

In KBTH Eye Unit

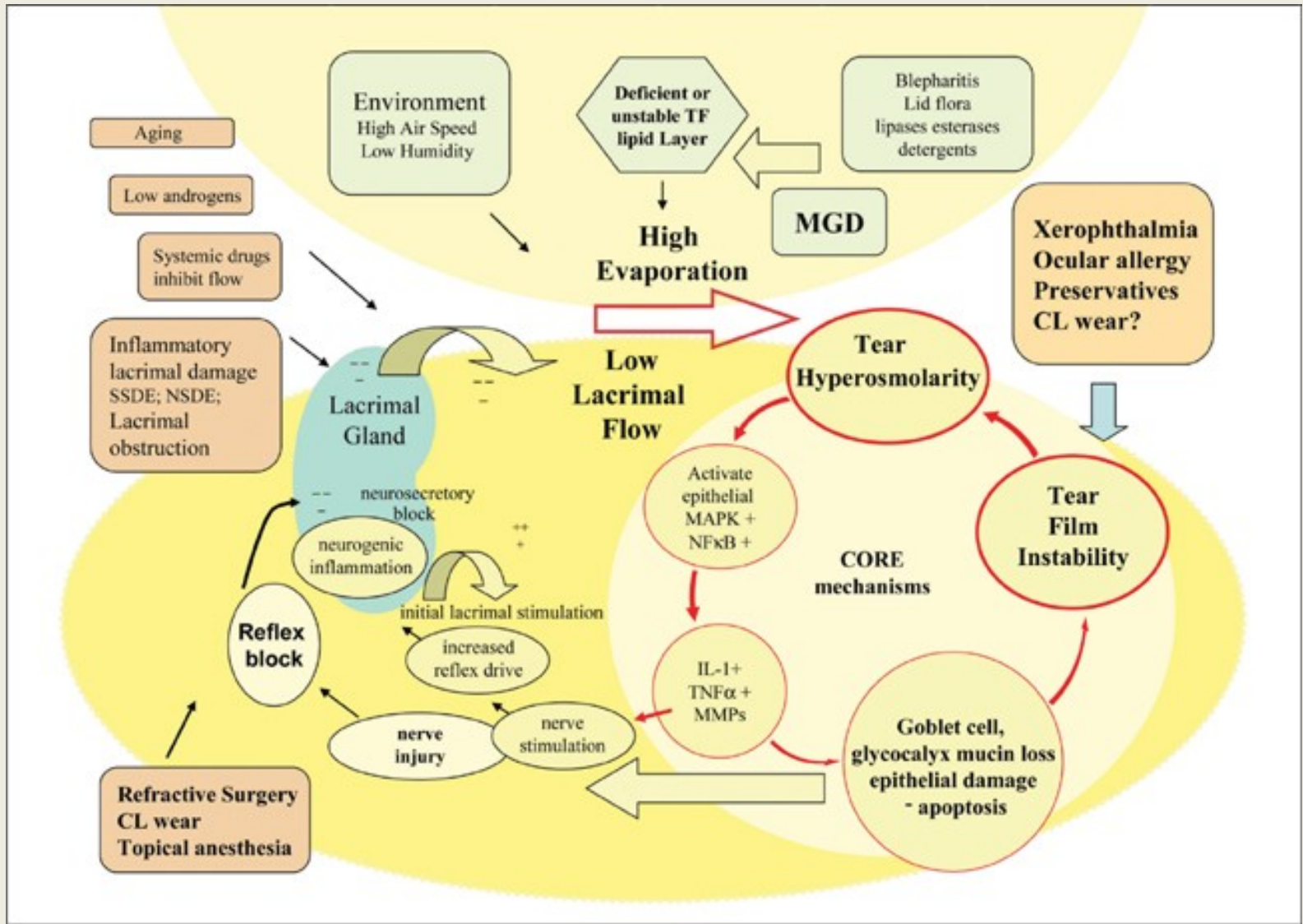
- Sept 2014-Aug 2015
- Total of 240 cases reported - 1.2%
- Under-reported

Table 1. Risk Factors for Dry Eye

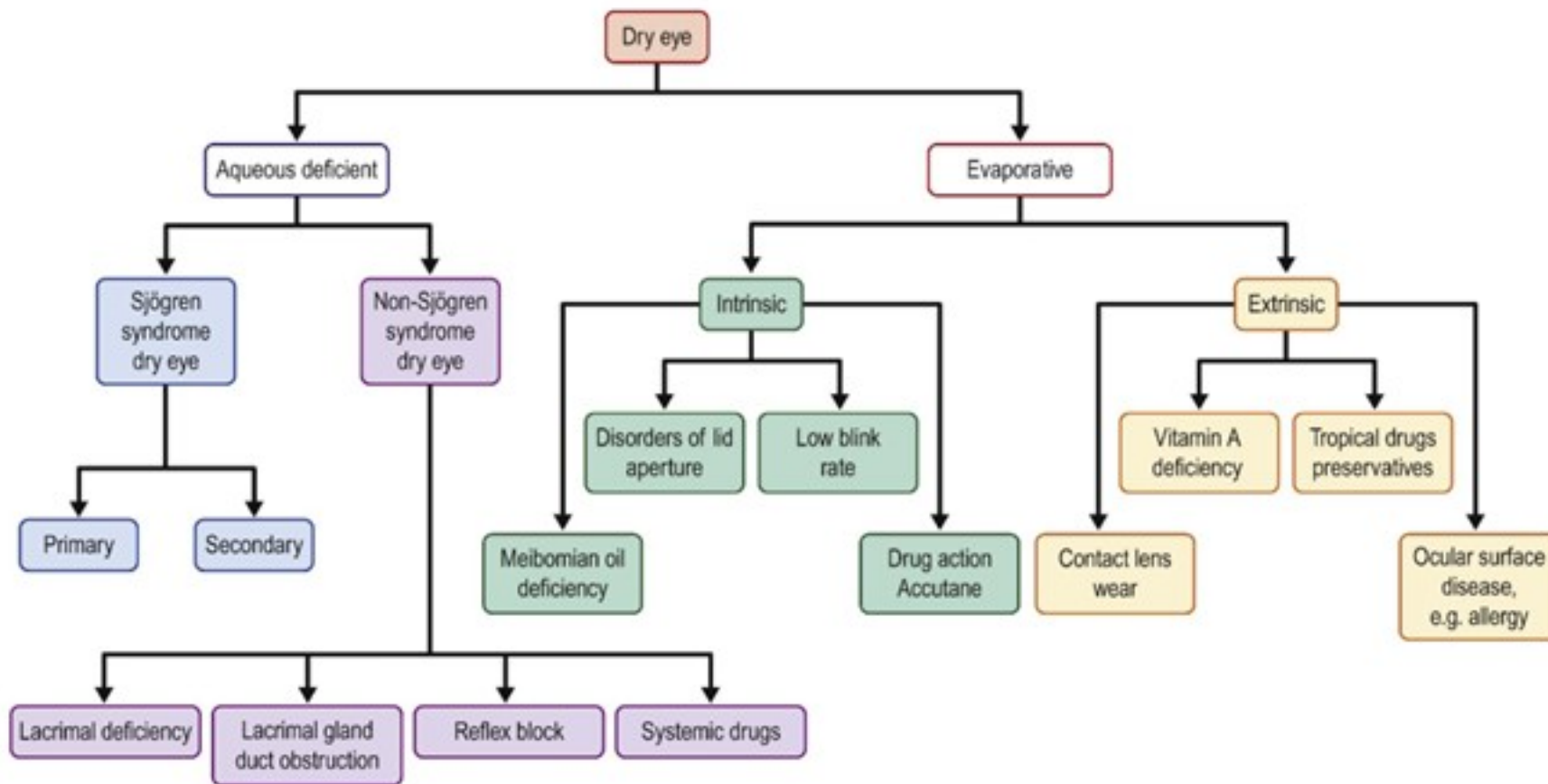
Level of Evidence		
Mostly consistent	Suggestive	Unclear
<ul style="list-style-type: none"> • Older age • Female sex • Postmenopausal estrogen therapy • Omega-3 and Omega-6 fatty acids • Medications <ul style="list-style-type: none"> Antihistamines • Connective tissue disease • LASIK and refractive excimer laser surgery • Radiation therapy • Hematopoietic stem cell transplantation • Vitamin A deficiency • Hepatitis C infection • Androgen deficiency 	<ul style="list-style-type: none"> • Asian race • Medications <ul style="list-style-type: none"> Tricyclic antidepressants Selective serotonin reuptake inhibitors Diuretics Beta-blockers Diabetes mellitus • HIV/HTLV1 infection • Systemic chemotherapy • Large incision ECCE and penetrating keratoplasty • Isotretinoin • Low humidity environments • Sarcoidosis • Ovarian dysfunction 	<ul style="list-style-type: none"> • Cigarette smoking • Hispanic ethnicity • Anticholinergics • Anxiolytics • Antipsychotics • Alcohol • Menopause • Botulinum toxin injection • Acne • Gout • Oral contraceptives • Pregnancy

Pathogenesis

- DED is multifactorial involving multiple interacting mechanisms.
- Dysfunction of any LFU component can lead to DED by causing alterations in the
 - volume
 - composition
 - Distribution
 - and/or clearance of the tear film
- Two mutually reinforcing global mechanisms
 - **tear hyperosmolarity** and
 - **tear film instability**



Aetiology



References

- The Epidemiology of Dry Eye Disease : Report of the Epidemiology Subcommittee of the International Dry Eye Work Shop (2007)
- AAO BCSC External Disease and Cornea
- Dry Eye Syndrome by C Stephen Foster, Medscape Reference
- AAO Preferred Practice Patterns. Dry Eye Syndrome

**Pronounced as one letter
And written with three
Two letters there are
And two only in me
I'm double, I'm single
I'm black, blue and grey
I'm read from both ends,
And the same either way
What am I?**