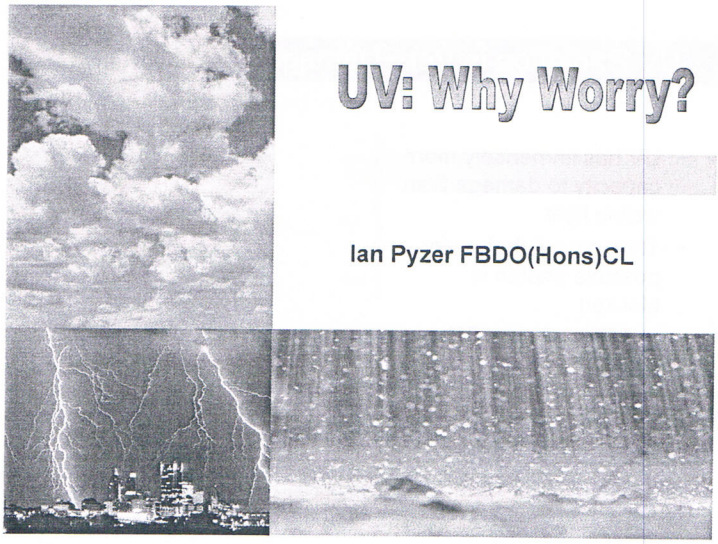
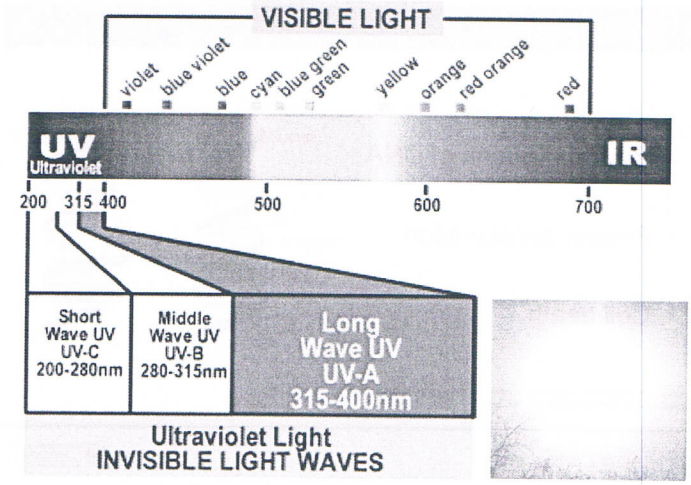


UV: Why Worry?

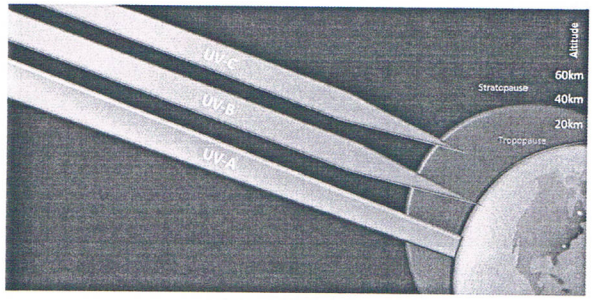
Ian Pyzer FBDO(Hons)CL

Overview

What is UV radiation?
What does it do?
Why UV protection is important
Overview of ocular risks of UV overexposure
Protecting the eyes



The Ozone Layer helps protect us



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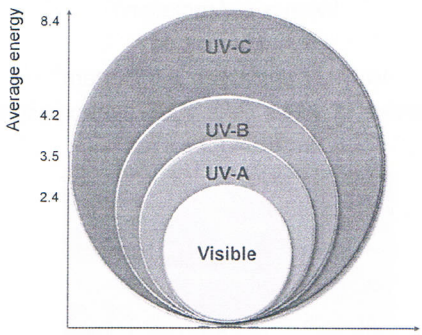
UV Photons carry higher energy . . .



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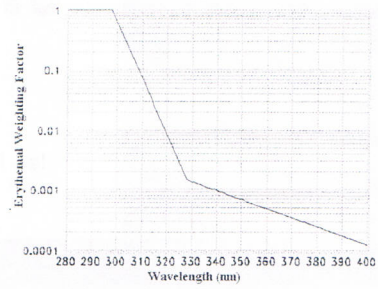
UV Radiation is Very Damaging . . .

- UV has immensely more capacity to damage than visible light
- Thus crucial that every possible photon is blocked
  - 95% blocking >> 75% blocking



Erythemal Action Spectrum (CIE)

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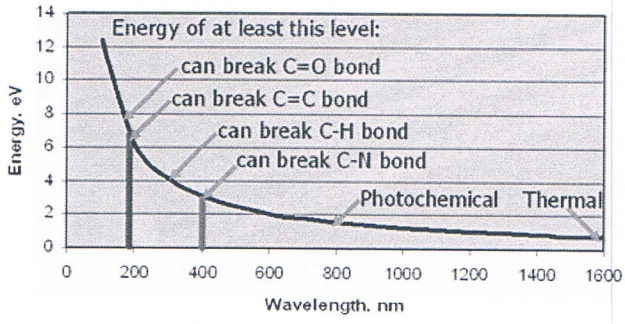
What Else the Energy Can Do . . .



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UV Damage to Cells . . . . .

- Point mutations of DNA
- Protein denaturation
- Cell death

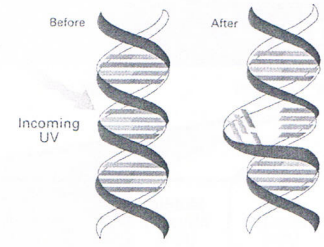

Illustration adapted from: Ultraviolet radiation: how it affects life on earth http://earthobservatory.nasa.gov/Library/UVB

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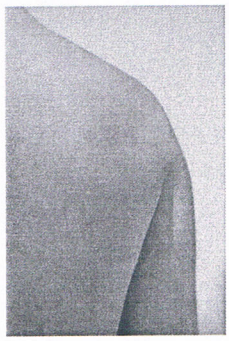
UVB Effects



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UVB Skin Damage is Seasonal

- 70% of potential UVB dosage to skin occurs in Summer
- Most intense from 10am to 2pm
- Does not penetrate glass

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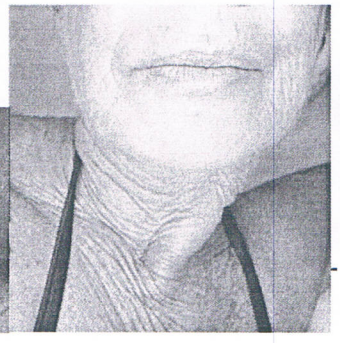
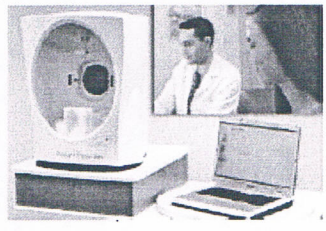
UVA is More Plentiful but Not Innocuous

- Penetrates deeply
- Causes indirect DNA damage via free radicals
  - Skin cancer
- Damages collagen
  - Skin ageing



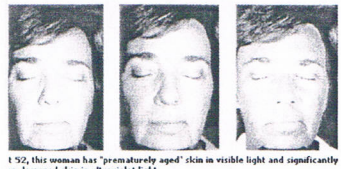
UV Damage beneath the skin?



Clarity™ Pro allows assessment of damage beneath the surface layer of the skin using multi-spectral image capture

Source: skincarephysicians.com David Mc Danial MD

his 37-year-old woman has subsurface sun damage, which is clearly visible the photo on the right.



t 52, this woman has "prematurely aged" skin in visible light and significantly n-damaged skin in ultraviolet light.

This 64-year-old beach community resident has skin that chronicles a lifetime of chronic sun exposure. UV photography is not necessary to see that her skin is dry, inelastic, wrinkled, and heavily mottled

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UVF Photography

- Areas seen to fluoresce represent precursor lesions
- Detection of ocular changes before clinical manifestation
- Sun related damage not seen at an earlier age

Source: Ooi J-L *et al.* Am J Ophthalmol 2006;141:294-298.

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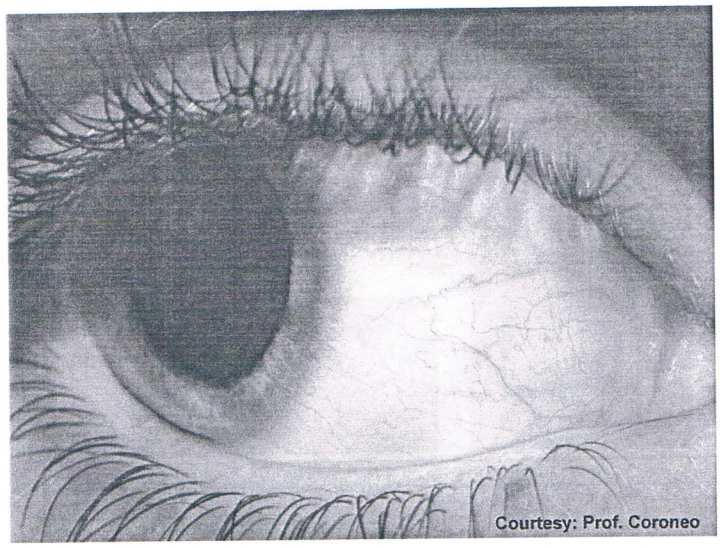

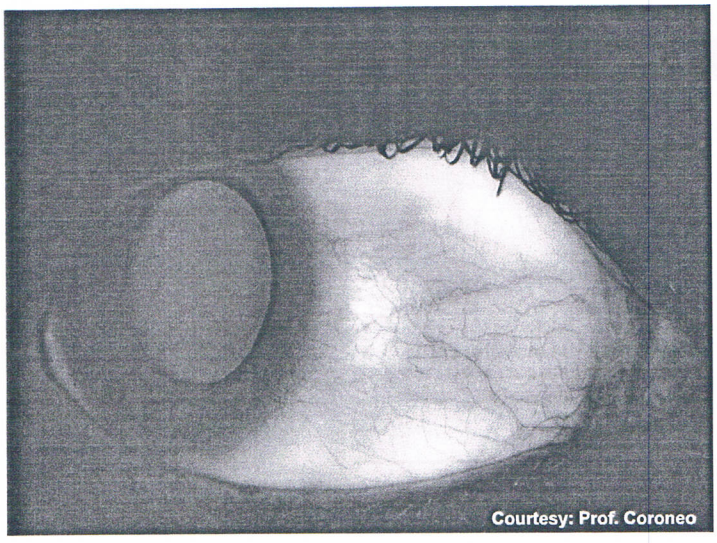

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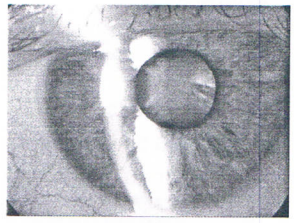
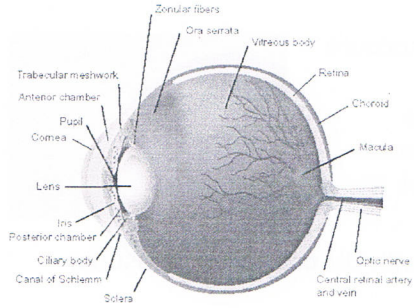
UV Damage and the Eye

- UV damage at the cellular level
- UV damage at the ocular level
- Pathological effects of UV exposure

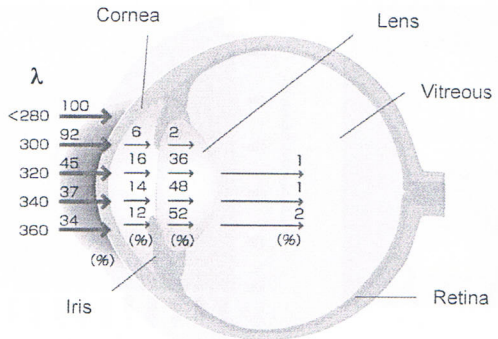


UV Damage to Ocular Tissue



- Cornea
- Lens
- Retina

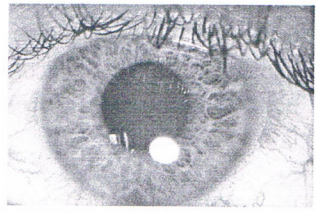
Penetration through ocular structures



Effects of Overexposure

Ophthalmohelioses

- UV keratoconjunctivitis
- Pterygium / Pinguecula
- Cataract
- Macula



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The Threat of Overexposure

Greater lifetime exposure

- Depletion of ozone
- Longer life expectancies
- More time outdoors

Poor compliance with UV protective measures

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The Threat of Overexposure

Young patients are especially vulnerable

- Larger pupils
- Clearer lenses
- Increased time outdoors
- Few wear sunglasses

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Exposure Occurs at Unlikely Times

New research findings:

During spring, summer and autumn, ocular UV exposure is greatest during **early morning** and **late afternoon**

Exposure is **nearly double** that of mid-morning & early afternoon

Sasaki H. UV exposure to eyes greater in morning, late afternoon. Proc. 111th Ann. Meeting, Japanese Ophthalmologic Soc., Osaka, Japan. April 2007.

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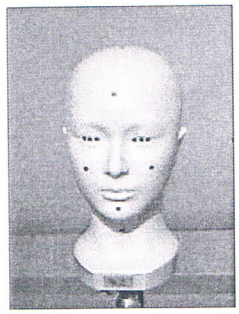
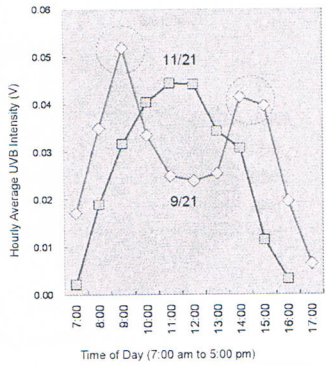
UVB Sunrise to Sunset





Sasaki H. UV exposure to eyes greater in morning, late afternoon. Proc. 111th Ann. Meeting, Japanese Ophthalmologic Soc., Osaka, Japan. April 2007.

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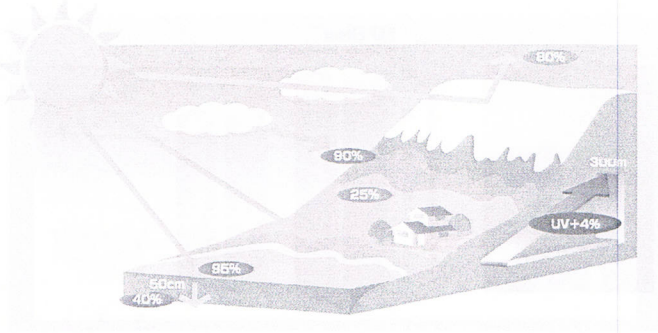
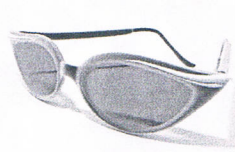
Sources of Exposure



Inadequate Protection

- Patients are unaware that their sunglasses and/or contact lenses may not adequately protect their eyes
  - 66% believe sunglasses alone are enough
  - 57% don't know if their contact lenses provide UV blocking
  - 39% believe **all** contact lenses provide UV protection



Brand Health Monitor Report, November 2005.

Is sun protection being used?

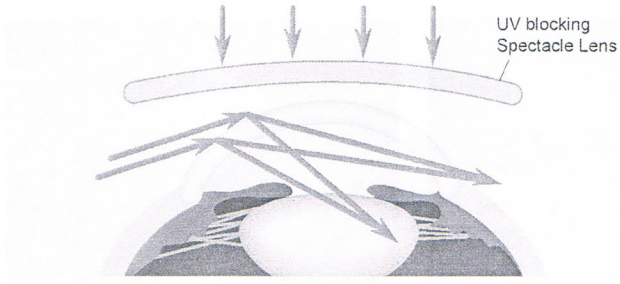
>60% of consumers are NOT wearing sunglasses

- *for over 30% of the total time they spend outdoors during daytime hours*

% of time outdoors with sunglasses	% of consumers surveyed
0	24%
1-30	37%
31-60	17%
61-90	12%
91-100	11%

Vistakon Consumer Research May 2005: Thinking about all the time you spend outdoors during daytime hours (regardless of weather conditions), including driving, approximately what percentage of time do you wear sunglasses? This includes eyeglasses with clip-on shades as well as eyeglasses that change to a darker tint in bright light.

Spectacles alone



Exposure to UV from peripheral sources is still possible even when wearing UV blocking spectacle lenses

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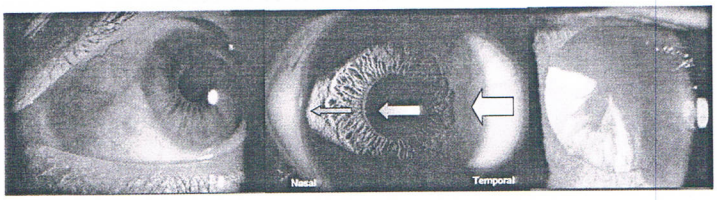
Peripheral Light-Focusing Effect #2

- Due to PLF effect
  - UV radiation is 22x stronger at nasal limbus
    - Typical site for Pterygium / Pinguecula
  - UV radiation is 8x stronger at nasal lens cortex
    - Typical site for cortical cataract



Kwok LS, Daszynski DC, Kuznetsov VA, Pham T, Ho A, Coroneo MT. Peripheral light focusing as a potential mechanism for phakic dysphotopsia and lens phototoxicity. *Opthalmic Physiol Opt* 2004;24(2):119–29.

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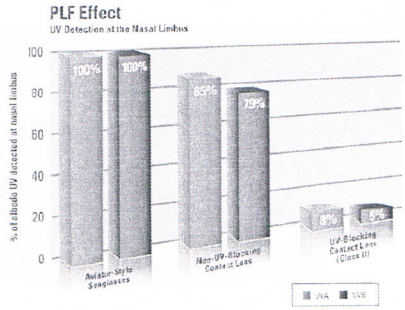
UV Blocking CLs and the PLF Effect



Kwok LS, Kuznetsov VA, Ho A, Coroneo MT. Prevention of the adverse photic effects of peripheral light focusing using UV-blocking contact lenses. *Invest Opthalmol Vis Sci* 2003;44(4):1501–7.

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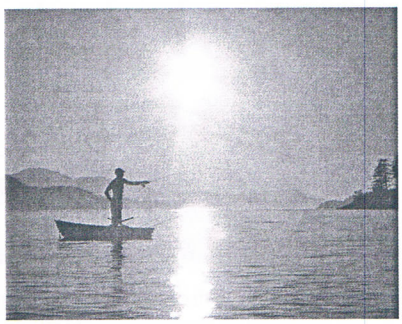
Reflective Exposure



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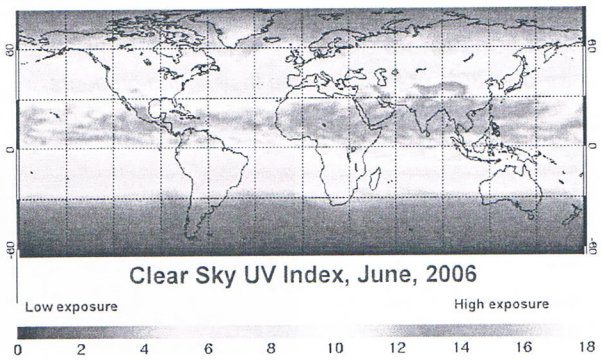
Geographic Location



European Space Agency Forecast for October 8, 2008.

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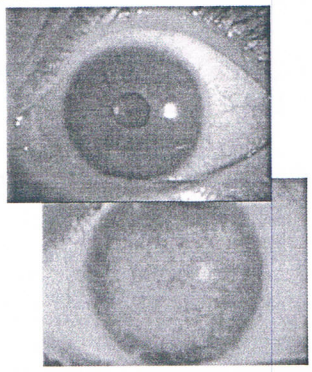
UV Keratoconjunctivitis

- Acute response to above-threshold dose
- Epithelial cell death
- Decreased visual acuity
- Nerve fibres spared
  - Significant pain
- Related conjunctival trauma
  - Sand-in-the-eye sensation



1. Bergmanson JP. Corneal damage in photokeratitis—why is it so painful? Optom Vis Sci. 1990;67(6):407–13.

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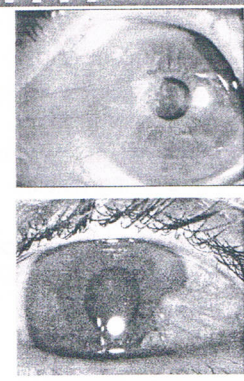
Pterygium

- Degeneration of conjunctival and corneal stroma
- Raised, wing-shaped wedge of fibrovascular tissue, typically nasal
- Patients often asymptomatic
- Difficult to treat



1. Saw SM, *et al.* Pterygium: prevalence, demography and risk factors. Ophthalmic Epidemiol. 1999;6(3).
2. Mackenzie FD, *et al* Risk analysis in the development of pterygia. Ophthalmology. 1992;99(7)

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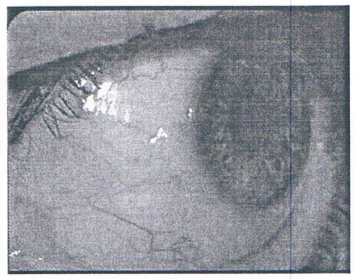
Pinguecula

- Non-malignant localized elevated, yellow lesion typically on nasal limbus
- Slow growing
- Occur as a result of conjunctival stroma degeneration.



1. Perkins ES. The association between pinguecula, sunlight and cataract. Ophthalmic Res. 1985;17(6):325–30.
2. Lica L. Pinguecula and pterygium. Gale Encyclopedia of Medicine Web site, accessed via BNET Research Center Web site. Published 1999. Accessed December 7, 2007.

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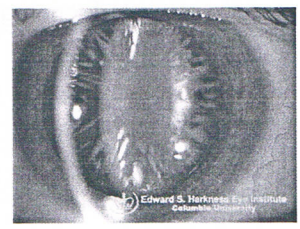
Cataract

Major risk factors:

Age
Heredity
UV exposure



Due to changes in lens proteins and pigments

1. **Truscott, R. Age-related nuclear cataract—oxidation is the key .** Exp Eye Res. 80(5) , 709 – 725, 2005.
2. **Neale, R *et al.* Sun Exposure as a Risk Factor for Nuclear Cataract.** Epidemiology. 14(6):707-712, 2003.
   Taylor, HR *et al.* Effect of ultraviolet radiation on cataract formation. 319(22):1429-1433, 1988.

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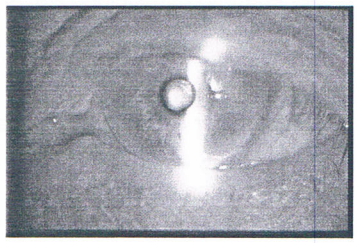
Functional Effects

- Auto-fluoresence
  - UV becomes visible entering nucleus
  - Internal glare source provoking visible scatter
  - Veiling glare reduces CS and possibly VA



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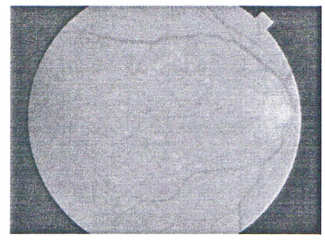
Macular Degeneration

- Some UVA light reaches the retina
  - 4% in young eyes
- Increasing evidence for role in ARMD pathogenesis



1. Bialek-Szymanska *et al.* Risk factor evaluation in age-related macular degeneration. Klin Oczna. 2007;109(4–6):127–30.
2. Cruickshanks KJ *et al* Sunlight and the 5-year incidence of early age-related maculopathy: the Beaver Dam Eye Study. Arch Ophthalmol. 2001;119(2):246–50.

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The Challenges of Blocking UV

- Peripheral light-focusing effect
- Reflective exposure
- Geographic location
- Inadequate protection

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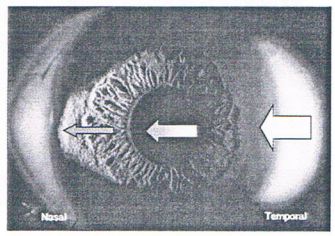
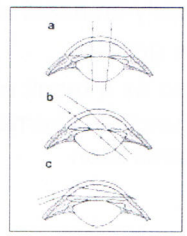
Peripheral Light-Focusing Effect #1

Corneal optics focus and intensify rays entering from temporal periphery onto lens and nasal limbus





Different paths of direct and peripheral light rays

Kwok LS, Daszynski DG, Kuznetsov VA, Pham T, Ho A. Coronea MT. Peripheral light focusing as a potential mechanism for phakic dysphotopsia and lens phototoxicity. *Ophthalmic Physiol Opt* 2004;24(2):119–29.

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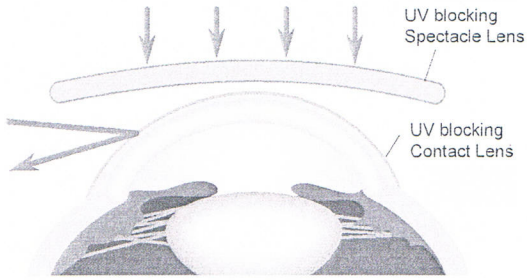
Spectacles plus UV blocking CL



The use of a UV blocking contact lens provides additional protection

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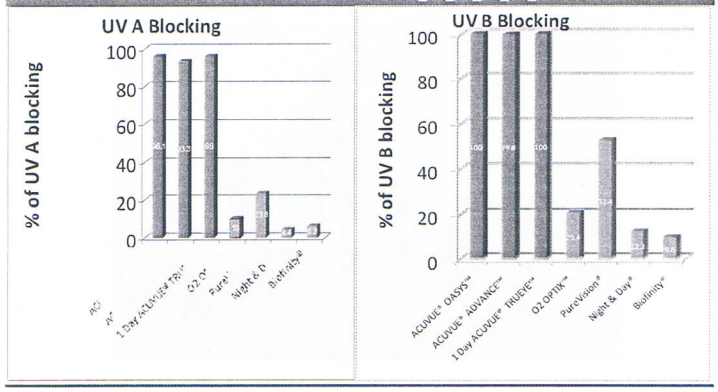
Contact Lenses and UVB Protection



Class I blockers must absorb at least 90% UVA, 99% UVB.
Class II blockers must absorb at least 70% UVA, 95% UVB.

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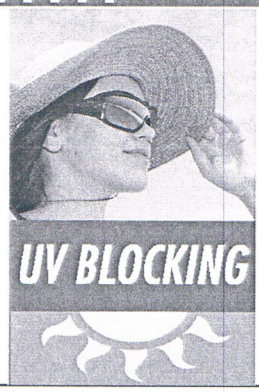
The Best Protection

Combined protection

- Quality sunglasses wraparound or goggle-style
- Broad-brimmed hat
- UV-blocking CLs if require Rx



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Benefits of UV Education

Healthy eyes

Loyal patients

Enhanced service for your patients

Can offer UV protection through more than one modality

- UV-blocking spectacles
- Quality sunglasses
- UV-blocking contact lenses

Protection for all ages