Phototherapy & PDT

Phototherapy & PDT

- The use of light (especially UV light) in the treatment of skin conditions may seem like a contradiction.
  - However, "light" can be thought of as a *form of medicine.*
    - Like any medicine, it has risks, but **also has benefits**.

Phototherapy & PDT

In This Module, We Will Be Reviewing…

- PUVA
- Narrowband UVB (NB-UVB) } "Phototherapy"
- Blue Light Photodynamic Therapy (PDT)
  - Often referred to simply as "Blue Light".

Phototherapy

PUVA

PSORALEN ⇨ "PUVA" ⇦ UVA

- *Used to treat a variety of conditions, including…*
  - Psoriasis
  - Atopic Dermatitis (Eczema)
  - CTCL
  - Vitiligo
  - Lichen Planus
  - *And others…*

PUVA

So what is a "psoralen"?

Definition

Chemical compound which, upon exposure to light, produces a *phototoxic* reaction.

PUVA

So what is a "psoralen"?

Definition

Chemical compound which, upon exposure to light, produces a *phototoxic* reaction.

"requires light"

PUVA

So what is a "psoralen"?

Definition

Chemical compound which, upon exposure to light, produces a *phototoxic* reaction.

"is harmful to its surroundings"

PUVA

So what role do "psoralens" play in PUVA?

Definition

Chemical compound which, upon exposure to light, produces a *phototoxic* reaction.

PUVA

So what role do "psoralens" play in PUVA?

Definition

"8-Methoxypsoralen" (aka "8-MOP")

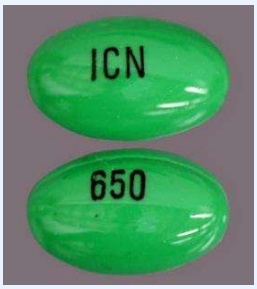
Chemical compound which, upon exposure to light, produces a *phototoxic* reaction.

"UVA"

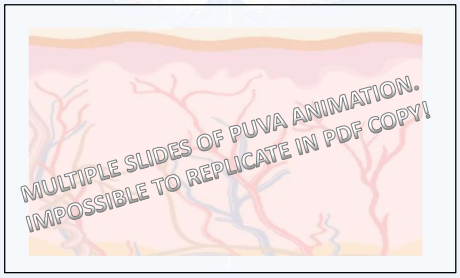
PUVA

8-Methoxypsoralen ("8-MOP" or "Methoxsalen")

- Many "psoralens", including "8-MOP", are found in nature.
- May be taken *systemically* **or** applied *topically*.
  - Most patients undergoing PUVA treatments are prescribed the *systemic* version.
  - "8-MOP" is taken (or applied) prior to the patient's UVA treatment.
    - *For example, medications like "Oxsoralen® Capsules" are usually taken 90 minutes to 2 hours prior to UVA exposure.*



PUVA



Narrowband UVB

- Narrowband UVB (NB-UVB), like the UVA used in PUVA, is also a form of ultraviolet light.
  - *However,* ***no "psoralens" are used in NB-UVB!***

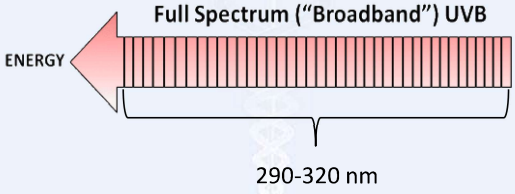
Narrowband UVB

How Is NB-UVB Different?

- "Broadband" UVB (290 – 320 nm)
  - **The wavelength that causes sunburns.**
    - "UVB = UVBurn".
  - The most harmful UV light we receive because its energy is easily ~~*absorbed by epidermal cells.*~~
    - Causes DNA damage.
    - Temporarily (though significantly) has the ability to *lower immune activity in the skin.*

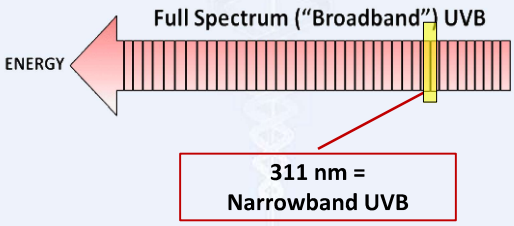
Narrowband UVB

How Is NB-UVB Different?

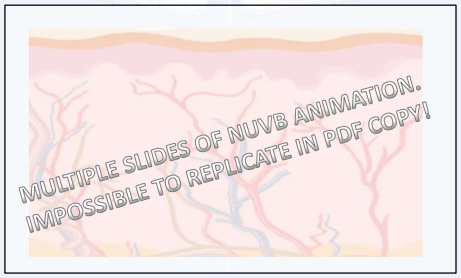


Narrowband UVB

How Is NB-UVB Different?



Narrowband UVB



PUVA & UVB

General Safety Considerations

- Risks Associated w/ Ultraviolet Light
  - Increased Risk of Skin Cancer
    - Phototherapy is *generally avoided* in patients with a PMH of Melanoma, but *not necessarily* BCC/SCC.
    - Phototherapy is also *generally avoided* in patients with "photosensitive" conditions (e.g., Lupus, Porphyria, Xeroderma Pigmentosum, etc.).
    - Phototherapy should also be *used with caution* in patients taking "photosensitizing" medications.

PUVA & UVB

General Safety Considerations

- Risks Associated w/ Ultraviolet Light
  - Increased Risk of Skin Cancer
    - Covering areas "unaffected" by their skin condition may decrease risk in those areas. *For example…*
      - May leave underwear/bra on during phototherapy.
      - *Even if involved, men should keep groin covered!*

PUVA & UVB

General Safety Considerations

- Risks Associated w/ Ultraviolet Light
  - Increased Photoaging
    - Increased skin laxity, wrinkling, fragility, lentigines, etc.
  - Increased Risk of Cataracts
    - All patients (both UVB and PUVA) **must** wear eye protection while in phototherapy.
    - PUVA patients should *also* wear UVA-blocking sunglasses for up to 24 hours after taking 8-MOP!

Booth Goggles

"Wraparound"
UV Glasses

PUVA & UVB

General Safety Considerations

- Risks Associated w/ Ultraviolet Light
  - "Additional" UV Exposure Should Be Avoided
    - Patients can have *too much UV exposure* if they're also "laying out" or going to tanning bed in addition to phototherapy.
    - PUVA patients in particular should limit UV exposure for up to 24 hours after treatment!

PUVA & UVB

What About Use In Pregnancy?

- Ultraviolet light *alone* is generally considered safe during pregnancy.
- PUVA, because of its use of 8-MOP, is ***not recommended during pregnancy***.
  - Females should be told this in case they become (or are) pregnant!

PUVA & UVB

How Are Treatment Regimens Determined?

- Determining which version of phototherapy to use, or exactly how it's administered, *is completely up to your supervising physician and office protocol.*
  - Phototherapy is the type of procedure that requires "hands-on" training for full safety and understanding.
    - **This module is intended to provide you with a solid foundation for such training, but by no means replaces it!**

PUVA & UVB

Before receiving "in-office" phototherapy training, you should know…

- Either the patient's "Skin Type" **or** their "Minimal Erythema Dose" (MED) are used to determine treatment protocol.
  - Skin Type
    - Our "UV Light, Sunscreen, & Skin Type" module reviews "Skin Type" in detail!

PUVA & UVB

Before receiving "in-office" phototherapy training, you should know…

- Either the patient's "Skin Type" **or** their "Minimal Erythema Dose" (MED) are used to determine treatment protocol.
  - Minimal Erythema Dose (MED)

    Definition

    The minimum amount of energy required to produce uniform redness (erythema) 24 hours after exposure to ultraviolet radiation.

PUVA & UVB

Before receiving "in-office" phototherapy training, you should know…

- Phototherapy "dosages" are typically measured in "millijoules per square centimeter" (mJ/cm^2).

Example

A psoriasis patient with "Skin Type" III needs to start narrowband UVB phototherapy today. The office protocol indicates that this patient would start treatment at a "dose" of 260 mJ/cm^2.

PUVA & UVB

NUVB BOOTH DEMO VIDEO

Blue Light PDT

Blue Light PDT

So what is "Photodynamic Therapy" (PDT)?

Definition

The use of a photosensitive agent that, when exposed to light, absorbs and subsequently transfers energy to adjacent cells, thereby resulting in therapeutic change to the surrounding tissue.

Blue Light PDT

So what is "Photodynamic Therapy" (PDT)?

Definition

"Aminolevulinic Acid" (aka "Levulan®")

The use of a photosensitive agent that, when exposed to light, absorbs and subsequently transfers energy to adjacent cells, thereby resulting in therapeutic change to the surrounding tissue.

"Blue Light"

Blue Light PDT

- Aminolevulinic Acid (Levulan®)
  - A type of "porphyrin".
    - Has the ability to *absorb* light energy, and then *release* that energy to its surroundings, **essentially causing "controlled destruction" of neighboring tissue**.
  - *Useful in dermatology because…*
    - Can be applied topically.
    - Absorbed fairly rapidly.
    - Has an affinity for keratinocytes – *particularly "atypical" keratinocytes*.

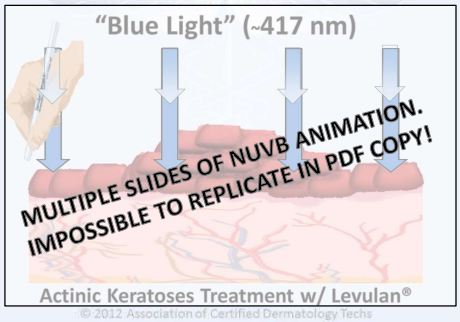
Levulan® Kerastick®

Blue Light PDT

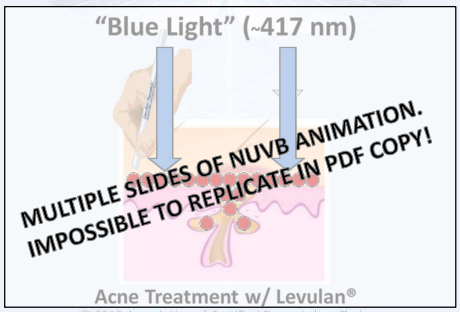
- Blue Light (BLU-U®)
  - BLU-U® is able to penetrate up to 2 mm into the skin.
  - Emits light at ~ 417 nm.
    - **Blue Light is <u>not</u> a form of UV light!**
    - It is only effective because "porphyrins" are sensitive to the "blue" wavelength of light.
  - Provides maximum "porphyrin response" after 1000 seconds.
    - The reason why many treat for "16 min 40 sec".

BLUE-U®

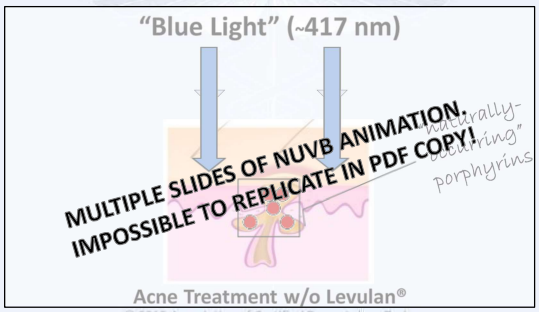
Blue Light PDT



Blue Light PDT



Blue Light PDT



Blue Light PDT

General Considerations

- Blue Light PDT is *generally avoided* in patients with "photosensitive" conditions (e.g., Lupus, Porphyria, etc.).
- Patients will likely experience some degree of redness, crusting, stinging, itching, and inflammation both *during treatment and for about 5-7 days thereafter.*
  - Many patients report that the reaction looks/feels similar to that caused by Efudex® or Carac®, but that the duration isn't nearly as long.

Blue Light PDT

General Considerations

- **Patients should avoid "strong" light sources for up to 40 hours after Aminolevulinic Acid has been applied to the skin!**
  - This includes *either* sunlight **OR** bright indoor lighting.
    - Should even wear a wide-brimmed hat when going to their car after the PDT treatment.
    - Simply applying sunblock **does not** protect patients from the "blue light" wavelengths.
    - Even after Levulan® loses its effect, any inflamed skin should be protected.

CONCLUSION