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# Dead Sea Climatic Factors

*Marco Harari, MD*

NORWEGIAN  
MULTIDISCIPLINARY PROGRAM

June 2018




***At the Dead Sea the sun shines differently !***

**Dead Sea Climatotherapy**



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40 years after being studied,  
Dead Sea Climatotherapy  
can be considered as  
a natural and simple  
dermatological and immunological treatment,  
highly effective  
and free of side effects

**The Dead Sea message**



*The sun shines differently...*





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**Is that true?  
How does it come?**

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Jerusalem → 







# What is so different?

## The unique climatic factors



# Unique Climatic Conditions

## 1. High Barometric pressure

- Sea level: 754+6 mmHg
- Dead sea level: 791+4 mmHg

## 2. Oxygen rich air

- 8% more O<sub>2</sub> molecules/m<sup>3</sup>
- Higher PO<sub>2</sub> blood levels
- Higher blood O<sub>2</sub> saturation
- Better exercise capacity



# Unique Climatic Conditions

## 3. Ultra Violet Radiation

**UVA – 320-400 nm      -8%**

**UVB – 280-320 nm      -15%**

**UVC – 100-280 nm      NA**

**At Dead Sea level:**

**UVA/UVB Ratio – is the highest**



# Unique Climatic Conditions

## 4. High and constant temperatures

Summer : 32 - 40° C

Winter : 20 - 32° C

## 5. Low Relative Humidity

30% - 45%

## 6. Low rainfall



# Unique Climatic Conditions

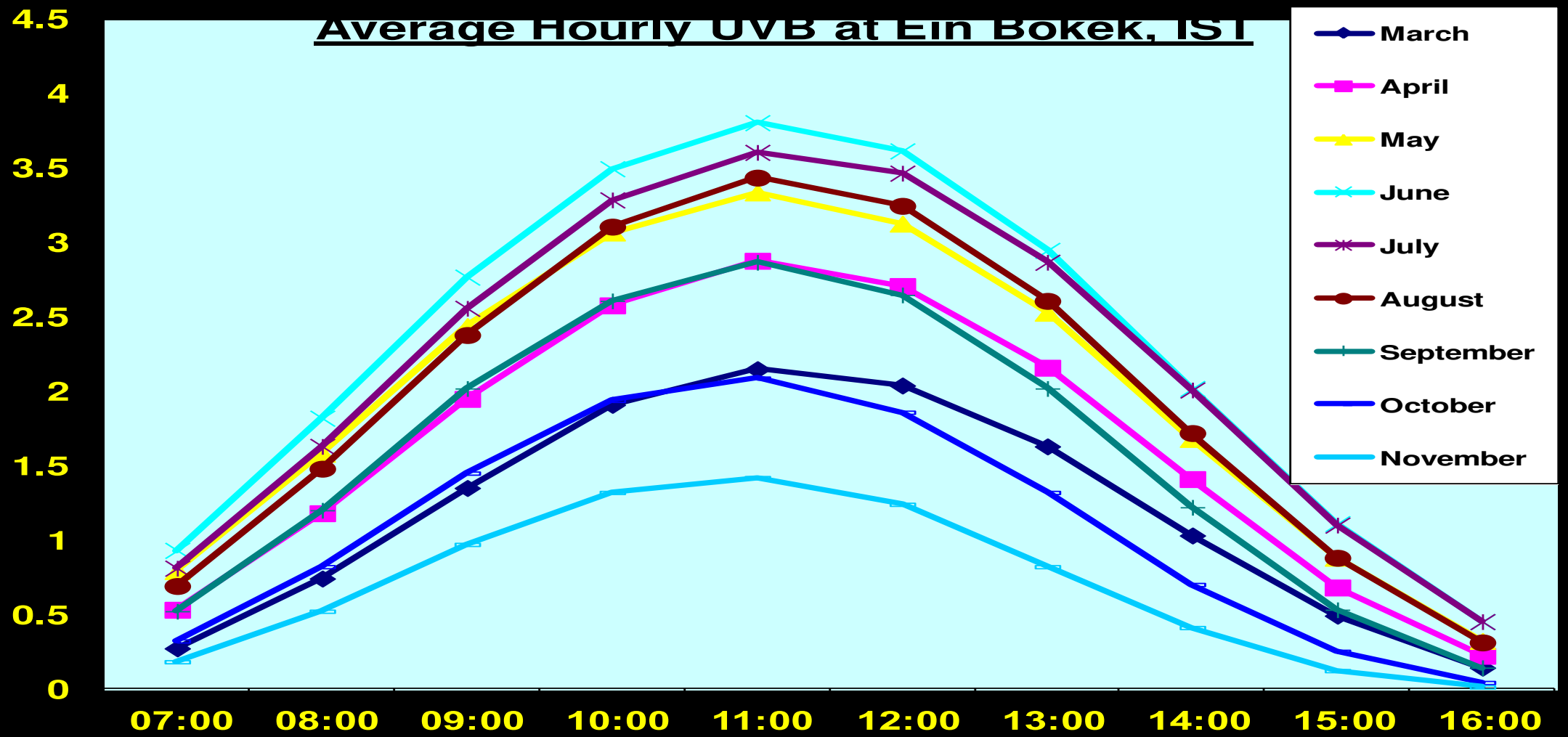
7. **Pollen free atmosphere**
8. **Bromine rich atmosphere**
  - 20 times higher bromine in the air
  - Tranquilizing effect
  - ↑ serum bromine levels

# Hollander H., New-York Academy of Science 1961

## Arthritic Patients prefer:

- High atmospheric pressure
  - Low humidity
- High and constant temperatures





Continuous monitoring of UV radiation  
at the Dead Sea area

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**Can we use these conditions?**



# Dead Sea Climatotherapy

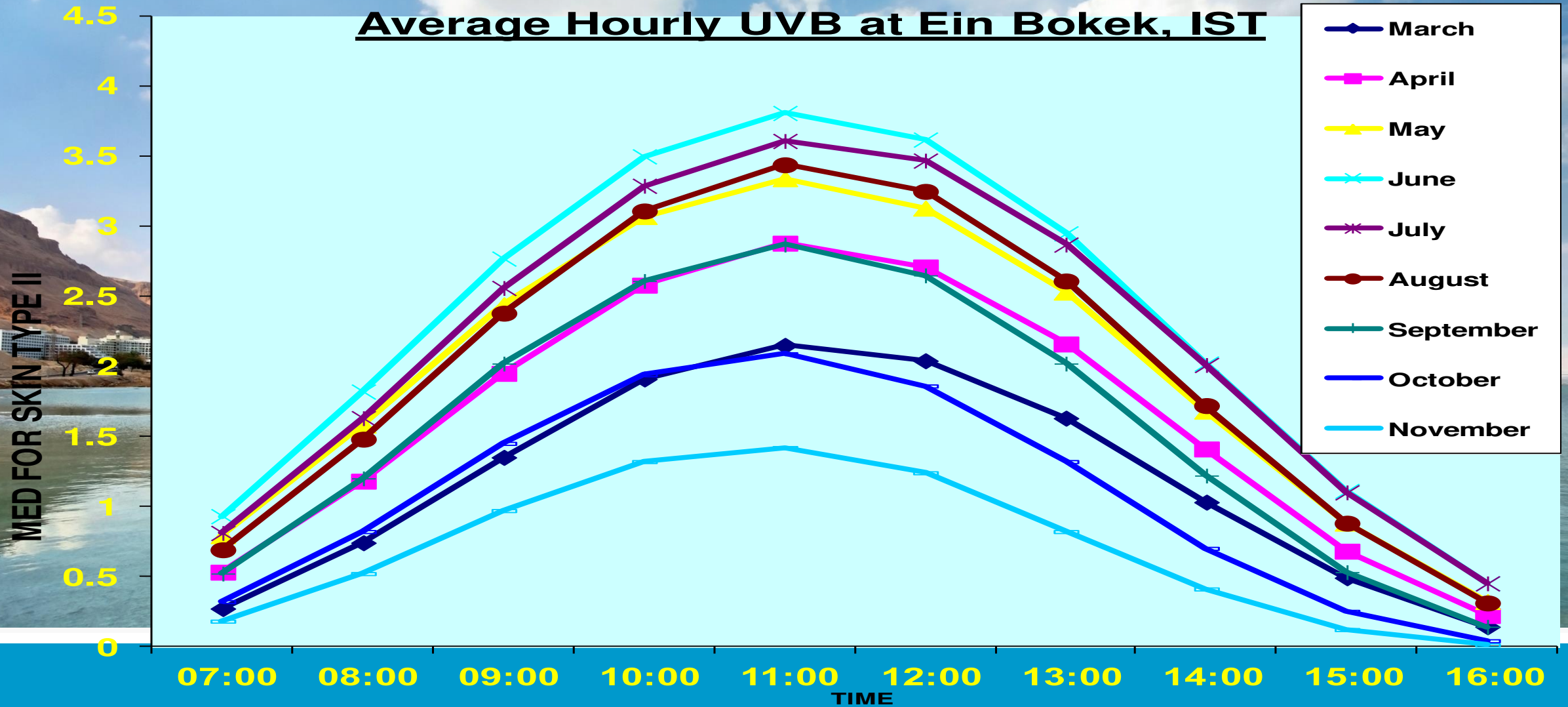


# Dead Sea Climatotherapy

Combination of  
sun exposure and bath in salty waters  
under medical supervision  
during a stay in a *specific* area  
for a defined period of time

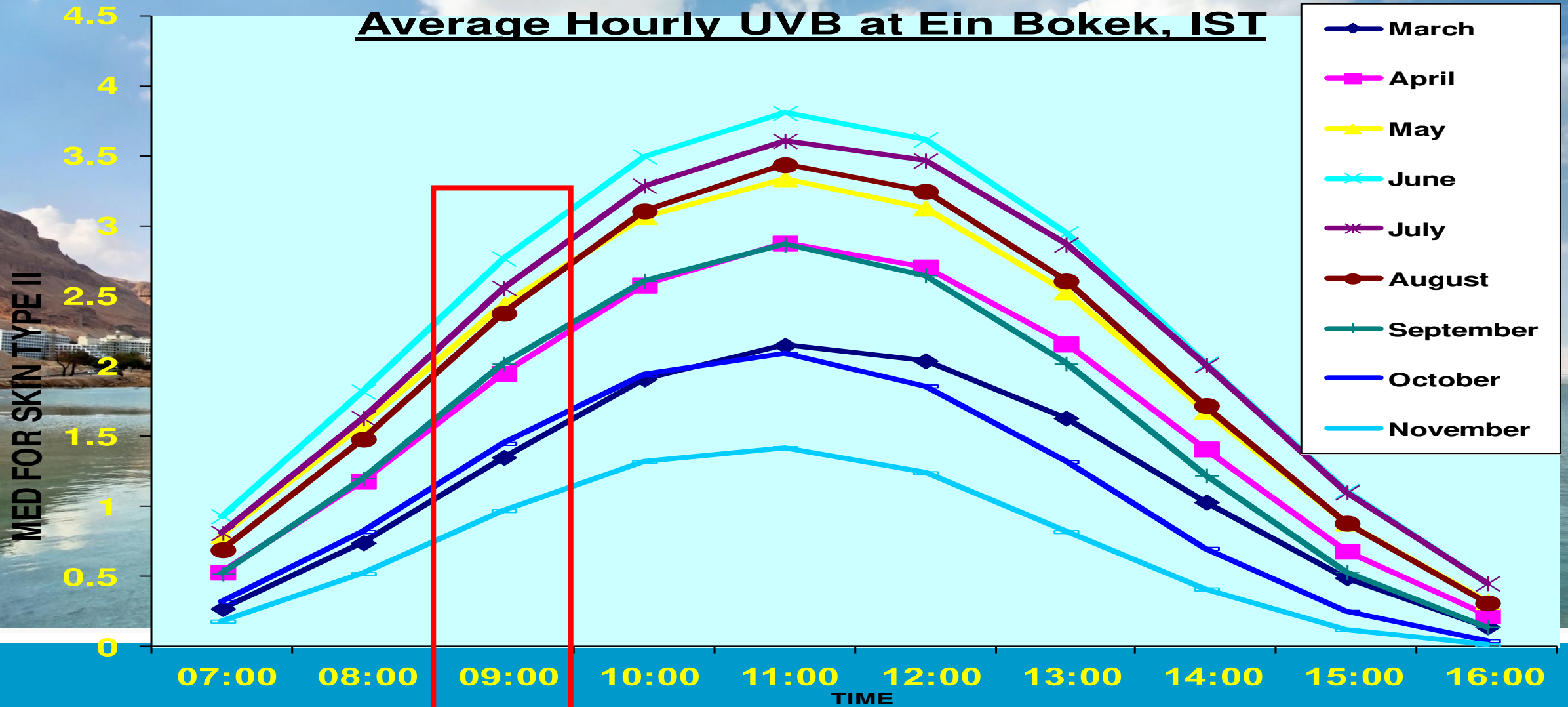


# Average Hourly UVB at Ein Bokek, IST



Between November and May:  
2.5 ratio for 1 MED per hour

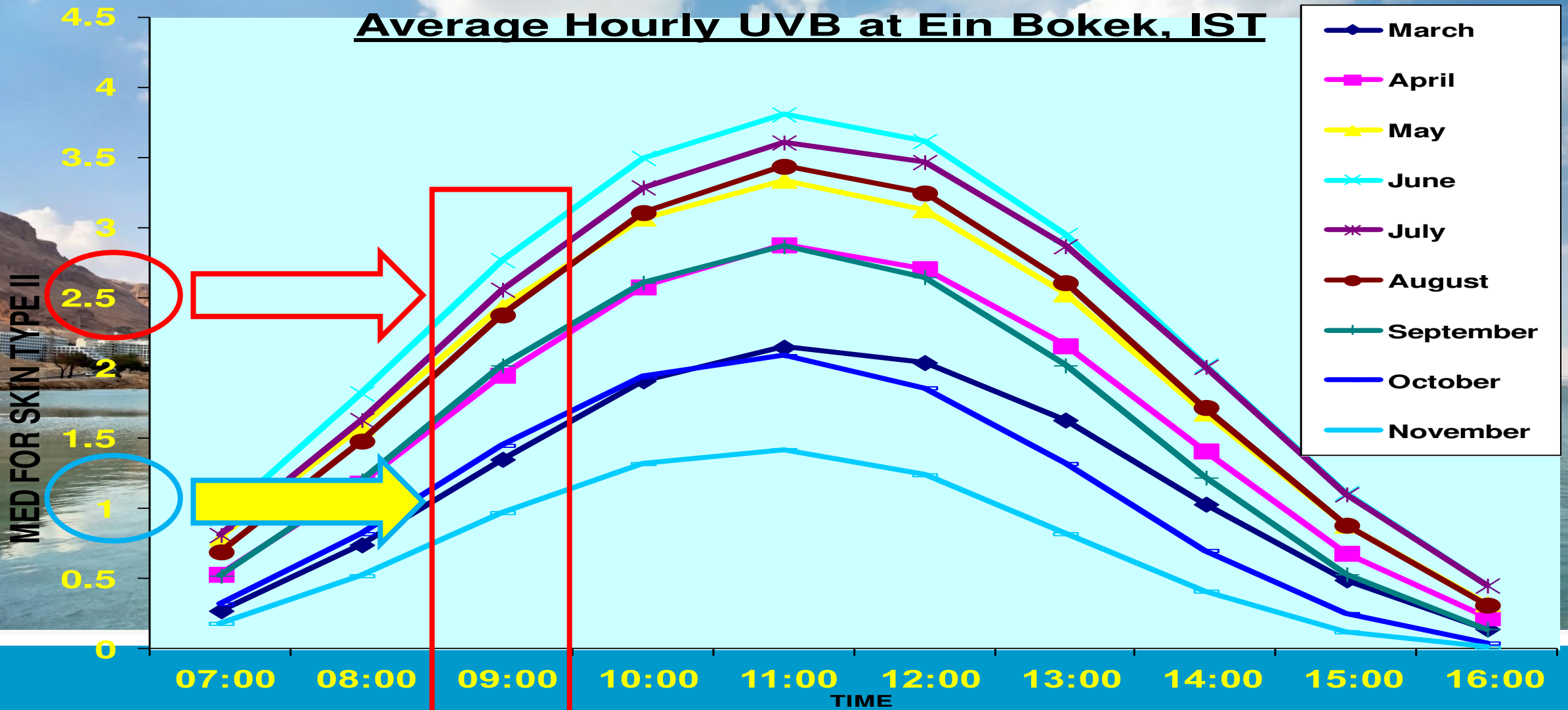
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# Average Hourly UVB at Ein Bokek, IST



Between November and May:  
2.5 ratio for 1 MED per hour

## Climatotherapy at the Dead Sea

- Treatment is usually for 3-4 weeks
- One of the most effective treatments in **psoriasis**; disease remission occurring for several months



## Climatotherapy at the Dead Sea

- Few adverse effects can include:
  - Sunburn, pruritus, folliculitis
  - solar damage such as elastosis, solar lentigines, facial wrinkles
- Theoretical risk of:
  - Photo-damage, Non-melanoma skin cancer
  - and possibly malignant melanoma

## Psoriasis treatment: the results

- PASI 75: 91.4%
- Average duration of remission : 33 weeks
- Younger age of patients significantly correlated with better outcomes

Harari M, Novack L, Barth J, David M, Friger M, Moses SW.

The percentage of patients achieving PASI 75 after 1 month and remission time after climatotherapy at the Dead Sea.

Int J Dermatol 2007; 46:1087-91.



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# Heliotherapy at the Dead Sea

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**Indeed...**







# Balneotherapy

Mode of therapy based on the water's mineral and thermal properties, in addition to their physical properties:

- Mineral water contains **more than 1 gr/L**
- **Hypothermal** water:  $< 20\text{ }^{\circ}\text{C}$
- **Thermal** water:  $20\text{-}30\text{ }^{\circ}\text{C}$
- **Hyperthermal** water:  $> 30\text{ }^{\circ}\text{C}$

# Dead Sea Treatment modalities

- **Dead Sea water bath**
- **Thermo-mineral springs bath**
- **Mud application**
- **Physiotherapy**
- **Fitness classes**

# What happens in the waters ?

## **Physiology of immersion**



# Physiology of immersion (1)

## Cardiovascular effects

Displacement of  $\sim 700 \text{ cm}^3$  of blood from extremities and abdominal vessels into the great veins of the thorax and into the heart

# Physiology of immersion (2)

## Increased

- Right atrial pressure
- ANF secretion
- Stroke volume
- Cardiac output
- Muscle circulation
- Lymphatic return

## Decreased

- Systemic vascular resistance
- Pulse rate (bradycardia)
- Plasma norepinephrine

# Physiology of immersion (3)

## Renal effects

- Diuresis
- Natriuresis, Kaliuresis
- Suppression of ADH
- Suppression of renin-aldosterone axis



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# Skin and Gut Microbiome

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**Indeed many climatic factors  
work differently at the Dead Sea...**



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**And surely if we combine a  
multidisciplinary approach and  
a rehabilitation program**



# Are you ready for 2 more minutes ?



# WHY CHOOSING MULTIDISCIPLINARY REHABILITATION FOR CHRONIC PAIN?

## LESSONS FROM A RECENT REVIEW

Marco Harari, MD

The Norwegian Dead Sea Clinic





**EFFECTIVE TREATMENT OPTIONS FOR  
MUSCULOSKELETAL PAIN  
IN PRIMARY CARE:**

**A SYSTEMATIC OVERVIEW OF CURRENT  
EVIDENCE**

e. PLoS ONE 12(6): e0178621. June 2017

<https://doi.org/10.1371/journal.pone.0178621>



# BACKGROUND & AIMS

- Musculoskeletal pain (MSP): most common cause of **disability** globally
- MSP : most frequently managed in **primary care**
- People with MSP in different body regions share similar **characteristics, prognosis**, and may respond to similar **treatments**

# REVIEW FLOW PROGRAM ON DATA

- Identification:  $4247 + 4 = 4251$  records
- Screening: 3588 records, excluded: 2131
- Eligibility: 1457 articles assessed, excluded: 1329
- Inclusion: **146 studies** (including 18 from updates)



# RESULTS

- Moderate to strong evidence suggests that **exercise therapy and psychosocial interventions** are effective for relieving pain and improving function for musculoskeletal pain



## RESULTS 2

- NSAIDs and opioids reduce pain in the **short-term**, but the effect size is modest and the potential for adverse effects need careful consideration
- Corticosteroid injections were found to be beneficial for **short-term pain relief** among patients with knee and shoulder pain

# CONCLUSION

- This evidence synthesis of interventions for common MSP presentations shows **moderate to strong evidence for exercise therapy and psychosocial interventions**
- With only short-term benefits from pharmacological treatments



# CONCLUSION

**Multidisciplinary Rehabilitation programs including these interventions should be recommended for patients with MSP**

(Add from the lecturer)





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**Welcome and visit us!**

**thank  
you!**