UV PROTECTION AND TEXTILE
An important method of prevention

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Most of the high-energy solar radiation is stopped by Earth's atmosphere.
THE SUNSHINE: POSITIVE EFFECTS

- **Tan**
  - Aesthetic advantage

- **Synthesis of Vitamin D**
  - Regulate the cell growth
  - Build strong bones and teeth
  - Reduce the bone and muscle pain

- **Stimulate the release of serotonin**
  - Elevate the mood: therapy for depression and mood swings

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THE SUNSHINE: ADVERSE EFFECTS

IMMEDIATE DAMAGES

Erythema

Sunburn

CHRONIC AND LATE DAMAGES

Skin ageing

Skin cancer
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SUN AND LANDSCAPE

80-100%

20%

17%

3%
### UV Protection and Textile

**An Important Method of Prevention**

**INDIVIDUAL SKIN TYPE OFFERS INFORMATION ON SELF-PROTECTION TIME**

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>SKIN TYPE 1</th>
<th>SKIN TYPE 2</th>
<th>SKIN TYPE 3</th>
<th>SKIN TYPE 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKIN</td>
<td>very fair-skinned</td>
<td>fair-skinned</td>
<td>light/dark brown</td>
<td>light brown, olive</td>
</tr>
<tr>
<td>HAIR</td>
<td>red or blond</td>
<td>blond, brown</td>
<td>light brown, brown</td>
<td>dark brown/black</td>
</tr>
<tr>
<td>EYES</td>
<td>blue, rarely brown</td>
<td>blue, green, grey</td>
<td>grey, brown</td>
<td>brown/dark</td>
</tr>
<tr>
<td>SUNBURNs</td>
<td>always heavy, aching</td>
<td>mostly heavy, aching</td>
<td>less frequently, moderate</td>
<td>hardly ever</td>
</tr>
<tr>
<td>SELF-PROTECTION TIME OF SKIN</td>
<td>5 - 10 minutes</td>
<td>10 - 20 minutes</td>
<td>20 - 30 minutes</td>
<td>40 minutes</td>
</tr>
<tr>
<td>PROTECTION BY A TEXTILE WITH A UPF OF 20</td>
<td>100 — 200 minutes</td>
<td>200 — 400 minutes</td>
<td>400 — 600 minutes</td>
<td>900 minutes</td>
</tr>
</tbody>
</table>

**REMARK:** Skin Type 5 & 6 are not listed here as they show no risk of erythema.
RECOMMENDATION OF DERMATOLOGISTS: UV PROTECTION AS PREVENTION OF SKIN CANCER

- GRADUALLY SUNBATHING
- NO SUNSHINE BETWEEN MIDDAY AND 4 p.m.
- SUITABLE SUNSCREEN (SOLAR CREAM) WELL-ADAPTED TO SKIN TYPE AND ACCORDING TO CONDITION OF EXPOSURE TO SUNSHINE

- UV PROTECTIVE CLOTHING AND SUNGLASSES

- ORAL ANTIOXIDANT (ABUNDANT FRUITS AND VEGETABLES AND VITAMIN SUPPLEMENTS)
Special care for children

- Sunburn for children is dangerous because it can predispose them to skin cancer in adult age.
- Children are susceptible to high solar risk:
  - They must be protected against UV Radiation with more attention and effectiveness (solar cream and sunglasses).
  - They can’t stay in the sunshine for a long time and in the central time of the day.

Progressive damages to eyes especially under 18 years.
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**Protection of Head**

- Sunshine on the head can provoke headache and sunstroke
- Sunshine can damage hair (especially grey or light hair)

We should use **caps** and umbrellas

- Textile hats more protective than straw hat
- UV Protective fabrics
- Wicking fabrics suitable for perspiration
- Holes for ventilation
THE ROLE OF TEXTILES

Textiles can be intrinsically a barrier against radiations

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UV PROTECTION FACTOR

UPF indicates how many times you can multiply the period of protection offered naturally by the skin to sunlight before you see redness (erythema)

\[ UPF = \frac{\sum_{290}^{400} E_{\lambda} \cdot S_{\lambda} \cdot \Delta\lambda}{\sum_{290}^{400} E_{\lambda} \cdot S_{\lambda} \cdot T_{\lambda} \cdot \Delta\lambda} \]

- \( E_{\lambda} \) = Erythemal action spectrum
- \( S_{\lambda} \) = Solar spectrum \([\text{Wm}^{-2}\text{nm}^{-1}]\)
- \( T_{\lambda} \) = Transmittance [%]
- \( \Delta\lambda \) = range of wavelength (5 nm)
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THE INSTRUMENTAL MEASUREMENT

Diagram showing UV radiation, sample, filter, integrating sphere, and detector.
THE ROLE OF TEXTILES IN UV PROTECTION

Their effect depends on:

- **Type of fibre**
- **Mass per unit area**
- **Interlacing**
- **Colour**
- **Chemical and finishing treatments**
THE ROLE OF TEXTILES IN UV PROTECTION

....but also on service and care conditions

Stretching

Wetting

Abrasion

Washing

Weathering (for shading textiles)
EXAMPLE OF RESULTS – UPF AND COMPOSITION

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Natural fibre  |  Syntetic fibre
UPF  | 134%

100% Natural fibre  |  95% Natural fibre
UPF  | 37%
## Example of Results – UPF and Colour

Same fibre composition, same mass per unit area, same parameters of construction, **different colour**

<table>
<thead>
<tr>
<th>Colour</th>
<th>UPF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep grey</td>
<td>507</td>
</tr>
<tr>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td>Brown</td>
<td>16</td>
</tr>
<tr>
<td>Yellow</td>
<td></td>
</tr>
<tr>
<td>Orange</td>
<td></td>
</tr>
<tr>
<td>Purple</td>
<td></td>
</tr>
<tr>
<td>Pink</td>
<td></td>
</tr>
<tr>
<td>Light grey</td>
<td></td>
</tr>
<tr>
<td>Beige</td>
<td></td>
</tr>
<tr>
<td>Ivory</td>
<td></td>
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</tbody>
</table>
UPF TEST STANDARDS FOR TEXTILES

**Australian/New Zealand Standard**

**European Standard**

**USA Standard**
- AATCC Test Method 183-2014 “Trasmittance or Blocking of Erythemally Weighted Ultraviolet Radiation through Fabrics”
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UPF TEST STANDARDS FOR TEXTILES

AS/NZS 4399:1996
Sun protective clothing - Evaluation and classification

• First UPF measurement/classification standard
• Solar spectrum of Melbourne, Australia
• Measurement in new, dry and unstretched state
• UPF classification system (TABLE 1 OF THE STANDARD)

<table>
<thead>
<tr>
<th>UPF RANGE</th>
<th>UV PROTECTION CATEGORY</th>
<th>EFFECTIVE UV TRANSMISSION (T%)</th>
<th>UPF RATINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 to 24</td>
<td>GOOD PROTECTION</td>
<td>6.7 to 4.2</td>
<td>15, 20</td>
</tr>
<tr>
<td>25 to 39</td>
<td>VERY GOOD PROTECTION</td>
<td>4.1 to 2.6</td>
<td>25, 30, 35</td>
</tr>
<tr>
<td>40 to 50, 50+</td>
<td>EXCELLENT PROTECTION</td>
<td>≤ 2.5</td>
<td>40, 45, 50, 50+</td>
</tr>
</tbody>
</table>

- It refers only to apparel fabrics
- Measurement in new, dry and unstretched state
- Same measurement conditions of AS/NZS 4399, but solar spectrum of Albuquerque
- Part 2 specifies the requirements for marking clothing if they respect strict requirements (e.g. UPF > 40 + some design requirements)
UPF TEST STANDARDS FOR TEXTILES

AATCC Test Method 183-2014

Transmittance or Blocking of Erythemally Weighted Ultraviolet Radiation through Fabrics

- Same measurement conditions of EN 13758-1
- Determination of UPF and calculation of the “percent blocking UV-A and percent blocking UV-B” expressed as percentages
CERTIFICATION OF UV PROTECTION

**UV Standard 801:2015**

“Test and Certification System for UV Protection with Textiles”

- UPF measurement according Standard AS/NZS 4399/96 (Solar spectrum of Melbourne, Australia)
- Measurement under practical everyday use conditions: new condition, wearing stress (stretching), wetting, mechanical stress (abrading), textile care (washing), artificial weathering for shading textile
- The lowest determined UPF can be certified
- The textile can be labelled (UV STD 801 label)
- Issued only by one of the UV Standard 801 Institutes

(The only one Italy is CENTROCOT)
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UV STANDARD 801 CERTIFICATE
UV STANDARD 801 LABELS

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CLOTHING AND CLOTHING FABRICS

SHADING TEXTILES
The website is a popular information platform offering added value to consumers for example through a reference list of certified manufacturers.
MARKETS AND TARGET GROUPS OF UV PROTECTION TEXTILES

- **Beach wear** especially for infants & children
- **Outdoor and sportswear** (tennis, sailing, golf, trekking, biking, etc.)
- **Work wear** for employees who have to work in the open air (gardeners, construction workers, etc.)
- **Headgear** (hats, etc.)
- **Shading textiles** (beach umbrellas, awnings, etc.)
Thank you for your attention

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