SUNLIGHT SIMULATORS

A KEY TO UNDERSTANDING

THE PHYSIOLOGICAL EFFECTS OF THE SUN

A. Singh, J. S. Dam, A. E. Karsten
CSIR-NLC Biophotonics group
ASingh1@csir.co.za
Mass (kg) : 1.989e+30 ≡ 332.830(Earth mass)
Equatorial radius (km) : 695 000 ≡ 108.97(Earth radius)
Mean Density (gm/cm$^3$) : 1.410
Rotational Period (days) : 25-36
Luminosity (ergs/sec) : 3.827e33
Mean surface temperature : 6,000°C
Age (billion years) : 4.5

Principal Chemistry

- Hydrogen : 92.1%
- Helium : 7.8%
- Oxygen : 0.061%
- Carbon : 0.030%
- Nitrogen : 0.0084%
- Neon : 0.0076%
- Iron : 0.0037%
- Silicon : 0.0031%
- Magnesium : 0.0024%
- Sulfur : 0.0015%
- All others : 0.0015%
"A sunlight simulator includes an elongated, cylindrical housing, an artificial light source disposed along the longitudinal axis thereof, and a plurality of light collecting subassemblies equidistantly spaced radially from and around the light source.

The light source is of a type that emits a substantial amount of radiation in the UV portion of the spectrum. The light collecting subassemblies provide a plurality of individually and selectively adjustable beams of UV radiation. A plurality of light guides are provided for directing the radiation to desired locations." - United States Patent 4933813
WHY SOLAR SIMULATORS

- Benefits of natural sunlight
- Restrictions of lifestyles
- Common misconceptions
- Experimental setups
### Worldwide incidence and mortality data for different cancers

<table>
<thead>
<tr>
<th>Cancer</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cases</td>
<td>Deaths</td>
</tr>
<tr>
<td>Oral cavity</td>
<td>175,916</td>
<td>80,736</td>
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<tr>
<td>Esophagus</td>
<td>315,394</td>
<td>261,162</td>
</tr>
<tr>
<td>Stomach</td>
<td>603,419</td>
<td>446,052</td>
</tr>
<tr>
<td>Colon/rectum</td>
<td>550,465</td>
<td>278,446</td>
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<tr>
<td>Liver</td>
<td>442,119</td>
<td>416,882</td>
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<tr>
<td>Lung</td>
<td>965,241</td>
<td>848,132</td>
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<tr>
<td>Melanoma of skin</td>
<td>79,043</td>
<td>21,952</td>
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<tr>
<td>Breast</td>
<td>1,151,298</td>
<td>410,712</td>
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<tr>
<td>Leukemia</td>
<td>171,037</td>
<td>125,142</td>
</tr>
<tr>
<td>All sites but skin</td>
<td>5,801,839</td>
<td>3,795,991</td>
</tr>
</tbody>
</table>

- MALES Cases
- MALES Deaths
- FEMALES Cases
- FEMALES Deaths
1 in 45 White male \(^{(2)}\)

1 in 56 White female

1 in 909 Black male

1 in 769 Black female

Ambient UV radiation conditions in SA are high throughout the year \(^{(5)}\) hence an elevated prevalence of skin cancer

**Fig 1: UV ratings per year**

According to Australian reports 1 in 25 males and 1 in 38 females will develop skin cancer by the age of 75 \(^{(3)}\)

Points to bear in mind, many deaths in poorer communities goes unnoticed
The presence of malignant cells in the outer layers of the skin often as a result of sun exposure.

**Fig 2: Sunlight and skin penetration**

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Fig 3: Different forms of skin cancer (7)
By definition, sunscreens include active ingredients which variably absorb, scatter and reflect UV energy which would otherwise enter the skin and cause damage. They filter the light passing through the skin and do not block it all out.
Figure 4: Comparison of histological cross-sections of real skin tissue (left) and a 3D skin model (right).
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DIFFERENT STUDIES

Figure 5: Tumour induced skin models

- BLM-cell line infiltrate the dermis
- M13 cell line build tumour nests
- SK Mel 28 cell line
REFERENCES

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THANK YOU