

ULTRAVIOLET RADIATION

Ultraviolet radiation is not very penetrating and its direct biological effects are due to chemical reactions induced in the skin and the eyes. The only proven beneficial effect in humans is the production of vitamin D3. All wavelengths of UV are hazardous but the hazard does vary with the wavelength.

UVA (400nm-315nm) is next to the visible part of the spectrum is the most penetrating but least harmful part of the UV spectrum.

UVB (315nm-280nm) is less penetrating than UVA and more is cut out by the earth's atmosphere. It is the absorption of UVB that is involved in the production of vitamin D3. Very little UVB is required for good health.

UVC (280nm-100nm) has the shortest wavelengths and is all cut out by the earth's atmosphere so we are not exposed to it naturally.

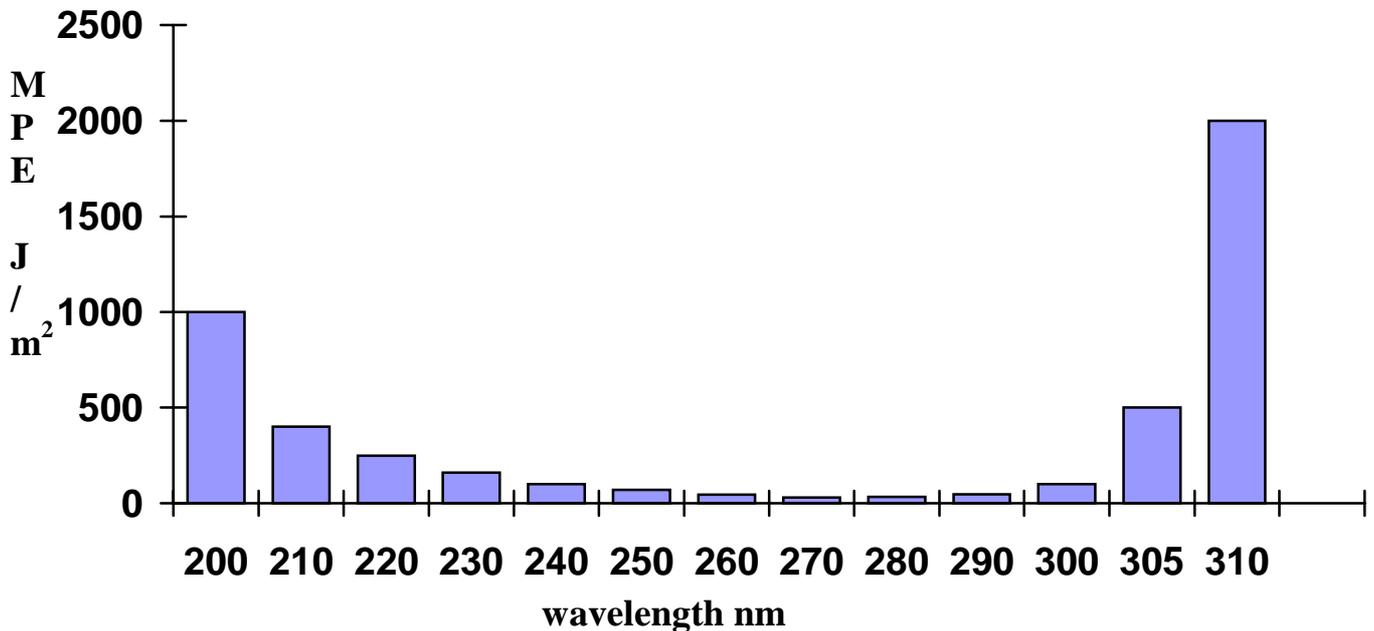
NB

UVA and UVB can penetrate thin cloud - so you can get burned even on a cloudy day!

UV SOURCES

- sunbeds for cosmetic tanning and the treatment of psoriasis
 - *use predominantly UVA wavelengths but fast-tanning units use more UVB. Excessive use is not recommended. People with sensitive skin types are advised not to use them. Over use can lead to premature skin ageing and an increased risk of skin cancer.*
- disco lights - nickel/cobalt oxide glass (wood's glass) emits UVA
 - *only emit low levels of UVA radiation within acceptable limits.*
- germicidal lamps for sterilisation
 - *emit hazardous UVC radiation at 254nm - when kept clean! Need routine testing for optimum sterilisation - contact Safety Services for survey.*
- transilluminators
 - *emit hazardous UVB radiation at 297 nm. They are particularly hazardous because they emit the radiation upwards and the researcher is looking down at them.*
- outdoor work
 - *Outdoor work in the summer can lead to excessive UV exposure - remember to cover up or use a high factor sun cream. SPF factor indicates degree of protection. SPF of 4 reduces exposure to 1/4, SPF of 10 reduces exposure to 1/10. Head and neck of outdoor workers most likely areas to develop non-melanoma skin cancer.*
- arc welding
 - *Adventitious UV is generated by arc welders and these areas must be well screened for unprotected workers.*
- printing and curing
 - *Other processes such as printing and curing use various UV wavelengths.*

RELATIVE SPECTRAL EFFECTIVENESS IN ACTINIC REGION OF UV



The most biologically active area of the UV is called the 'actinic region' and is from 200 - 310nm in the UVB/C part of the spectrum.

The chart shows the maximum permissible safe exposure levels (MPE) in Joules /m² in this region. The lower the level the more hazardous the radiation. UVB transilluminators operate at 297nm and germicidal lamps operate at 254nm in the UVC. Both are very hazardous wavelengths - NB the germicidal lamps are using the UV to kill organisms ! Therefore we need to protect ourselves against the UV from these sources.

UV EFFECTS

- Early effects:
 - darkening of existing skin pigment (melanin) by UVA.
 - erythema - reddening of skin (sunburn) UVB at 297nm (more than thousand times more effective than UVA)
 - increase in pigmentation (production of new melanin granules) - UVB most effective.
 - changes in cell growth - can result in scaling.
 - on the eye - conjunctivitis and keratitis.
- Late effects:
 - skin ageing, possible cataract formation from UVA
 - skin cancer from all wavelengths of UV

UV PROTECTION AGAINST OVEREXPOSURE

UV like other radiation sources presents an external hazard that can be controlled by a combination of:

- time - *minimise your time of exposure*
- distance - *maximise your distance from the source*
- shielding - *utilise effective shielding materials*

All hazards are also controlled by a hierarchy of control measures. Firstly by applying engineering controls, if at all possible; then using administrative controls; and finally, if the hazard still poses a risk, by using personal protective equipment.

- Engineering controls
 - effective screening - *get it tested by Safety Services*
 - preferably in an interlocked enclosure
- Administrative controls
 - limitation of access - *Access should be limited to authorised users in areas where UV is used without enclosures.*
 - hazard awareness training - *It is essential that all potential users of UV equipment are made aware of the hazards associated with this type of work.*
 - warning signs - *must be displayed warning users and others of the potential hazards and the protective measures that need to be taken.*
- PPE
 - protect skin and eyes - *If screen not practical, all persons present must have adequate UV opaque PPE with all exposed areas of skin and the eyes protected. When using a transilluminator often forgotten areas are: the neck/upper chest below a face visor; and, underneath the wrist area of the forearms.*

NB MPE for transilluminators generally equates to an exposure time of less than 1 minute per day for unprotected skin.

EXAMPLE OF HAZARD WARNING SIGN

CAUTION ULTRAVIOLET RADIATION

- 1. Work must always be carried out behind a screen or a full face visor must be worn**
- 2. Operators should also ensure that their hands and forearms are always covered.**
- 3. To protect other people in the vicinity there should be screens to the rear and sides of the transilluminator.**

NB UVB from transilluminator is hazardous up to 2m away.