Figure 2.0. Average amount ozone from 2005 to 2008

Figure 2.1. Daily period (in hours) of vitamin D production in terms of time and latitude for a clear atmosphere and no surface reflection and for a typical level of total ozone (300 DU). The austral vitamin D winter is identical to the vitamin winter at Northern latitudes.

Figure 2.2. Same as figure 2.1, but using the higher simulated radiation threshold as described in the table 2.1 legend (BED threshold = 3.46).

Figure 3.0. Photosynthesis of precholecalciferol (PRE-D$_3$) at various time on cloudless days in Boston October (●) and July (○).

Figure 3.1. Photosynthesis of Precholecalciferol (PRE-D$_3$) after exposure of 7-dehydrocholesterol to sunlight in Boston (42°N) for 1 h (○) and 3 h (●); in Edmonton, Canada (52°N) for 1 h (△) each month and in Los Angeles (34°N) (▲) and Puerto Rico (18°N) in January.

Figure 3.2. Daily period (in hours) of vitamin D production in terms of time and latitude for a clear atmosphere and no surface reflection and for a typical level of total ozone (300 DU). Black areas constitute the vitamin D winter.

Figure 3.2a. UV-B irradiance spectrum during different months for different solar zenith angles and total ozone.

Figure 3.3. Annual variation of solar zenith angle at local noon at lower and mid latitude i.e. ■ 28.5°N (Delhi), ● 45.0°N (mid Latitude)

Figure 3.4. Variation of MED/Hr. for the days of minimum local noon solar zenith at low and mid latitude station (■ 5 degree and ● 21 degree).

Figure 3.5. Variation of MED/Hr. at different solar zenith angle and skin reflectance with respect to annual average MED/Hr. at local noon.

Figure 3.6. Variation of MED/Hr. at low latitude station Delhi where minimum solar zenith angle is around for different days where solar zenith angle is between 5 and 50 degree i.e. ■ 5°, * 30°, and ● 50°.

Figure 3.7. Variation of MED/Hr. at mid latitude station where minimum solar zenith angle is around for different days where solar zenith angle is between 21 and 50 degree, i.e. ■ 21 degree, * 40 degree and ●
Figure 3.8. Calculated integrated daily global ultraviolet radiation i.e. direct and scattered at 300nm at 50 degree latitude. The values for the mid of each month are shown from January to December. Total annual radiation 1.2 x 10^6 J/m^2 at this wavelength and latitude.

Figure 3.9. Ultraviolet radiation at 307nm, 21-vi=June 21; 21-iii=March 21; 21-ix=September 21; 21-xii=December 21.

Figure 3.10. Action spectrum corresponding to wavelength for the formation of Vitamin D3.

Figure 3.11. Recommended UV exposure times around noon for a cloudless sky and base conditions with respect to latitude and day of year to obtain 1 SDD for Skin Type I, MED 200 J/m^2; i.e. 37.2 Jm^-2 vitamin D weighted UV dose. The red areas illustrate when and where unity SDD is not achievable. The recommended SDD dose can be obtained in minutes in the black area.

Figure 3.12. CIE (Commission International de l'Eclairage) erythemal action spectrum (MacKinley, A. F. and B. L. Diffey (Eds.), 1987) (solid) and the vitamin D weighted action spectrum (extra polated from ref. MacLaughlin, J. A., R. R. Anderson and M. F. Holick, 1982).

Figure 3.13. Recommended UV exposure times around noon for base it respect to UV index on 21 March in Boston (42.28 N) for Skin Type I. The recommended UV exposure is not available for UV indices below 0.5. It is not possible to calculate UV indices above 7.5 for this time and location.

Figure 3.14. Number of MEDs acquired when unity SDD is obtained for Skin Type I, as a function of latitude and day of year for a cloudless sky. Black areas indicate where and when the recommended UV dose for vitamin D (SDD) is not achievable. Close to these areas, the margin between the recommended minimum UV for SDD and UV exposure liable to produce erythema is the smallest.

Figure 3.15. Spectral irradiance at different location in India, ← Haflong (25.2°N, 92.8°E), ← Neem-Ka Thana (27.8°N, 75.8°E) and ← Delhi (28.6°N, 77.2°E) at local noon.

Figure 3.16. Diurnal variation of MED in different Month at Delhi.

Figure 3.17. Solar UV spectrum (1) and Spectral UVD3 (thick upper line) for an SZA of 7.5 degree and action spectrum for the conversion of 7-dihydrocholesterol to previtamin D3 (right axis). The solar UV spectrum for SZA of 77.2 degree (2) and the corresponding spectral UVD3 (thick lower line).

Figure 3.18. Time in hours required to synthesize the oral equivalent of 4000 IU vitamin D for skin type2 (fair) exposing hands, face, neck, arms and legs. 4000 IU is the officially recommended dose for children and the elderly.
Figure 3.19. Time in hours required to synthesize the oral equivalent of 400 IU vitamin D for skin type 5 (dark) exposing hands, face and neck. 400 IU has been suggested by some scientists for optimal health.

Figure 4.0. Numbering system of vitamin-D molecule

Figure 4.1. Examples of stereochemistry at position 24 and 25 in the vitamin D₂ series.

Figure 4.2. Synthesis of Vitamin D by Sunlight

Figure 4.3. UV radiation therapy for rickets. (A) Photograph from the 1920s of a child with rickets being exposed to UV radiation. (B) Radiographs demonstrating florid rickets of the hand and wrist (left) and the same wrist and hand taken after treatment with 1 hour UV radiation 2 times a week for 8 weeks. Note mineralization of the carpal bones and epiphyseal plates (right).

Figure 4.4. The photo production and metabolism of vitamin D

Figure 4.5. Modified Structure of Vitamin D after circulation of Liver and kidney

Figure 4.6. Seasonal changes in serum 25-hydroxycolecalciferol (25-OH D) white subjects (——), non-vegetarian Asians (--------). Values are means with their standard errors represented by vertical bars.