How much sunlight exposure is required to safely provide adequate vitamin D?

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Vitamin D synthesis is initiated in human skin upon exposure to UVB radiation; wavelengths that are also responsible for DNA damage, sunburn and associated skin cancer risk. The natural source of UVB radiation is the sun, a part of our everyday environment yet highly variable with location, season and weather. In determining whether we can gain the vitamin D benefits of sunlight exposure without suffering untoward damage, we take a pragmatic approach. “Safe” exposure is defined as that which is clearly sub-erythemal i.e. for the vast majority of the population it poses no risk of even the slightest sunburn. The limit of insufficient available sunlight for vitamin D synthesis, used to define the so-called vitamin D winter, is taken as that which produces little or no change (<1.5 nmol/L) in mean monthly population vitamin D. Where there is a significant vitamin D winter, vitamin D status is observed to follow a seasonal pattern, peaking at the end of summer and with a trough at the end of winter. A validated UV radiative transfer model was used to calculate the 10-year climatological average (2003-2012) UV across Europe for all weather conditions, and hence determine the length of the vitamin D winter for locations from 35-69 degrees North latitude. Using detailed \textit{in vivo} studies from Manchester (central to the European latitude band at 53\textdegree N), the safe exposure regime for year-round adequate vitamin D synthesis for the UK population was determined. In extending this safe exposure assessment to other locations with different climates, account must also be taken of the range of population skin types, and the national dietary norms, as illustrated for a range of European locations.