

## **Excessive light exposure: Endocrine influences particularly as they relate to cancer initiation and progression**

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Animals, including humans, evolved over eons where the amount of light a species witnessed was determined by the rising and setting of the sun. In this situation the duration of the daily light and dark periods varied seasonally with the degree of variation depending on the latitudinal distribution of the species. As a result of technological advances, currently animals and especially humans are only minimally influenced by seasonal variations in the light:dark environment due to the introduction of artificial lighting. Furthermore, the duration of the daily dark period that humans witness, especially during the winter months, is often severely truncated by the imposition of artificial light at the onset of darkness. Also, dark has become a more relative term because of contamination of the night with the widespread use of artificial light, i.e., what is sometimes referred to as intrusive trespass light. Organizations, for example, the International Dark Skies Association, have been organized to curb the misuse of light at night. The potential consequences of darkness contamination with light pollution include effects on photosynthesis in plants and bird migration. Beside these theorized consequences, however, there is also the real suppression of melatonin production by the pineal gland. The pineal gland in mammals (including humans) is an end organ of the visual system and its chief secretory product has significant physiological consequences. Particular importance with regard to the current symposium relates to melatonin's role in influencing damage to the genome, alterations that lead to an increased incidence of cancer, and to its role in curtailing the growth of already established tumors. Melatonin protects DNA from damage via its ability to scavenge oxygen and nitrogen-based reactants which are capable of mutilating DNA thereby potentially initiating a cancer growth. The most damaging of these reactants are the hydroxyl radical ( $\cdot\text{OH}$ ) and the peroxynitrite anion ( $\text{ONOO}^-$ ), both of which are effectively neutralized by melatonin before they abuse DNA. Surgical removal of the pineal gland, a major source of melatonin, like excessive light exposure, increases the degree of free radical-mediated DNA damage and the growth of established tumors. Thus, excessive light exposure, which reduces the total amount of melatonin produced, has a dual effect in potentially influencing the incidence or severity of cancer. In conclusion, the integrity of the daily dark period should be maintained to reduce light inhibition of melatonin synthesis.