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● *IRPA/INIRC Guidelines*

FLUORESCENT LIGHTING AND MALIGNANT MELANOMA

International Non-ionizing Radiation Committee
of the
International Radiation Protection Association

DURING the last 20 y, epidemiological studies of the incidence of malignant melanoma of the skin have suggested an etiologic role of ultraviolet radiation (UVR) (Anaise et al. 1978; Beral and Robinson 1981; Dubin et al. 1986; Fears et al. 1976; Gallagher et al. 1987; Green et al. 1986; Holman et al. 1986; Klepp and Magnus 1979; Kripke 1979; Lee 1985; MacKie 1987; Sober 1987).

More recently, some concern has arisen regarding the potential role that UVR emitted from fluorescent lighting could play in the etiology of malignant melanoma. This concern developed from published reports of epidemiological studies of the incidence of malignant melanoma in various occupations. An initial study, conducted in Australia by Beral et al. (1982), indicated that indoor office workers who reported working for many years under fluorescent lights had a higher incidence of malignant melanoma than those who reported they did not and those who worked outdoors. Further epidemiological studies specifically designed to test the hypothesis that exposure to UVR from artificial sources correlated with malignant melanoma incidence have shown either a positive correlation (Elwood 1986; English et al. 1985; Pasternack et al. 1983) or no significant correlation (Pasternack et al. 1983; Rigel et al. 1983; Sorahan and Grimley 1985; Swerdlow et al. 1988). The results of these studies and problems in their methodologies have been reviewed (Muel et al. 1988).

Despite the fact that Beral's original reported correlation was greatest for malignant melanoma occurrences on the trunk, which is normally covered by clothes, it has been speculated that the weak UVR emissions of fluorescent lamps could explain the correlation. This hypothesis would require an indirect mechanism, such as a general UVR effect upon the immune system (Kripke 1979).

An obvious difficulty in all of the above studies has been the estimation of indoor vs. outdoor exposure to UVR and reliance on the recollections of both patients and matched controls of the characteristics of indoor lighting. In an ongoing study in Queensland, Australia,* very poor correlation was found between the recollections of patients and controls about the types of artificial lighting to which they had been exposed and the descriptions provided by a lighting engineer familiar with the buildings where the patients and controls had worked. It is therefore likely that one cannot completely rely upon the results found in such studies. From a theoretical point of view, it is far more likely that alternative theories are more valid to explain the clear increase in incidence of malignant melanoma of the skin among these indoor workers.

Recreational and social habits of indoor workers may increase the likelihood that they would sustain severe, acute overexposure to sunlight on untanned, normally covered regions of the skin (Carlton-Foss 1982; Holman et al. 1986; MacKie and Aitchison 1982). The very low incidence of melanoma lesions on least-exposed areas of the skin (e.g., buttocks and women's breasts) and the high incidence of appearance on normally covered areas of the body (e.g., the trunk) argues for the hypothesis of an etiology related to acute overexposure to sunlight and against the hypothesis of an etiology related to direct fluorescent light exposure. The role of UVB in an indirect photochemical mechanism remains unresolved (Wiskemann et al. 1986).

The very low contribution of UVB (280–315 nm) and UVC (100–280 nm) radiation (CIE 1983; Cole et al. 1985; Diethelm 1970; Muel et al. 1988; Sliney and Wolbarsht 1980; Whillock et al. 1988) to the emissions from fluorescent lighting also argues against this exposure as a major or very significant etiology. Plastic diffusers serve as shields and will further attenuate UVB and UVC emissions (Cole et al. 1985; Whillock et al. 1988). Even if individuals were exposed to the UVR from unshielded

* Private communication (1988), R. MacLennan, Queensland, Australia.

fluorescent lamps, the exposure from these would be only a small fraction of exposure to solar UVR (Muel et al. 1988).

At least one health authority has suggested that where people are concerned about the UVR emitted by fluorescent lamps, absorbing plastic diffusers may be fitted to effectively remove it (FDA 1988). However, the reported health benefits of low-level exposure to UVB (e.g., vitamin D production, adaptation to further exposure) have been used to argue in favor of people regularly receiving a small amount of UVB (Health Council of the Netherlands 1986).

Considering all of the above arguments, INIRC concludes that UVR exposure from indoor fluorescent lighting should not be considered a malignant melanoma risk. Lamp manufacturers should be aware of this issue and not allow the current low levels of emission of UVB from fluorescent lighting to increase.

REFERENCES

Anaise, D. R.; Steinitz, R.; Hur, N. B. Solar radiation: A possible etiological factor in Israel. A retrospective study (1960–1972). Cancer 42(1):299–304; 1978.

Beral, V.; Evans, S.; Shaw, H.; Milton, G. Malignant melanoma and exposure to fluorescent lighting at work. The Lancet II: 290–293; 1982.

Beral, V.; Robinson, N. The relationship of malignant melanoma, basal and squamous skin cancers to indoor and outdoor work. Brit. J. Cancer 44:886; 1981.

Carlton-Foss, J. A. Letter: Comments on Beral's paper. The Lancet II:818; 1982.

CIE, Centre d'information de l'éclairage. Fluorescent lamps and health. Jan. 1983 Hors Serie No. 8; 1983. Available from: CIE, 52 Boulevard Malesherbes, 75008 Paris, France.

Cole, C.; Forbes, P. D.; Davies, R. E.; Urbach, F. Effect of indoor lighting on normal skin. Ann. NY Acad. Sci. 453:305–316; 1985.

Diethelm, R. Can fluorescent tubes cause skin carcinomas? Schweizerische Medizinische Wochenschrift—Journal Suisse de Medecine 100:1159–1160; 1970.

Dubin, N.; Moseson, M.; Pasternack, B. S. Epidemiology of malignant melanomas, pigmentary traits, ultraviolet radiation. In: Gallagher, R. P., ed. Epidemiology of malignant melanoma. Recent results in cancer research: 102. Heidelberg: Springer-Verlag; 1986:56–75.

Elwood, J. M. Could melanoma be caused by fluorescent light? A review of relevant epidemiology. In: Gallagher, R. P., ed. Epidemiology of malignant melanoma. Recent results in cancer research: 102. Heidelberg: Springer-Verlag; 1986:127–136.

English, D. R.; Rouse, I. L.; Xu, Z.; Watt, J. D.; Holman, C. D. J.; Heenan, P. J.; Armstrong, B. K. Cutaneous malignant melanoma and fluorescent lighting. J. Nat. Cancer Inst. 74:1191–1197; 1985.

Food and Drug Administration, Center for Devices and Radiological Health. Fact Sheet 'Fluorescent Lamps'. Rockville, MD: U.S. Food and Drug Administration; June 1988.

Fears, I. R.; Scotto, J.; Schneiderman, M. A. Skin cancer, melanoma and sunlight. Am. J. Public Health 66:461–464; 1976.

Gallagher, R. P.; Elwood, J. M; Threlfall, W.J.; Spinelli, J. J.; Fincham, S.; Hill, G. B. Socioeconomic status, sunlight exposure, and risk of malignant melanoma: The Western Canada Melanoma Study. J. Nat. Cancer Inst. 79:647–652; 1987.

Green, A.; Bain, C.; MacLennan, R.; Siskind, V. Risk factors for cutaneous melanoma in Queensland. In: Gallagher, R. P., ed. Epidemiology of malignant melanoma. Recent results in cancer research: 102. Heidelberg: Springer-Verlag; 1986:76–97.

Health Council of The Netherlands. Human exposure to UV radiation. Report 1986/9, Gezondheidsraad, PO Box 90517, 2509 LM, The Hague; 1986.

Holman, C. D. J.; Armstrong, B. K.; Heenan, P. J. Relationship of cutaneous malignant melanoma to individual sunlight exposure habits. J. Nat. Cancer Inst. 76:403–414; 1986.

Klepp, O.; Magnus, K. Some environmental and bodily characteristics of melanoma patients. A case-control study. Int. J. Cancer 23:482–486; 1979.

Kripke, M. L. Speculations on the role of ultraviolet radiation in the development of malignant melanoma. J. Nat. Cancer Inst. 65:541–545; 1979.

Lee, J. A. H. The rising incidence of cutaneous malignant melanoma in Scotland. Am. J. Dermatopathology 7(Suppl.): 35–39; 1985.

MacKie, R. M. Links between exposure to ultraviolet radiation and skin cancer. A report of the Royal College of Physicians. J. Roy. Coll. Physicians 21:91–96; 1987.

MacKie, R. M.; Aitchison, T. Severe sunburn and subsequent risk of primary cutaneous malignant melanoma in Scotland. Br. J. Cancer 46:955–960; 1982.

Muel, B.; Cesarini, J. P.; Elwood, J. M. Malignant melanoma and fluorescent lighting. C.I.E. J. 7(1):29–33; 1988.

Pasternack, B. S.; Dubin, N.; Moseson, M. Letter: Malignant melanoma and exposure to fluorescent lighting. The Lancet I:704; 1983.

Rigel, D. S.; Friedman, R. J.; Levenstein, M.; Greenwald, D. I. Relationship of fluorescent lights to malignant melanoma: Another view. J. Der. Sur. Oncol. 9:836–838; 1983.

Sliney, D.; Wolbarsht, M. Safety with lasers and other optical sources. New York: Plenum Press; 1980.

Sober, A. J. Solar exposure in the etiology of cutaneous melanoma. Photodermatology 4:23–31; 1987.

Sorahan, T.; Grimley, R. P. The etiological significance of sunlight and fluorescent lighting in malignant melanoma: A case-control study. Br. J. Cancer 52:765–769; 1985.

Swerdlow, A. J.; English, J. S. C.; MacKie, R. M.; O'Doherty, C. J.; Clark, J.; Hole, D. J. Fluorescent lights, ultraviolet lamps and risk of cutaneous melanoma. Brit. Med. J. 297:647–650; 1988.

Whillock, M. J.; Clark, I. E.; McKinlay, A. F.; Todd, C. D.; Mundy, S. J. Ultraviolet levels associated with the use of fluorescent general lighting, UVA and UVB lamps in the workplace and home. Oxon: National Radiological Protection Board; NRPB R221; 1988.

Wiskemann, A.; Sturm, E.; Klehr, N. W. Fluorescent lighting enhances chemically induced papilloma formation and increases susceptibility to tumour challenge in mice. J. Cancer Res. Clinical Oncology 112:141–143; 1986.