Published in final edited form as:

DNA Repair (Amst). 2009 January 1; 8(1): 3. doi:10.1016/j.dnarep.2008.10.004.

Bromodeoxyuridine photodamage in studies of UVA damage and the cell cycle

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Keywords

Bromodeoxyuridine; Ultraviolet-A; UVA; Cell cycle; Flow cytometry; DNA damage

Dear Editor:

I would like to comment on the article by Girard and co-workers entitled "Inhibition of S-phase progression triggered by UVA-induced ROS does not require a functional DNA damage checkpoint response in mammalian cells" [1]. Their study involves the effects of ultraviolet A (UVA) on the cell cycle in the presence or absence of the ATM, ATR and p38 signaling pathways. The effects of UVA exposure on the cell cycle are assumed to be due to UVA absorption by cellular molecules or media components. In contrast to earlier flow cytometry studies of ultraviolet A (UVA) cell cycle effects [2,3], Girard et al. incorporate bromodeoxyuridine (BrdU) into cellular DNA before UVA exposure. BrdU is a type I photosensitizer capable of causing a variety damage to cellular molecules [4,5]. This raises the possibility of molecular damage due to BrdU photolysis in the flow cytometry studies of Girard et al. It cannot be assumed that the cell cycle effects observed are due only to UVA absorption by cellular molecules or medium components.

The light source used by Girard et al. (described in their reference 40) has a substantial component at 313 nm, a wavelength at which UVA photo-nicking of BrdU substituted DNA is very efficient even in the absence of dyes [6]. The peak of the source used by Girard et al. is at 365 nm, where UVA photo-nicking of BrdU substituted DNA is about three orders of magnitude less [6], but the irradiance of the source at 365 nm is also about five orders of magnitude greater than at 313 nm. UVA irradiation of cells that have incorporated BrdU, using similar light sources, has been shown to be very mutagenic [7], and to inactivate DNA virus [8]. In addition to base damage and DNA strand breaks, there is a possibility that irradiation of BrdU substituted DNA at these wavelengths can cause DNA-DNA crosslinks [9] and DNA-protein crosslinks [10,11]. The possibility of several types of molecular damage from UVA photolysis of BrdU complicates the interpretation of the studies reported by Girard et al..

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