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ASSESSMENT OF A NOVEL PERFLUOROCHEMICAL EMULSION IN SKIN PROTECTION AGAINST PHOTODYNAMIC THERAPY IN MICE

M.C. Berenbaum, S.L. Akande, R. Bonnett*, R.D. White*, K.C. Lowe**, Dept. Pathology, St Mary's Hospital Medical School, London; *Dept. Chemistry, Queen Mary College, London; **Dept. Zoology, University of Nottingham.

Recent attention has focussed on the possible value of oxygen-carrying perfluorochemical (PFC) emulsions as adjuncts to tumour destruction by photodynamic therapy (PDT; Fingar et al 1988; Berenbaum et al 1990). One finding from this preliminary work was that emulsified PFCs may be useful to protect skin against PDT-induced damage, although the mechanism(s) of this effect remain obscure (Berenbaum et al 1990). We have therefore examined the effectiveness of a novel PFC emulsion in providing skin protection in mice receiving PDT.

Inbred BALB/c female mice were given 6.25 - 50μM/kg b.w. of meta-tetra(hydroxyphenyl) porphyrin (m-THPP; batch RDW 123), a new potent tumour photosensitizer (Berenbaum et al 1986). 1,2,4 or 7 days later, they were exposed to 10 J cm ^{2} of light at the activating wavelength (648 nm) from a laser. Some mice were given, at intervals from 1 h to 4 days before PDT, an intravenous (i.v.) injection of up to 50 mL/kg b.w. of a novel 20% (w/v) perfluorodecalin (FDC) emulsion containing 4% (w/v) Pluronic F-68 and 1% (w/v) perfluoroperhydrofluoranthrene (Rhone-Poulenc Chemicals, ISC Division, Avonmouth; Sharma et al 1987). 24 or 48h after injection of m-THPP, changes in weight of a 1 cm diameter depilated skin disc, together with uptake of Evan's Blue dye, were determined as previously (Berenbaum et al 1986, 1990). In some mice, the proportion of skin over which epithelial loss occurred was measured 7 days after light exposure. Dermal temperature was also measured at intervals after PFC emulsion injection using an ADP-15 probe (Ellab Instruments, Copenhagen).

PDT-induced skin damage was significantly less in mice injected with emulsified PFCs, as shown by downward shifts of up to 60% ($P < 0.05$) in dose-response curves for both skin weight (oedema) and Evan's Blue uptake (vascular permeability) compared to controls. However, the % epithelial loss over 7 days in emulsion-injected mice and controls were not significantly different. Injection of emulsion was followed by a sharp fall in mean skin temperature of 5.3 ± 0.1°C ($P < 0.05$) within 30 min; skin temperature remained low for about 1h and then gradually returned to normal by 4h.

These results provide further evidence that pre-treatment of mice with a novel FDC-based emulsion can protect against PDT-induced skin damage. The emulsion appears to protect skin not by reducing primary cellular damage, but by suppressing the secondary acute inflammation produced by PDT. This probably involves leucocyte inhibition since related studies suggest that protective effects of the Fluosol-DA emulsion in the ischaemic dog myocardium (Bajaj et al 1989) occurred by suppression of leucocyte-mediated inflammatory responses. However, further work is needed to confirm this.

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