Original Articles

Photosensitizing Capabilities of Photofrin® in Vascular Endothelial Cells

Cheng-Jen Chang, Shwu-Fan Ma, Fu-Chan Wei

The object of the present study was to evaluate the feasibility of photodynamic therapy (PDT) using Photofrin® (porfimer sodium), an United States Food and Drug Administration approved photosensitizer. The *in vitro* absorption and photosensitizing activities of Photofrin® were evaluated with cultured human microvascular endothelial cells and *in vivo* activities were evaluated with ductal carcinoma cell stimulated mammary tumor. The viability of microvascular endothelial cells was assessed using rhodamine-phallodin coupled α-tubulin antibody specific for cytoplasmic microtubule and visualized by immunofluorescence microscopy. At the optimal wavelength of 630 nm, the percentage of microvascular endothelial cells killed by variable concentrations of Photofrin® was measured by either live/dead or lactate dehydrogenase-released assays and the in vivo biological activity was assessed by determining the amount of necrosis produced in stimulated mammary tumor. A combination of 3.5 μg/mL Photofrin® and laser light at 630 nm with a power density of 100 mW/cm^2 resulted in a 50% cell kill. The lactate dehydrogenase released from microvascular endothelial cells after PDT showed a 50% optical density obtained from each concentration of photosensitizer of 50% cell killing after laser illumination. Stained histology specimens of stimulated mammary tumor demonstrated significant vascular destruction 1 hour after PDT. In conclusion, Photofrin® has the capabilities to destroy microvascular endothelial cells *in vitro* and vasculature *in vivo*. However, the degree of absorption and tissue destruction in vasculature *in vivo* and different anatomical structures should be considered and will be included in our subsequent studies.

Key words: Photofrin® , microvascular endothelial cell, chicken combs

Photodynamic therapy (PDT), using a photosensitizing drug specifically activated by a specific wavelength of light which triggers a photoreaction in biological systems, dates back to the beginning of this century[1]. The basic concept of PDT is that certain molecules function as photosensitizers. The presence of these photosensitizers in biological tissues makes the tissue vulnerable to light at optimal wavelengths absorbed by the chromophore. Previous studies have attempted to achieve an understanding of the mechanism of tumor destruction after

From Laser Laboratory, Department of Plastic and Reconstructive Surgery, Chang Gung Memorial Hospital, Taipei, Taiwan
Received for publication: January 31, 2001
Reprints and correspondence to: Dr. Cheng-Jen Chang, Department of Plastic and Reconstructive Surgery, Chang Gung Memorial Hospital, 199 Tung Hwa North Road, Taipei, Taiwan, Tel: 886-2-27135211 ext 3502, Fax: 886-2-25140600, E-mail: chengjen@adm.cgmh.org.tw