Background and Objectives: Photodynamic therapy (PDT) appears to be endowed with several favorable features for the treatment of infections originated by microbial pathogens, including a broad spectrum of action, the efficient inactivation of antibiotic-resistant strains, the low mutagenic potential, and the lack of selection of photoresistant microbial cells. Therefore, intensive studies are being pursued in order to define the scope and field of application of this approach.
Results: Optimal cytocidal activity against a large variety of bacterial, fungal, and protozoan pathogens has been found to be typical of photosensitizers that are positively charged at physiological pH values (e.g., for the presence of quaternarized amino groups or the association with polylysine moieties) and are characterized by a moderate hydrophobicity (n-octanol/water partition coefficient around 10). These photosensitizers in a micromolar concentration can induce a $>4-5$ log decrease in the microbial population after incubation times as short as 5–10 minutes and irradiation under mild experimental conditions, such as fluence-rates around 50 mW/cm^2 and irradiation times shorter than 15 minutes.
Conclusions: PDT appears to represent an efficacious alternative modality for the treatment of localized microbial infections through the in situ application of the photosensitizer followed by irradiation of the photosensitizer-loaded infected area. Proposed clinical fields of interest of antimicrobial PDT include the treatment of chronic ulcers, infected burns, acne vulgaris, and a variety of oral infections. Lasers Surg. Med. 38:468–481, 2006.

Key words: antibiotic resistance; bacteria; microbial pathogens; phenothiazines; photosensitization; phthalocyanines; porphyrins; reactive oxygen species