RESEARCH ADVANCES

Blue Light May Deserve Green for Treating Skin Infections

David C. Holzman

Blue light selectively eradicates *Pseudomonas aeruginosa* on the skin and in infected soft tissues without harming host cells, according to Michael R. Hamblin of the Massachusetts General Hospital (MGH) and Harvard Medical School (HMS) in Boston, Mass., and his collaborators. If this approach proves safe and effective, blue light could become a nontoxic means for treating burn or other patients, who are prone to infections with *Pseudomonas*, including drug-resistant strains. Details appear in the March 2013 *Antimicrobial Agents and Chemotherapy* (57:1238–1245).

This use of blue light is by no means the first time light was evaluated as a means for treating infections, according to Hamblin’s collaborator Tianhong Dai. Other approaches, including antimicrobial photodynamic therapy and ultraviolet-C (UVC) irradiation, can be effective alternatives to conventional means for treating skin and soft tissue infections “regardless of antibiotic resistance,” he says. However, photodynamic therapy is complicated by the need to use photosensitizers. This addition can be difficult in itself, but also can inadvertently introduce the photosensitizers into host skin cells, making them more vulnerable to UVC than they already are, narrowing the therapeutic window.

However, blue light kills bacteria without reliance on photosensitizers and, by itself, is nontoxic to mammalian cells. Yet, its effectiveness against bacteria was not adequately tested before nor fully appreciated, according to Dai. “There have been—rather surprisingly—no published reports to demonstrate blue light therapy for skin and soft tissue infections,” he says.

Blue light apparently targets porphyrin molecules that are found in bacterial cells but not mammalian cells, Dai continues. Thus, *P. aeruginosa* is 35 times more sensitive than are human keratinocytes to blue light. In another experiment, all the *P. aeruginosa*-infected mice survived following blue-light treatment, whereas 9 of 11 of the infected but untreated mice died.

“The results demonstrating the reduction in wound infection and prevention of lethal bacteremia in mice are groundbreaking, and highlight the potential for this technology in wound disinfection treatment,” says Michelle MacLean of the University of Strathclyde in Glasgow, United Kingdom. “Clinically, I use blue light with wounds and see consistently good outcomes, but strong research on in vivo models is lacking,” adds James Guffey of Arkansas State University, Jonesboro. “This is a real addition to the literature.”

Skin and soft tissue infections are the second most common bacterial infections encountered in clinical practice, according to Hamblin. “The prevalence of skin and soft tissue infections among hospitalized patients is 10%, with approximately 14.2 million ambulatory care visits in the United States, and an annual associated medical cost of almost $24 billion,” he says. “Treating resistant skin and soft tissue infections often requires the use of more expensive or more toxic drugs and can result in longer hospital stays for infected patients.”

Blue light may be a safe and effective way to treat *Pseudomonas* skin infections, lessening the need for drugs and potentially shortening hospital stays for many patients (Photo © Krzysztof Zmij/iStockphoto.)