

PHOTODYNAMIC THERAPY EMERGES IN WAR ON CANCER

Esophageal cancer leaves many of its victims unable to swallow, and nearly always results in death. The American Cancer Society projects diagnosis of 12,300 people in the United States with esophageal cancer in 1996 and 11,200 deaths from it.¹ Doctors have limited treatment options.

Now there is a new treatment for esophageal cancer, based on a method that holds great promise for other cancers, as well as for noncancerous conditions. The FDA-approved Photofrin[®] captures light energy and uses it to selectively destroy diseased cells. It is the first drug ever approved for the photodynamic therapy (PDT) of cancer.

Photofrin was originally developed by Dr. Thomas Dougherty as an anticancer agent at the Roswell Park Cancer Institute (Buffalo, NY). The Medical Free Electron Laser (MFEL) program at Baylor Research Institute (Dallas, TX) studied it as a blood purifier. BMDO's MFEL program, established by Congress to transfer BMDO-sponsored free-electron laser (FEL) technology to medical and other spinoff applications, initially funded some of this laser research.

Using laser light of a specific wavelength, Photofrin produces an oxygen radical that kills cells in its immediate vicinity. Abnormal tissues selectively absorb the drug, which laser light then activates, making it a well-controlled therapy that avoids harm to normal cells. In late-stage esophageal cancers that obstruct breathing and swallowing, PDT is a kinder alternative to surgery, which causes pain and forms scar tissue.

Baylor eventually licensed Photofrin to QLT Phototherapeutics, Inc., which submitted the drug for FDA approval. QLT awaits FDA approval to use Photofrin in the treatment of bladder and some lung cancers. The company is conducting extensive research in PDT for treatment of a wide variety of cancers and for noncancerous disorders such as psoriasis, rheumatoid arthritis, and cardiovascular disease.

Many exciting clinical advances resulted from Baylor's MFEL-related research, including unique photoactive drugs for collagen repair in the knee joint and improved methods for treating eye disease. Baylor has developed a photochemical to isolate stem cells from blood in order to restore the marrow of chemotherapy patients and other immunocompromised individuals. Baylor also developed a photochemical, now available in Taiwan and Egypt, that can reverse drug resistance in malaria sufferers.

ABOUT THE TECHNOLOGY

PDT involves techniques in which photoactive dyes kill viruses or cancers when irradiated with laser light. The dyes selectively attach to a number of enveloped viruses, such as HIV, hepatitis, Epstein-Barr, cytomegalovirus, and herpes, as well as many cancerous cells. When light of a specific wavelength and intensity shines on the dye, a chemical reaction begins that gives off a toxic oxygen radical, called singlet oxygen, that exists for a short distance and for a fraction of a second. The oxygen radical breaks down the viral sheath and kills the virus.

Because these dyes produce this radical when they absorb laser light of a specific wavelength, Baylor used an FEL and other lasers to deliver the correct wavelength. Before FELs, doctors used continuous-wave lasers, which could not produce the variety of wavelengths and very short pulses of FELs. The FELs produce more precise and varied wavelengths, enabling researchers to study discrete interactions of light and matter.

¹Cancer facts and figures. 1996. American Cancer Society. 1-800-4-CANCER.

Can You Imagine . . .

. . . techniques in which photoactive dyes kill viruses or cancers when irradiated with laser light.

QLT PHOTOTHERAPEUTICS, INC., HAS ACQUIRED A LICENSE FOR PHOTOFRIN, WHICH AWAITS FDA APPROVAL FOR USE IN THE TREATMENT OF BLADDER AND SOME LUNG CANCERS.



Courtesy of Beckman Laser Institute.

■ Fiber optics can deliver light energy through endoscopes and catheters in PDT for cancer.