Low-level IR therapy gets arthritic elephant on her feet

VALLEJO, Calif. — Zookeepers at Marine World Africa USA recently tried low-level light therapy as a last resort to relieve the severe arthritic symptoms of Ginny, a 58-year-old female Asian elephant. And it appears to be working.

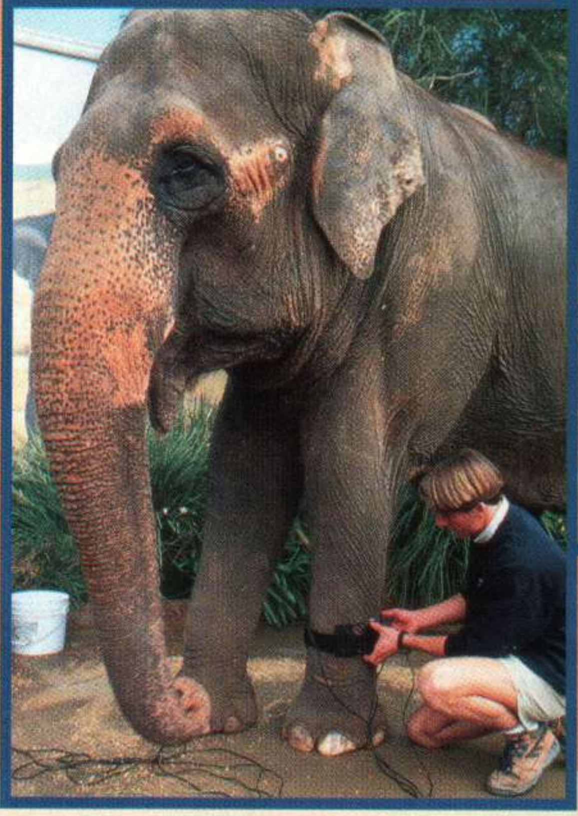
Ginny's keepers consulted with Dr. Larry Galuppo, assistant professor of equine surgery at the University of California at Davis School of Veterinary Medicine. Galuppo suggested that zoo veterinarians try low-level infrared treatments after they had exhausted all conventional treatments.

Ginny's keepers noticed a marked improvement after three weeks of treatment using arrays of IR light-emitting diodes, donated by manufacturer Equi-Light Inc. of Denver. "It was a leap of faith to think that this would actually do any good," said the zoo's veterinarian, Laurie Gage, "but the results have been remarkable."

Equi-Light's president, Dale Bertwell, said his company's IR devices have been used by some veterinarians to treat inflammatory conditions in horses for several years, even finding use at the 1996 Olympic games in Atlanta.

The US Food and Drug Administration gave Bertwell 510(k) clearance in 1994 to market his light therapy device essentially as a heating pad for human patients. Bertwell said the diode pads emit light centered around 890 nm at about 10 mW of power — a wavelength region and power level that some studies have suggested may have therapeutic benefit in stimulating healing.

But many physicians are not sure about the efficacy of using IR biostimulation to speed healing in human patients, something Bertwell said is being evaluated by several Denver podiatrists.



Zookeepers at Marine World Africa USA have begun using low-level infrared light therapy devices manufactured by Equi-Light Inc. on the elephants at the facility. A number of flexible pads containing arrays of IR-emitting LEDs are inserted into Velcro cuffs wrapped around the elephants' legs.

"I wouldn't mock it, but whether it's really clinically useful is yet to be proven," said Dr. Jeffrey R. Basford of the Mayo Clinic in Rochester, Minn. In an article in *Lasers in Surgery and Medicine,* he said that, in spite of more than 30 years of application, the therapeutic value of low-intensity laser therapy has not been definitively confirmed by authoritative clinical research.

Basford told *Biophotonics International* that "large, controlled studies" would be required to adequately compensate for the many variables involved. Bertwell said his company lacks the financial resources to conduct such studies at this time. □

Daniel J. Dufresne

Yale team believes its AFM has imaged elusive fusion pores

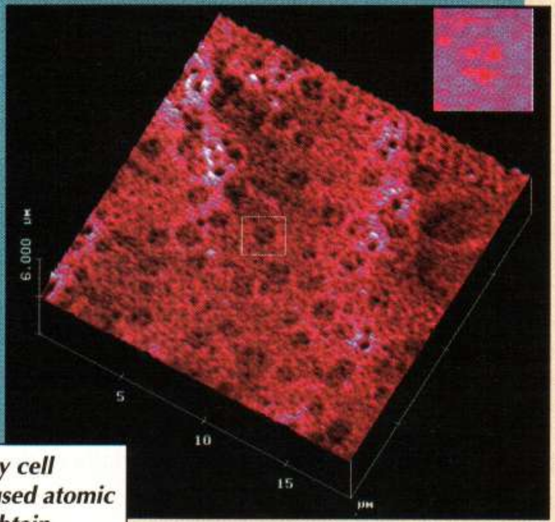
NEW HAVEN, Conn. — Using an atomic force microscope (AFM), researchers at Yale University School of Medicine have found in living cells what they believe to be the long-sought fusion pore, which is associated with the secretion of chemicals and the intercellular transmission of chemical information.

The imaging of this previously unseen cell membrane structure demonstrates the potential of AFMs to allow researchers to monitor, in real-time, cellular events in living cells. According to Yale cell biologist Dr. Bhanu P. Jena, leader of the research team in the department of surgery, understanding cell secretory processes in fine detail could have important implications for developing new drug therapies that regulate the secretion of chemicals into the body.

All living cells, including the endocrine cells in the rat pancreas studied by the Yale group, secrete materials in a process called exocytosis: Membrane bags inside cells, called secretory vesicles, dock and fuse with the plasma membrane to release their contents to the cell exterior. Vital processes such as neurotransmission and the release of hormones and digestive enzymes are mediated by exocytosis. However, the molecular mechanism controlling this process remains unclear.

Presented in January's *Proceedings of the National Academy of Sciences* (PNAS), the Yale team imaged 100- to 180-nm-wide depressions within 0.5- to 2-μm pits at the plasma membrane of pancreatic acinar cells that secrete digestive enzymes. When the cells were stimulated to secrete, researchers used a BioScope AFM (BAFM) from Digital Instruments of Santa Barbara, Calif., to watch as the depressions dilated and then returned to their original size following the completion of exocytosis.

The images, created using the AFM in contact mode, led Jena's group to believe that the unidentified depressions they were watching were never-before-imaged fusion pores — specialized permanent plasma membrane sites that serve as valves for the release of chemicals during exocytosis.



Yale researchers led by cell biologist Bhanu Jena used atomic force microscopy to obtain surface images of small pits in pancreas cell plasma membranes.

When the cells were exposed to cytochalasin B, a chemical that depolymerizes actin from its beaded filament form into individual globs, the depressions collapsed and secretion was inhibited, leading Jena's group to conclude that actin strands in the cytoskeletal protein play a role in the structure of these permanent plasma membrane structures.

Jena said these findings could eventually allow the pharmaceutical industry to develop drugs to regulate the secretion of certain materials in the body. He said a knowledge of the physical dimensions of fusion pores, combined with a knowledge of the proteins they are made of, could help researchers create drugs that dock with fusion pores on the exterior of cells to prevent materials from exiting the cells. These "blockers" would in turn be regulated by other chemicals as part of a course of drug therapy.

In a commentary published in the same issue of *PNAS*, Julio M. Fernandez of the Mayo Clinic's Department of Physiology and Biophysics in Rochester, Minn., said Jena's group's evidence that fusion pores are permanent structures that open transiently to secrete materials contradicts the way many cell biologists have pictured the mechanics of exocytosis. Moreover, he said their experiments are an important demonstration of the potential of AFMs to allow scientists to track subcellular structures during exocytosis. Fernandez cautioned, however, that further research is required to definitively confirm that Jena's group did, in fact, identify fusion pores, an opinion echoed by Harvard neurobiologist David Clapham recently in *Science*. □

Daniel J. Dufresne