

Shedding light on veterinary wound care developments

LIGHT therapy is a fascinating field of medical research. The study of laser and LED light use in wound healing, physiotherapy, dermatology, and increasingly in human oncology, shows how flexible, adaptable and effective the wavelengths of light are in healing a variety of medical conditions.

Phototherapy, photodynamics or just plain light therapy, developed as a result of years of fruitful laser research in medicine. Lasers are used in eye surgery, tattoo and skin lesion removal, medical imaging and microscopy. In the field of dermatology and oncology, the trend is to administer photosensitive drugs and then target them using laser or LED light (LEDs are cheaper to produce, operate and replace).

In veterinary medicine the technology has been advanced by overseas providers, such as Thor and Vet-Light, for use in wound healing, orthopaedic cases and dermatology. Case studies of light therapy's efficacy include an ex-champion racing greyhound, Yankee, from Hall Green in Birmingham. Yankee suffered a severe bite wound to a forelimb, ending his racing career and beginning a period of protracted veterinary treatment.

Years of treatment

After years of skin grafts and antibiotics, his owners John and Lorraine Fellows trialled Vet-Light's Photizo – a high intensity LED unit – to treat his persistently infected wound. Using a honey gel and light therapy, the wound closed after three months.

Ruth Milner of Danetre Health Products – Vet-Light's UK distributor – gives some background on the case: "John explained their difficulties and we suggested they consider using light therapy to help close the wound, especially as Yankee's immune system seemed to be compromised. We told them we had received feedback from our clinical cases that Photizo helps to prevent re-infection on abscesses and other wound types.

"He decided to give it a go after the honey had cleaned up the wound, and he treated Yankee himself at home and hired the mini

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Robin Fearon features editor, reveals how low level light therapy is being trialled by a UK VN in healing potentially infected wounds



A bite wound on the lateral foreleg of a dog, proximal to the elbow. Above: at presentation, 24 hours post-injury; above right: following clipping and lavage (both pictures taken on July 12, 2010); and right: the wound after 19 days of management using honey dressings and Photizo (taken on August 17, 2010).

unit, initially for a few weeks, but they weren't in a position to keep hiring for too long. As Yankee was responding so well, we were glad to offer the opportunity of carrying on with a complete vet system and large treatment head until wound closure."

With built-in evidence-based dosages and the fact it is LED (not laser), the unit is simple for those untrained in light therapy to use in home care situations. "Light therapy worked from the first treatment both by visible changes in the wound and the fact that Yankee seemed a lot more comfortable – he wasn't gnawing at the wound any more," said John.

Time for expansion

If you look up low level light therapy (LLLT) on the internet there are thousands of papers highlighting clinical research – investigating the most effective light wavelengths and dosages – but the time may well be ripe for its expansion into



UK veterinary practice as units become more widely available. NHS photobiology centres are well established. There, the emphasis on lasers to deliver photodynamic therapies has changed to include LED systems, mainly due to cost. Meanwhile, manufacturers keen to break into the UK veterinary market are pushing research and case studies highlighting the technology's potential.

In South Africa, Vet-Light's veterinary surgeon Berol Goede introduced LED therapy at Sea World in Kwazulu Natal. Antibiotic use in sea mammals is contraindicated so staff treat wounds with a Photizo unit in a special waterproof housing. Marietje Venter, Photizo's developer, says the unit's use is becoming more widespread.

"In Kwazulu Natal, the unit is used by one of the vets on sea lions, dolphins and penguins," says Marietje. "She uses antibiotics less and less and Photizo more and more. Antibiotics are quite poisonous for sea mammals so she uses it quite extensively.

"In general veterinary work, the biggest use is bite wounds, chronic necrotic wounds and oozing abscesses. We use it to clean up septic wounds. Other big areas for use are fractures and nerve damage and now it is starting to be used in liver and kidney treatment. Because it works on a cellular level and it stimulates the immune system, you get the body to do its own work."

Photizo was developed out of Marietje's physiotherapy practice. She has treated small animals for years, working in the clinic alongside veterinary surgeons, with dogs, cats and other small animals. On discovering LLLT she researched the field to build up her knowledge base, attending conferences and meeting with researchers and developing it as a practical modality. "I am really interested in cellular work because I'm a great believer that if the cell works correctly then the body can do its own job and heal perfectly."

There were some obvious hurdles to using laser-based systems in a clinical setting. It was time-consuming, and glasses were required to protect the operator's eyes from the laser beam. Marietje found a number of LED-based projects and started to conduct her own research. "I got the same results as I did with laser systems, but LED systems are more sturdy and practical to use – you can cover larger areas and push the output power higher so you can treat faster."

She then realised that clinicians did not have sufficient knowledge or expertise to use LED or laser therapy effectively. "The problem was that they didn't have the knowledge to calculate correct dosages," she says. "So to bring it to a place where people could start using it I pre-programmed dosages for ease of use."

Marietje cites Kendric Smith as an influence on her work. Professor Smith is founder and first president of the American Society for Photobiology. As professor emeritus

of radiation oncology and radiation biology at Stanford University, he wrote a paper in 2005 detailing the basics of photobiology. In it he said that unless light is absorbed by the specific biological system targeted by therapy then no photo-

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therapeutic effect takes place. For phototherapy to occur, you need the right light wavelength and dose of radiation. He notes that phototherapy cannot be effective in every system or situation. It depends entirely on the state of the cells being treated. "When irradiating fresh wounds, the effect of the irradiation can be minimal or nonexistent," he says. "This happens when cellular proliferation is active and the regeneration of the tissues is occurring at a more or less normal rate. This may explain why there is often no phototherapeutic effect observed when irradiating fresh experimental wounds, while an effect is observed for 'old' wounds."

The paper was, in part, a plea to raise standards in phototherapy experiments and clinical trials. Phototherapeutics became a controversial field because studies were not designed rigorously enough to satisfy the medical community about its benefits. In 2007, two researchers based at the University of Johannesburg published a review of the scientific literature showing positive evidence for phototherapy, entitled *Phototherapy – a treatment modality for wound healing and pain relief*.

They described the primary, secondary and tertiary effects of phototherapy on cells. Primary effects are the reactions induced by light absorption, such as changes in membrane permeability or improved signalling between mitochondria and nucleus; secondary effects result from primary changes, such as protein secretion or RNA/DNA synthesis; and tertiary are effects in distant cells induced by intercellular communication, such as increases in cytokines, growth factor, or endorphins. It is clear from the sheer volume of work in the field that there is a movement to investigate its efficacy in a wide variety of conditions. British universities that currently house photobiology units or research teams include King's College London, the University of Manchester and the University of Dundee, which hosts the NHS' National Photobiology Unit.

Marietje Venter feels justified in her persistence with LLLT, but admits that for her research to continue she must employ an independent scientist to take things forward. "Time-wise I'm limited because I work full time as a physiotherapist," she says. "Right now I need to decide whether to involve myself fully in a shoulder tendinitis project with a group of sports doctors. The problem is that I'm involved with manufacturing so I need to recruit someone independent."

Berol Goede helped develop the veterinary market in South Africa with cases studies on small animals, horses and wildlife (including cheetahs and a cockatoo). A seal receives low level light therapy at Sea World, Kwazulu Natal. Antibiotic use in sea mammals is contraindicated so staff treat wounds with a Photizo unit in a special waterproof housing.



A cat with cellulitis/abscess (the vets weren't sure). Above: at presentation following several days of medical management with antibiotics and anti-inflammatories; above right: the wound following partial debridement (both taken on July 12, 2010); and after five weeks' of moist wound management using honey dressings and Photizo.



Now she is in Australia researching the use of phototherapy on cancer mast cells. "Berol uses phototherapy in her veterinary practice and Onderstepoort University veterinary school has also introduced it in its eye clinic," says Marietje.

"It's a quickly evolving treatment modality. I'd like to develop it more for horses and upgrade the unit so it keeps pace with technology. We are looking to develop it for mastitis in cattle and lameness in horses, so each unit has to have specific settings for these conditions and be practical for each type of use."

She is unsurprised by the lack of UK and European awareness about phototherapy because much of the knowledge base was developed in the US and, perhaps surprisingly, Russia. "In fact, Russia is leading the world really, it's a household device there," she says. "But awareness is starting to develop in Europe."

A veterinary nurse's experience

Alison King is veterinary nurse at the Animal Medical Centre in Northampton. She deals with wound management at the practice and has provided evidence on cases for the UK's Veterinary Wound Library. Her practice manager told her about a company offering phototherapy equipment to trial in wound healing and she arranged a meeting.

"Danetre offered to bring a trial unit over whenever we needed it," she says. "I was only supposed to have the unit for a month, but it's been more like three. We've used it on wounds that could become infected, like bite wounds.

"For advanced wound dressings I tend to use honey more than anything. We start off with antibacterial agents, like honey, then once they are healing nicely we move on to hydrogels – it's always moist wound management – the advantage is they heal really well and quickly. We haven't had any problems with the cases that we've treated with antibacterial agents and Photizo. It is particularly good for swelling, because it appears to go down very quickly.

"We used it on a cat with lots of bite wounds – its whole leg was swollen for about four days. We treated it using the unit and the owner said they noticed the swelling going down shortly after treatment. It is difficult to talk with real accuracy about its performance on wounds because we are combining it with moist wound management, which does a great job anyway a lot of the time – it's subjective, but it appears to be good. Without a control case we don't know."

The verdict is that Alison needs more case studies, but her preliminary feeling is that the unit is easy to use and effective. There are more programmes she would like to try, such as the orthopaedic and tissue trauma settings, but for now the wound or abscess programme is absorbing most of her time.

"There are an awful lot of things that we could be using it for that we just have not had time to try," she admits. "Most of my case studies will go into the wound library, but I'd like to do more work with the unit on orthopaedic cases, with arthritis, and pain management. It would be really interesting to see how it works."