Editorial

From the editors

Dear Readers,

Parallel with the invention of the laser in the 1960s, the search began for possible applications of high energy densities achievable with coherent light to address problems in clinical medicine and surgery. Pioneering work in laser biophysics provided general guidelines for understanding light-tissue interactions.

In the 1970s, clinical trials were initiated using the output of high power lasers to employ photothermal tissue interaction including precisely controlled incisional and ablative procedures. For some clinicians and investigators, the high power laser remained a tool in search of an application. In veterinary medicine, the carbon dioxide (CO₂) laser was introduced as an incisional instrument that allowed simultaneous hemostasis and controlled tissue ablation.

By the 1980s, use of industrial lasers mushroomed, especially in fiber-delivered communication fields and electronics. During this period, clinical surgical applications also continued to expand. Limitations included restricted portability, less than optimum delivery systems, as well as high costs, especially in veterinary medicine. The technology began to develop beyond photothermal interaction and included photoacoustic or photomechanical applications (lithotripsy), and photochemical activity (photodynamic therapy, PDT).

In the 1990s, improvements in device reliability, portability, robustness, and economy of production boosted introduction to veterinary practices and allowed greater capability and flexibility of light delivery for targeting pathologic tissues through minimally invasive procedures, primarily through the endoscope. However, even with increased availability, education was the deciding factor on whether or not surgical lasers could be integrated into a clinical program or practice. In order to successfully move into this new and exciting modality of surgery, it was essential that “we learned before we burned.” A cavalier attitude then, as well as now, towards safe use of lasers can be disastrous for both the operator and the patient. Finally, understanding the fundamentals of laser surgery was, and is still today, exceedingly important. A fundamental understanding leads to appropriate practical use of the laser as a therapeutic device as well as progression of the technology.

Since the beginning of the 21st century, the use of lasers for numerous surgical and diagnostic procedures has been described in a multitude of publications. An emphasis in human medicine has been towards the dermatologic or esthetic

surgery application as well as monumental work that has been performed in ophthalmologic procedures (e.g., LASIK, glaucoma treatment). Veterinary procedures have primarily been focused on precise incisional surgery, ophthalmologic applications, minimally invasive techniques, especially in the horse, and expansion of the use of low power laser therapy for biostimulation.

The holmium:YAG laser has been used for arthroscopically supervised intra-articular villi ablation and chip fracture removal in horses, as well as for percutaneous laser disc ablation (PLDA). PLDA of the nucleus pulposus in the dog has been utilized as a prophylactic method to prevent recurrence of displaced discs. There is still work to be done to prove efficacy of this technique as well as to improve methods to provide appropriate laser fluency requirements based on water content of the discs. Three papers included in this edition by *Bartels*, *Bordelon* and *Piao* et al. provide a synopsis of past experiences and future developments for this form of photoablative therapy in the dog.

Ohnesorge and *Rötting* present an excellent overview for the use of lasers for minimally invasive laser techniques for upper respiratory airway diseases in the horse. Prior to laser energy directed through endoscopes via small diameter optical fibers, many of the procedures required extensive surgical approaches with extended morbidity.

As a 21st century technology, the emerging field of low level laser therapy using an equine skin wound healing model is also presented by *Jann* et al. which offers one of the first objective evaluations of this treatment modality using a reproducible and controlled clinical model.

The uses of lasers in veterinary ophthalmology is reviewed and the impact of this application for treatment of glaucoma and retinal pathology, and as well as surface ablation/excision of periocular tumors using the CO₂ laser are discussed by *Spiess*. Advances in ophthalmic cancer treatment using PDT is used today and continues to be an exciting modality that needs further investigation for all parts of the body. Tied in with aspects of ophthalmologic treatment regimes is a description and results of research given by *Schulmeister* et al. who explore a research model coupled with computer analysis to ensure the safe use of lasers in the future.

Finally, the paper from *Göppner* et al. explains the concept of non-invasive two-photon microscopic imaging in which the authors offer a new approach to dermatohistopathology of excised skin tumors. This contribution is well supplemented by the hot topic “Laser endomicroscopy for the intraoperative diagnostic” presented by the University of Munich.

At this point, we would like to draw your attention to the snapshots given in the magazine section and would like to encourage all of our readers again to submit manuscripts. We are pleased to announce the 2013 Pater Leander Fischer prize which will be awarded to the best publication from the years 2012/2013. The prize is donated by the *Deutsche Gesellschaft für Lasermedizin (DGLM) e.V.* and is endowed with €1000. Detailed information can be found in the 'Call for Papers' in this issue.

This edition of *Photonics & Lasers in Medicine* and the articles presented lead through from fundamental applications of clinical therapy in both large and small animals and extend to

more advanced methods using various laser wavelengths for a more accurate diagnostic approach for a variety of conditions. Our effort with this issue has been to use both the science and art of veterinary medicine to describe how this has developed from the past to present. More importantly, we hope it will serve as a reference for the future!

Kenneth E. Bartels

Jörg A. Auer