

Professor Endre Mester, the Father of Photobiomodulation

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Editor's Note: During a recent visit to Romania to attend a conference, Dr. Steven Parker met with Professor Lajos Gáspár, an ALD member from Hungary. Both were invited speakers at the meeting and their discussions led to the recognition of the undisputed place of Professor Endre Mester (1903–1984) in the development of low-level laser application in medicine.

Inspired by the work of Professor Mester, Professor Gáspár is credited with the first Hungarian PhD thesis in the field of laser research. In his own country, Professor Gáspár has pioneered the introduction of both high-power and low-power lasers in oral and dental surgery.

The following reflects Professor Gáspár's intimate association with Professor Mester's family and provides testimony to the impact of Endre Mester as the father of photobiomodulation in low-level laser therapy.

Professor Endre Mester, MD, DSc, was born in Budapest, Hungary, in 1903. As a schoolboy, he excelled as a violin player and developed an interest in medicine. With such diverse interests, he decided to sit university entrance examinations in both medicine and music. He succeeded in gaining a place to read medicine at the University of Budapest. His continued interest in music was relegated to social enjoyment with friends on weekends.

Having successfully completed his undergraduate medical study and graduation, he was invited to receive training in surgery as a resident staff member of the 3rd Department of Surgery at the University of Budapest. He subsequently obtained his first position outside the university as head of children's surgery in St. Steven's Hospital in Budapest. From there, greater recognition beckoned and his next position was head of a major hospital in Budapest, the Bajcsy Zsilinszky. There he combined clinical work with administration, being appointed director of the hospital.

During this period, Mester undertook research and scientific work in the field of abdominal surgery, with a special focus on bile duct surgery. His interest in the



Professor Endre Mester, MD, DSc
(1903-1984)

latter led to his gaining his PhD. Promotion led to his full professorship and Director of the 2nd Department of Surgery of Semmelweis University in Budapest and election as President of the Society of Hungarian Surgeons.

At Semmelweis, Mester started laser research in 1965; this was five years after the development of the first laser by Theodore H. Maiman¹ and only two years after surgical laser applications had been pioneered by notable workers such as Paul E. McGuff² and Leon Goldman.^{3,4}

Like others of his era, Mester attempted to use a "high-power" laser to destroy malignant tumors. Early in his experiments, he implanted tumor cells beneath the

skin of laboratory rats and exposed them to a customized ruby laser, based on Maiman's earlier model. To his surprise, the tumor cells were not destroyed by doses of what was presumed to be high-power laser energy. Instead, it was observed that in many cases the skin incisions made to implant the abnormal cells appeared to heal faster in treated animals, compared to incisions of control animals that were not treated with light.⁵ Mester was baffled as to how a device that was intended to destroy tumor cells had instead promoted tissue repair. His custom-designed ruby laser was weak and certainly not as powerful as he thought it to be. Instead of being photo-ablative, the low-power light had no effect on the tumor. Indeed, it stimulated the skin to heal faster. This fortuitous encounter opened the field of monochromatic light treatment.

This casual observation led him to design an experiment to ascertain his suspicion that treatment with red light accelerated healing of the surgical skin incisions he made to implant the cells. The experiment was successful as it showed that treatment with red light indeed produced faster healing of the skin wounds. Baffled but fascinated by this development, he carried out

other experiments in which he showed that experimental skin defects, burns, and human cases of ulcers arising from diabetes, venous insufficiency, and infected wounds also healed faster in response to his laser treatment.⁵⁻⁷

In direct opposition of contemporary theory that the future of lasers lay solely in the domain of resective surgery, Mester had discovered a new application of laser energy – repeated low-intensity laser irradiation to determine radio-biological effects. He was the first to describe the “biostimulation” effect of lasers. Following his earlier observations on skin, he developed studies into accelerated healing: hair growth in mice, where depilated skin was prepared for such irradiation studies, appeared to be faster after exposure to laser energies as low as 1 Joule/cm² per day.⁸

Experimental research into laser biostimulation continued most actively during a period of 6 years and Mester was awarded a Scientific Doctorate by the Hungarian Academy of Sciences in recognition of his work. His experimental studies showed that many different beneficial effects associated with healing might be due to photobiostimulation.

Mester measured effects of different laser doses on the mucosal surface of dog’s intestinal mucosa. He proved fibroblast activation led to increased collagen production. During healing of vasculitis ulcers in rheumatoid arthritis patients, he observed anti-inflammatory and pain-decreasing effects as well. Measurement of increased phagocytosis in granulocytes was shown to be directly due to the effects of his low-level ruby laser. These observations promoted *in vitro* studies of lymphocytes, where systemic immunological effects were proved. He organized large numbers of collaborator researchers to undertake widespread studies. Results showed different laser effects on anti-inflammatory versus pro-

inflammatory prostaglandins, resulting in decreased inflammation.

Since Mester first uncovered the therapeutic value of red light, different wavelengths of light have been shown to promote healing of skin, muscle, nerve, tendon, cartilage, bone, and dental and periodontal tissues.⁹⁻¹⁹ In studies, when healing appears to be impaired, such tissues respond positively to the appropriate doses of light, especially light that is within 600 to 1,000 nm wavelengths. The evidence suggests that low-energy light speeds many stages of healing as it accelerates inflammation, promotes fibroblast proliferation, enhances the synthesis of type I and type III procollagen mRNA, quickens bone repair and remodeling, promotes re-vascularization of wounds, and accelerates tissue repair in experimental and clinical models.

The inspiration showed by Mester led to many Hungarian workers achieving eminence in the field of low-level laser therapy. His sons Andrew and Adam were co-workers, and Andrew, living in California, published studies about neuro-olfactory biostimulation. Lajos Hazay irradiated urinary bladder ulcers using a low-level laser and a fiber-optic delivery system. Attila Torok began work into duodenal ulcers and treated ulcerative colitis with a similar laser system. Judit Ortutay published rheumatologic studies. Eniko Korchma published results in oral and dental photobiomodulation. Judit Horvath wrote a book about experiences of a general practitioner using low-level lasers.

Other notable Hungarian workers have achieved success through Endre Mester:

- Lajos Kovacs was awarded a Scientific Doctor title with experimental and clinical studies in gynecology
- Gyorgy Szabo successfully submitted a PhD thesis in ear-nose-throat biostimulation

- Klara Barabas achieved a PhD in experimental and clinical double-blind evaluation of laser treatment of rheumatoid arthritis
- Timea Berki wrote a PhD thesis about immunological effects of laser irradiation on B-lymphocytes
- His elder son Adam Mester completed a PhD thesis about laser irradiation of T-lymphocytes. He is currently head of the National Laser Centre for biostimulation-based wound and arthritis healing in Budapest, Hungary.

It is inappropriate to consider the development of low-level laser therapy without the acknowledgement of many other international researchers and clinicians. Equally, it is pertinent to record that the basic investigations of Mester into a phenomenon known as “biostimulation” have shown that, far from active stimulation, many of the processes observed, such as pain suppression, are in fact inhibition. Therefore, it is now customary to look at the area of low-level laser therapy as “photobiomodulation” (PBM). The Academy of Laser Dentistry is proud of its association with current leaders in the field, such as Jan Tunér and Mary Dyson. The growing interest in PBM in clinical dentistry may lag that shown in other medical disciplines, but opinions are gradually changing in areas outside Eastern Europe and investigations continue to drive the understanding of nonablative, coherent photonic energy as an adjunct to tissue healing.

Professor Endre Mester passed away in 1984. His legacy is that his unforeseen results obtained using a rudimentary laser device has led to a far-reaching and routine treatment modality that is used in all branches of medicine and dentistry on a daily basis.

AUTHOR BIOGRAPHY

Dr. Lajos Gáspár is currently an Associated Professor, Head of Ecto Derma Polyclinic at the University

Educational Center, Budapest, Hungary. He has published 120 articles about lasers and 9 books and 16 book chapters about dentistry, and has given more than 600 presentations. His special honors include: President of the Biomedical Optics Committee of Academy of Sciences Hungary, Secretary General of the Hungarian Medical Laser and Optics Society, National Representative (Hungary) of the World Federation for Laser Dentistry (WFLD) and the International Society for Oral Laser Applications (SOLA). Professor Gáspár can be contacted by e-mail at gasparla@t-online.hu.

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