WOUND HEALING DISTURBANCES AND WOUND INFECTION INCLUDING MRSA IN HORSES AND DOGS TREATED BY PURE LASER ACUPUNCTURE

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SUMMARY

Pulse Controlled Laser Acupuncture (PCLAC) is the combination of two very effective treatments each for its own, acupuncture and Low Level Laser Therapy (LLLT). Laser Acupuncture will be described as an excellent therapy for any kind of wound healing disturbance and any tissue infection deriving from injuries or postoperative including wound infection by multi- resistant germs. Laser acupuncture treatment is carried out without any side treatment like antibiotic or anti- inflammatory treatment. This is from special interest in cases of MRSA infections, when antibiotic treatment has had no effects.

INTRODUCTION

Acupoints are small areas of reduced electrical resistance near the surface of the body consisting of a high concentration of free nerve endings and blood vessels within the fascia and muscles.[1,2] Acupuncture stimulates nerves to evoke autonomic reflexes and neurohumeral changes via higher brain centers to restore homeostasis of the body.[1,2] The acupoints effective for specific disorders have been determined by thousands of years of experience in traditional Chinese medicine (TCM).[3] Acupoints can mainly be stimulated by dry needles, electricity, or laser. Laser acupuncture is relatively new compared to the other forms of acupoint stimulation, but has advantages over dry needle acupuncture because it is usually painless and there is no need to touch the skin.[4]

Low level impulse laser (LLL) light at very specific wavelengths and pulse power, duration and frequencies can be applied focally over acupoints for laser acupuncture[4]. The used resonance frequencies of the laser and the wavelength of the laser light are very important and have to be selected carefully. Impulse laser devices emit a high intensity short duration pulsing light with a wavelength of 904 nanometers (nm), a peak pulse power of 90 watts and pulse duration of 200 nanoseconds (ns). Tissue penetration of these impulse lasers is up to 15 cm because of the powerful light pulses, but because of their ultra-short duration, no thermal or coagulating effects occur in the tissue, even at high impulse frequencies up to 40,000 Hz. Acupoints need a treatment duration of 15-30 sec but topical treatment of wounds usually takes about 30 sec to 1 minute/square centimeter surface depending on the depth one has to reach.

Stimulation of acupoints by laser has been used to treat immune-mediated disorders and stimulation of the immune system generally. Laser light has also been applied topically to wounds, to reduce inflammation, increase blood perfusion, for clearance of peroxide radicals, promotion of collagen growth, demarcation of damaged tissue and wound healing.[6,8,11,12]

Laser photon absorption during LLLT is thought to stimulate nerve endings at acupoints and induce therapeutic effects via autonomic nervous system reflexes and higher brain centers similar to other forms of acupoint stimulation.[10] The LLL appears to hyperpolarize local nerve endings and reduce muscle spasms and pain. During LLLT, laser photons can be directly absorbed into cells by means of a flavoprotein-metal-redox-system or a so called "antenna pigment", an important link within the mitochondrial respiratory pathways to stimulate adenosine triphosphate (ATP) production. Increased ATP production is the primary mechanism of laser acupuncture and topical therapy. Absorbed laser photons are transformed directly into cellular energy.[4, 7-10] Diseased and damaged tissues require high levels of energy to absorb inflammatory secretions and other debris, synthesize new structures, rebuild damaged tissue and return to normal function. The LLLT is thought to contribute to the rebuilding and healing process by increasing energy production within diseased cells. Another important therapeutic property of the laser light is its ability to improve blood perfusion in micro-circulatory disorders.[12]

MATERIALS AND METHODS

All horses and dogs in the case studies were presented to the author for LLLT after they had previously been treated over a longer period in a veterinary hospital. Several of them had been recommended for euthanasia due to extremely severe wounds considered hopeless by conventional medical standards.

Figure 1, left: Physiolaser Olympic low level impulse lasers unit (B) connected by cable (A) with 2x 90 watt single probes for acupoint stimulation and topical therapy (C). **Figure 2, right:** Laser Pen 40 W/904nm for acupoint stimulation in charging station.

The Physiolaser Olympic 90 W/904 nm[a] and the LaserPen 40 W/904nm[a] were the LLLT units used by the author (Figures 1a and 1b). A 90w impulse laser single probe and a 40 W impulse laser pen was used for acupoint stimulation and the tip of the laser device was placed directly on each acupoint for 20 seconds. 2 90 W impulse single probes and a 5x30w impulse laser cluster probe was used for topical treatment of wounds and the probe was held as close as

possible to the wound without directly touching to avoid contaminating the laser tip or the wound. Topical LLLT took 2-5 minutes of treatment for each location (Figure 2). Acupuncture points were used for stimulating the immune system (SP 4, 3H5). These two Luo- points are combined by Noon-Midnight –Rule. Interestingly TH 5 is known in *"Controlled Acupuncture"* as The Thymus- point and SP 4 as the Interferon- point which makes much sense to stimulate even in a western way of thinking. For improving blood perfusion LU 9 was treated and SP 2, the tonifying point of the spleen which is responsible for the body's "building energy" for improvement of wound healing. The concerning *Tendino-Muscular Meridian (TMM) or sinew channel* of the wound area was treated by its Ting point, its Tonification point and its specific Reunion point.

LLLT (Low Level Laser Therapy) of the infected tissue was added as a very effective anti-inflammatory therapy. Therefor a 90 watt 904 nm impulse lasers was used. The kind of laser here is most important, because only these lasers can penetrate deep enough into tissue that enough laser photons reaches the infected cells. The main principle of the anti-infectious force of LLLT is the clearance of peroxide radicals in the infected tissue, activation of immune cells like lymphocytes and macrophages and mediators.[5, 6] Resonance frequencies of laser pulses are from high importance. For treatment of inflammation we need fr. A''according to Nogier (37376 Hz). Currently the 90 watt 904nm impulse Physiolaser, Reimers & Janssen, Berlin is the only laser worldwide that provides this high energy.

The total diagnosis and LLLT treatment time for the first session was usually about 40 minutes. The following sessions took about 20-30 minutes. Between LLLT sessions, the wounds were bandaged with wet dressings of mild Entozon® (2g/L) and *arnica* tincture (10ml/L). The bandage was renewed after each laser treatment. The frequency and overall number of treatments varied with the individual needs of the patient. In the acute cases, LLLT was repeated every day until the wound showed valid granulation tissue. Then the treatment intervals were extended to three times or twice a week. In some patients after detailed instruction, the owner continued daily treatment at home using a 90w impulse laser.

Case Report 1

A 7 month old foal showed a neglected wound with a swelling nearly as big as a handball at the fetlock. The foal had been outside in the pasture night and day. When the wound was discovered it received standard treatment including bandages and antibiotics for about 2 weeks before it came in that state for laser acupuncture (fig.3). The following therapy included daily LLLT with four 90 watt impulse single probes for 15 minutes. Additionally laser acupuncture (LA) of SP 2 to support wound healing, TH 5, SP 4 to stimulate the immune system was carried out. Between the sessions the wound was covered by wet Entozon®/arnica- bandages. No other side treatment such as antibiotics, etc. had been applied. Three (3) weeks after starting Laser Acupuncture the wound was contracted and showed good epithelialization and sound granulation tissue. The swelling is reduced by half (fig.4). After 4 months of treatment, healing was finished (fig.5). For about 3 months the foal was treated on a daily base by its owner. Control sessions were every second week.

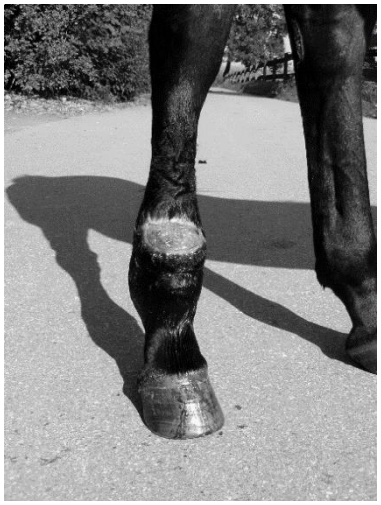
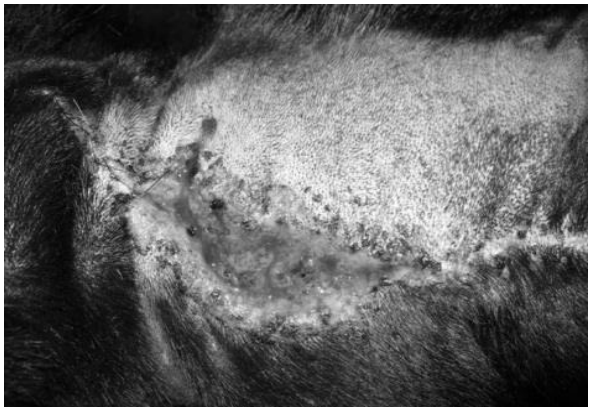



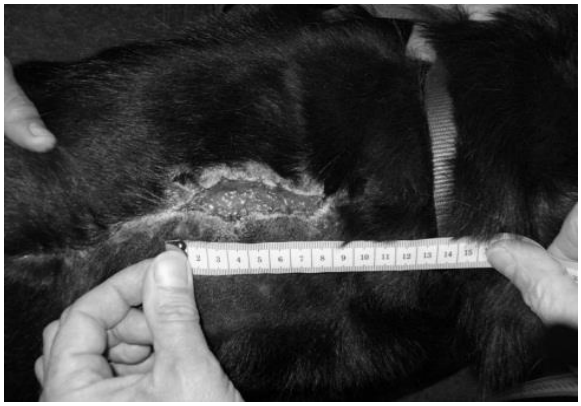

Fig.3, left: Neglected wound in a foal, Fig.4, middle: after 3 weeks laser acupuncture the wound shows nice granulation tissue and wound edge with 5mm epithelia, Fig.5, right: Wound is completely healed by laser acupuncture without any side treatment.

Case Report 2

The case of an MRSA infection in a dog shows the excellent anti-infective effect of Laser Acupuncture even in such cases, in which antibiotics have no effect. A three-year-old German shepherd mix was presented for Laser Acupuncture after a four months permanent treatment in a small animal hospital. Pathogen culture and resistance test had verified an MRSA infection. Treatment had been completely unsuccessful and Euthanasia was recommended to the owner, because there was finally no way to help.

At this stage the dog came for laser acupuncture. The wound showed a highly destructive infiltrative infection. The granulation tissue was tubercular and incredibly secretive (fig. 6). With beginning of the Laser Acupuncture any side treatment with antibiotics and anti-inflammatory drugs was spontaneously discontinued. In addition to LLLT of the wound with frequency A'' for 10 minutes the immune stimulating points TH 5 and SP 4 were treated. Already during the first session the wound showed a typical spontaneous superficial secretion and a spontaneous reduction in pain could be observed. After 10 days (5 treatments) a significant contraction with nice epithelisation and clean granulation tissue was seen (fig. 7). One month after the start of Laser Acupuncture the wound had healed without a visible scar (fig. 8).





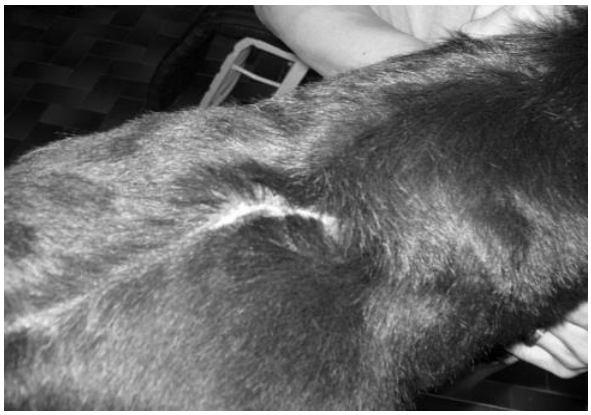


Fig.6 top left: MRSA infected wound before laser acupuncture shows infiltrative inflammation and hyper granulation. Fig.7 top right, 10 days later after laser acupuncture with nice granulation tissue and edge with good epithelia. Fig.8, bottom left: complete healing without further surgery and antibiotics
Petermann 2011, (Reprint with permission from: Kontrollierte Laserakupunktur, Sonntag Verlag in MVS Medizinverlag. Stuttgart, Germany: Thieme Verlagsgruppe 2011)

Case Report 3

A femur fracture in a dog was fixed by a metal plate. After healing of the fracture, the limb of this dog was completely paralyzed. There were no reflexes and no sensitivity in the whole leg. In intension to improve, the plate was removed by a second surgery, but without success. One year later the dog was introduced for acupuncture treatment. The leg was only skin and bone. There were still no reflexes and no sensitivity. The operation wound looked nasty but was closed completely. Beneath and beside the scar one could only feel the femur bone. I suspected that the scar was that nasty because of wound healing disturbance and that it had a granuloma inside. It was treated topically with fr. A'' for 2 minutes. Acupoints were SP 2/4 and TH 5. No side treatment was applied. 2 days later when the dog was presented for 2nd treatment the wound that had been closed for one year had opened and started secretion (fig. 9).

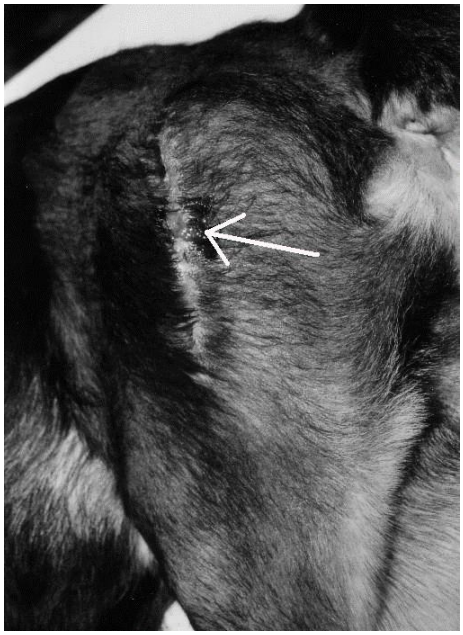


Fig.9: scar which was closed for one year opens after first laser acupuncture treatment and cleans itself.

During the next two days the scar tissue became more and more swollen and showed fluctuation. A big abscess developed and after a further two days 150 ml of pus came out when the abscess opened. Thereafter neurological treatment was started, treating the backshu- points from Kidney to Large Intestine, and the spinal cord in that area between the spines with frequency E according to Nogier. This frequency is known to improve nerve healing. The sciatic nerve was topically treated with the same frequency. Additionally the point KID 4 was treated which is correlated with the nerves. This treatment was carried out for one further month by the owner in a daily base, with a 90 watt impulse laser. When the patient came for the next visit after this time, the dog was able to stand on the leg and to move a little bit. All reflexes could be generated and the skin sensitivity was back again. The treatment was stopped. At the next visit in my practice 2 months later the dog walked and ran perfectly and the muscles were back again.

Case Report 4

In a two-year-old crossbred stallion a chip in the right ankle joint was removed by endoscopic surgery. Post operationem an infectious tarsitis developed. First treatment was performed by the clinic where the operation had taken place. Further treatments followed at three other clinics without success. 6 months later when the horse was introduced for acupuncture it was not able to step on the diseased limb and only with great difficulty moved on three legs. The circumference of the joint was 61 cm (fig 10). LLLT of the joint with a 5 x 30 Watt multicluster 904nm impulse laser was applied, dorsal, medial and lateral for 5 minutes each on a daily base for one week. Acupoints for the sinew channel of GB and LIV were stimulated by laser: GB 44/43, LIV 1/8, SI 18, CV 3. TH 5 and SP 4 were treated for control of infection. After fourteen days with seven similar treatments, the circumference of the joint had been reduced to 47 cm, and the horse walked without lameness and could be exercised at trot for about 5 minutes. After the third day of exercise, a new feverish inflammation of the joint appeared spontaneously, with 41°C body temperature and pronounced swelling of the joint. Also during the acute phase the inflammation no antibiotics or any other medication were applied. Four weeks later with twelve additional treatments, the patient was released (fig. 11) and gradually began training to full capacity at home in the following 3 months. Later on the horse was sold after passing the vet check without any problem.

Fig.10, left: A right tarsal joint infection of 6 months duration in a two-year-old crossbred stallion. On presentation the hock circumference was 61cm. Fig.11, right: The right tarsal joint infection of 6 months duration in a two-year-old crossbred stallion; After seven LLLT treatments over a 14 day period, the circumference had reduced to 47cm. (Reprinted with permission from: Petermann U. Kontrollierte Laserakupunktur bei Hund und Pferd. Sonntag Verlag in MVS Medizinverlag. Stuttgart, Germany: Thieme Verlagsgruppe 2011)

Case Report 5

Following a routine synoscopy of the digital synovial sheath of the fetlock in a six-year-old crossbred gelding, which took place within an operation on the palmar annular ligament of the fetlock, the healing of the wound was disturbed by a continuous discharge of synovial fluid. Despite intensive therapy by the clinic where the operation had been performed, an infection of the tendon sheath and a necrotizing inflammation in the operation area developed. After Six weeks of treatment, the clinic decided to suggest euthanasia to the owner, as continued deterioration of the horse's condition seemed definite and the infection of the tendon sheath could not be controlled. However, the owner decided to try laser acupuncture. This decision was strongly opposed by the clinic.

These were the findings: 6 x 2cm sized wound with escaping synovia and a necrotic center. The horse walked with a highest degree of lameness. The foot was set down only at the tip of the toe due severe pain and to adhesions of the tendon sheath. The circumference of the fetlock joint was 49 cm (fig. 12). LLLT of the infected tendon sheath was carried out with a 5 x 30 Watt multicluster 904nm impulse laser for 5 minutes on a daily base. Acupoints for the sinew channel of GB were treated by laser: GB 44/43 and the reunion point SI 18. TH 5 and SP 4 were treated for control of infection. At the third day of treatment no further secretion from the tendon sheath could be determined and the necrotic area in the center was considerably reduced. After five daily treatments the wound was completely dry and had shrunk to half its original size. After ten days the wound had almost completely closed (fig. 13). Only a slight lameness was still visible. After a total of fourteen days of treatment, the patient was released and received further daily laser acupuncture treatments in the same way at home. The horse was gradually increasing training in order to further loosen the adhesions. Half a year later the horse completely restored passed a vet check, when it was sold to another owner.

Fig.12, left: 6 x 2cm sized wound with escaping synovia and a necrotic center. Fig.13, right: After laser acupuncture ten days later the wound had almost completely closed.

Case Report 6

A 3 year old gelding had a very serious post-operative fistula of the funiculus testis with a durable big swelling of the scrotum and stiffness of the hind limb. After a 3 month period of therapy with several antibiotics by two different clinics and a second operation the gelding had a serious loss of weight and the fistula could not be healed. Thereafter 7 treatments of laser acupuncture with 90 watt 904nm impulse laser was applied. 5 minutes topical laser-radiation frequency A'' of the funiculus and laser acupuncture of the points BL 23, KID 3, SP 5 which affect the funiculus testis and TH 5 and SP 4 against infection and for improving wound demarcation were carried out with a 3-4 days interim. At the end of the therapy the fistula had been closed and the swelling and the stiffness of the hind limb had disappeared.

Case Report 7

A 2 years old gelding had a hand palm sized loss of skin in the flexor area of the tarsal joint. After 6 weeks of common treatment the wound looked really terrible because of hyper granulation tissue (fig. 14). The clinic decided to put the horse to sleep. But instead the owner decided for laser acupuncture. After surgical remove of the hyper granulation tissue topical LLLT and laser acupuncture was applied with a 90 watt 904nm impulse laser fr. A'' on a daily base for 2 weeks. The wound was covered by a moist bandage with a fluid of copper sulphate (5g/L) and tincture of Calendula, Echinacea and Arnica (each 10ml/L). For acupuncture SP 2 was treated for improvement of wound healing and TH 5 for wound demarcation. One week later the wound already looked quite better and showed nice granulation tissue and epithelisation (fig.15). Two months later with 1 treatment per week the wound was nearly closed (fig 16). The main problem at that time was the movement which always ruptured the soft epithelia layers which wanted to close the wound completely. So finally it took another 2 months with treatment every 2nd week until the wound was closed completely (fig. 17).

Fig.14, top left: After 6 weeks of common treatment the wound looked really terrible because of hyper granulation tissue. Fig.15, top right: One week later the wound showed nice granulation tissue and 3-4 mm new epithelia. Fig.16, bottom left: 2 months later the wound was nearly closed. Fig.17, bottom right: another 2 months later the wound was completely closed.

Case Report 8

An 18 years old Trakehnen breed mare had ruptured the superficial flexor tendon. Between the two ends of the tendon was a space of about 10cm. Because the wound was already deeply infected since some days, a surgical intervention was negated. Laser acupuncture in my experience is the ultimate treatment for wound- and tendon healing with an excellent anti-inflammatory treatment effect. It was applied daily LLLT with 5x 30w 904nm impulse laser (fig. 18) for about 5 minutes. Acupoints SP 2 for wound healing and tissue repair, SP 4 and TH 5 against infection and the sinew channel or Tendo-Muscular Meridian of the Pericardium (PC 9 and GB 23) where stimulated by the laser. Beside a Tetanus vaccination not any other conventional therapy was applied. The same therapy was applied for the next 8 weeks all 2 to 3 days in the clinic. Thereafter the wound had closed and the tendon healed step by step. The same treatment was carried on for another 6 weeks with a 90watt impulse laser by the owner at home to complete restructuring of the tendon fibers. Thereafter the tendon had been rebuilt to its physiological structure and the mare was step by step put to regular training (fig.19). Not any medication like antibiotics or anti-inflammatory drugs had been applied beside laser acupuncture over the entire treatment.

Fig.18, left: completely ruptured superficial flexor tendon and wound with proud flesh. Fig.19, right: Wound and tendon had healed by laser acupuncture without any side treatment.

Case Report 9

A six year old male Scotch terrier was bitten by a male Doberman. Three-quarters of the circumference around the neck the skin was lacerated. Fig. 20 shows the dog one week after the wound was stitched in a veterinary clinic. In spite of wound drainage and antibiotic treatment the complete suture became necrotic. Two days later a complete dehiscence had happened and the wound in that little dog was as big as the man's hand size. Over the course of 12 days four laser acupuncture treatments were needed to close the wound completely (fig.21) without any other

surgery and without any antibiotics or other medication. For each treatment we applied LLLT of the wound with 5x 30 Watt 904nm impulse laser for ten minutes. Acupoints TH 5 and SP 4 against wound infection and SP 2 for wound repair were treated with 90 Watt pulse laser for 30 sec each. No other side treatment was needed.

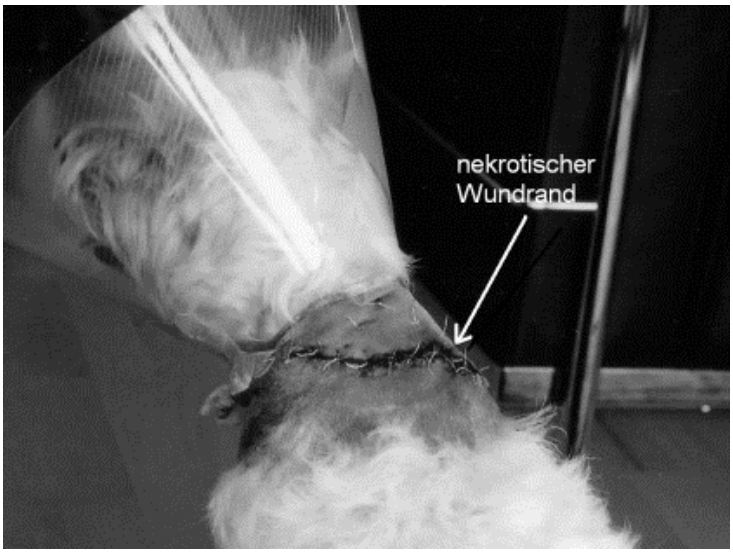


Fig.20, left: Necrotic wound around ¾ of the circumference of the neck before dehiscence (see arrow). Fig.21, right: 12 days later complete healing without surgery and antibiotics (arrows). (Reprinted with permission from Petermann U., Pulse Controlled Laser Acupuncture Concept (PCLAC). 2007: www.akupunkturtierarzt.de)

DISCUSSION

Treatment of wound infection is a big challenge in both trauma related wounds and post-operative, especially if multi-resistant or necrobiotic germs are involved. Because laser acupuncture always works without antibiotic medication the question of antibiotic resistance becomes completely meaningless. These case reports out of hundreds of successful treated cases in the last 25 years of the authors experience show that this combination of acupuncture as an autonomic regulating therapy and topical laser treatment as an anti- inflammatory and wound healing supporting treatment are an excellent alternative way if conventional treatment remains unsuccessful.

Left: Wound after suture dehiscence from wound infection. Right: Wound after healing from exclusively laser acupuncture without surgery and antibiotics

Beside the kind and the power of the laser, resonance frequencies play a fundamental role in treatment of living structures: For LLLT of diseased tissue the Nogier frequencies are mostly used: frequency A is particularly useful for treating inflammation, frequency B has special affinity to ligaments, tendons and muscles, frequency C to muscles, bones and joints and frequency E is stimulating nervous function. A second row are the Bahr- frequencies, which especially are useful for acupuncture diagnosis but they are also very effective therapeutic frequencies. The third row of frequencies, still relatively new, are the "Meridian frequencies" according to Reininger. Reininger found special resonance frequencies for each meridian. These frequencies in the meantime are also proved as important therapeutic frequencies for local tissue therapies of the respective organ, e.g. the liver or the kidneys (Table).[13,14] Over the last 25 years the author has applied these frequencies to treat dogs and horses for a variety of conditions. Laser acupuncture has excellent treatment effects compared with dry needle acupuncture and allows treatment of acupoints pain free and even safely in some uncooperative dogs or horses. The greatest advantage of the use of impulse lasers in acupuncture is the synergy between the effects of the acupuncture and LLLT. The local effect of LLLT supports the autonomic regulating effect of acupuncture and vice versa, which together seem to be especially effective in wound healing. Impulse lasers with 904nm wavelength and the new anti-inflammatory frequency A'' of 37376 Hz, can sufficiently penetrate tissue to locally reduce peroxide radicals and stimulate ATP production.[4,5] The cost of the equipment may seem to be a disadvantage initially, but the ability to help animals with both LLL acupuncture and topical treatments makes the investment more than worthwhile. It is the hope of the author that the technique reported here will be used to help animals even though euthanasia is being considered, because of the severity of their disease.

Left: Wound in a foal after several weeks of conventional treatment in a veterinary hospital. Right: Wound after healing from exclusively laser acupuncture without surgery and antibiotics

Further studies on LLLT wound healing are needed using a larger population of dogs and horses, compared with a group of conventionally treated horses and dogs. But if one considers these are examples out of hundreds of successfully treated patients with severe wound healing disturbances and wound infection one can state that laser acupuncture should be seen as a very efficient wound healing and anti-infective therapy. This is even true for infection by multi-resistant germs and MRSA infection.

MRSA Infection (multi resistant Staphylococcus Aureus) in a Bernese mountain dog after Castration, treated for a period of 3 month in a veterinary hospital. The dog should be put down after two further operations.

The wound in the same dog 3 weeks later after pure laser acupuncture without any side treatment.

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