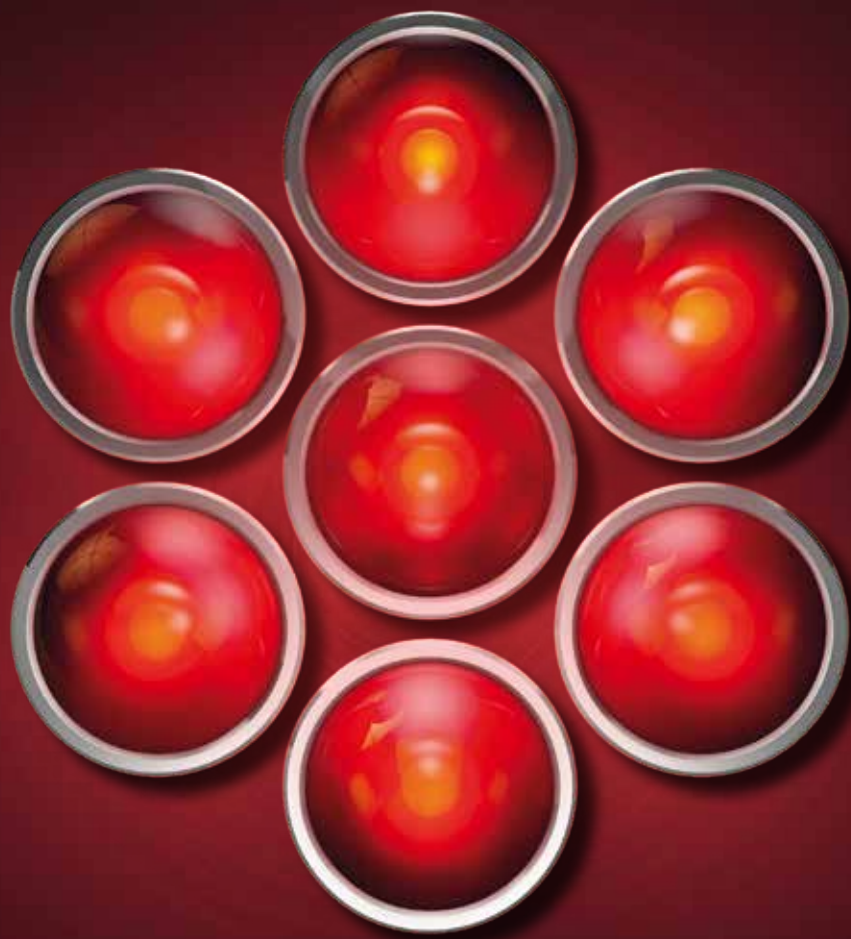


REPULS TECHNOLOGY AND THERAPY



The revolution
of medical pain therapy

January 2015



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REPULS PHOTO-MEDICAL TECHNOLOGY



THE COMPANY

was founded in 2005 by Brigitte and Konrad Rumpold (grad. of Business Studies) for the purpose of

- investigating,
- developing and
- disseminating

the usefulness of light to man. Photo Medicine forms the focus of the work of the company. The products developed ensure pain reduction and performance boosting as well as improvement of the quality of life.



REPULS MISSION

- We aspire to achieve the recognition of light and wavelengths as preventive and therapeutic medicine
- Modern LED technology should be established as standard therapy
- We develop innovative photo-medical products on the basis of scientific research and experience as well as contribute to the effective treatment of acute and chronic diseases



REPULS – INTENSIVE COLD RED LIGHT

Despite worldwide research, there have so far, been no adequate LED devices that were capable of achieving the same performance – technologically and medically – without side-

effects and with the intensity of a sophisticated laser. 9 years of research at the Technical University of Vienna have laid the groundwork for today's extremely successful REPULS therapy.

REPULS AT A GLANCE:

- REPULS works with cold red light within the wavelength range of 632 Nm. That is red light from the visible sunlight spectrum not infrared!
- REPULS works with maximum power density of: 0.4 Watt/cm²
- REPULS acts fast against inflammation and pain
- Treatment with REPULS is absolutely free of undesired side-effects
- REPULS can be applied on multifaceted indications
- REPULS has ongoing broad basis of clinical experience
- REPULS is based on scientific foundations: 9 years of research at the Technical University of Vienna, continuing advanced research works at Ludwig Boltzmann Institute of experimental and clinical traumatology
- REPULS uses the most modern LED technology and therefore constitutes a completely non-invasive, non-thermal form of therapy that is free of side-effects
- REPULS is patented
- REPULS is a medical product of class 2B
- REPULS stands out for a high success rate in therapies
- REPULS is easy to apply, uncomplicated and mobile
- REPULS can be applied with minimum training efforts and less labor force expenditure

REPULS IN SPORTS

- REPULS leads to strongly improved post-workout and post-competition regeneration by boosting ATP and through a significant rise in the breathing activity of the mitochondria in muscular cells
- REPULS leads to shorter injury-induced breaks



SCIENTIFIC BASES

THE SCIENTIFIC QUESTION

At the beginning of the development was the idea and the question of how the related pain sensations could be reduced in the photodynamic therapy of skin cancer. The research team led by Dr. Hönigsmann and the university Professor Paschke applied a thin-belt, pulsed source of red light for this purpose: first, laser light was used and was subsequently replaced by LED light at a wavelength of 632 Nm – equivalent to the cold red light from the visible sunlight spectrum. Analgesia (Painlessness) was largely achieved in a clinical study at the dermatological university clinic in Vienna. The therapeutic impact of red light on different kinds of inflammation without the application of photosensitizers was also discovered in this context. This impact was attributed to the huge depth of penetration of the red light as well as the postulated direct mode of action in molecular inflammatory processes that was backed by facts gained from asthma therapy:

IMPACT ON MOLECULAR INFLAMMATORY PROCESS

First, scientists assumed a direct impact of red light on the inflammation-controlling molecule Leukotriene B4 (LTB4) as found in high concentration in the lungs of asthma patients. However, this assumption did not agree with the resonance frequency of LTB4, which stood at 270 Nm because the cold red light would act at a frequency of 632 Nm. Further measurements and experimental findings finally led to the realization that it is not Leukotriene B4 itself but its precursor – the 12 oxo Leukotriene – that resonates directly with the red light applied.

This is because its resonance frequency lies at a wavelength of 316 Nm, which occurs through the phenomenon of frequency-doubling while the wavelength of the incoming red light treatment is reduced by half at the same time. The 12 oxo-leukotriene itself stems from a working group, which succeeded in achieving synthesis for the first time ever as a “key pivotal intermediate in LTB4 metabolism” and was described as “very unstable and elusive”. It is assumed that this molecule is bonded with other cell components in the aftermath of the red light treatment and is therefore no longer available for leukotriene production. This consequently leads to the easing of the inflammation.

PILOT STUDY AT THE UNIVERSITY CLINIC OF DERMATOLOGY, VIENNA

The point of origin was anecdotal therapy sequences that were performed on 3 patients of psoriasis or atopic dermatitis. A total of 21 patients of plaque psoriasis were subsequently included in a red light study and the evaluation of the therapeutic reaction was done using the clinical PSI (Plaque Severity Index) score. A drop in the PSI score by 37.6% was recorded following an average of 19.8 red light applications.

MEASUREMENT OF ELECTRIC VOLTAGE IN WOUNDS

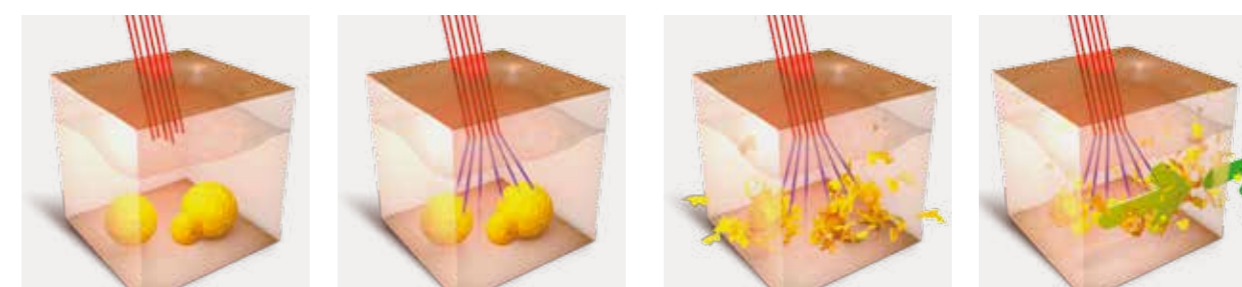
This was followed by further observation surveys on the subject of wound healing that were further substantiated by the measurement of the electric voltage in the area covered by the wound before and after the red light therapy. The related theory is based on the

fact that the entire human body is surrounded by an electrical voltage field. When a defect occurs such as in the case of a chronic wound, this electric field is sustained up until the edge of the wound that is fully intact. This voltage field does not exist within the chronic wound itself. The result of the measurement uncovered that the electric voltage was significantly built-up within the area covered by the wound through red light treatment performed on the chronic wound thus leading to an improvement of wound healing by 85%.

PHOTOBIOSTIMULATION AND ACTIONS ON THE SKIN

The special red light therapy (632 Nm) penetrates the skin perfectly well. It stimulates the membrane of the mitochondria, which produces adenosine-tri-phosphate (ATP). This ATP makes up the energy that is used by the cells for their cellular activities, amongst others, for the DNA and RNA synthesis, for the cell repair called mitosis and for the production of collagen. The

phenomenon of photobiostimulation takes hold on natural basis when the skin is exposed to the sun. Yet the light spectrum of the sun also contains damaging radiation (UV), produces thermal impacts, stimulates the production of melanin and can lead to burns and redness. Photobiostimulation through the cold and mono-chromatic LED light prevents all these negative impacts of the sun and exclusively protects the positive impact. This cold red light contributes to the reduction of specific vascular problems e.g. couperose, through their impact on blood vessels. Indications of erythema and burns can also be alleviated in the same manner. Photobiostimulation that is triggered by the cold red light impacts positively on scars, which on the other hand, impacts on skin-aging such as dermatitis solaris and on the reduction of the production of collagen and elastin, which are responsible for wrinkles. At the same time, it accelerates and improves the process of scar healing.



The red light emitted by REPULS® penetrates deeply into the tissue ...

... and is converted in the process, into mechanical UV oscillations.

This leads to the biochemical impact inhibition of 12-Oxo-LTB4.

The breaks between the light pulses promote the outward conveyance of the reaction products.

Duration of a pulse



MODE OF ACTION

Therapy with intensive cold red light translates into a favorable control of the processes of inflammation. These processes are subjected to a complicated control mechanism in which organic molecules play a decisive role.

The positive impact of the cold red light and its high level of efficiency are based on the high level of penetration that is enhanced by the following characteristics:



o. University Professor Dr. DI Fritz Paschke

„We choose red light in that frequency range, in which water virtually does not absorb, achieve a very high depth of penetration in the aftermath and are able to stimulate electromechanical molecular oscillations within the frequency range of the ultraviolet at a yet non-hazardous performance density.“

Baseline surveys at Ludwig Boltzmann Institute have uncovered that measurable biochemical effects are unleashed in the aftermath of treatment with REPULS. Data indicate that the treatment impact positively on cell metabolism. These positive impacts are also reflected in a significantly increased respiratory activity of cell respiration. Increased production of ATP was also recorded.

REPULS WORKS WITH PULSED RED LIGHT.

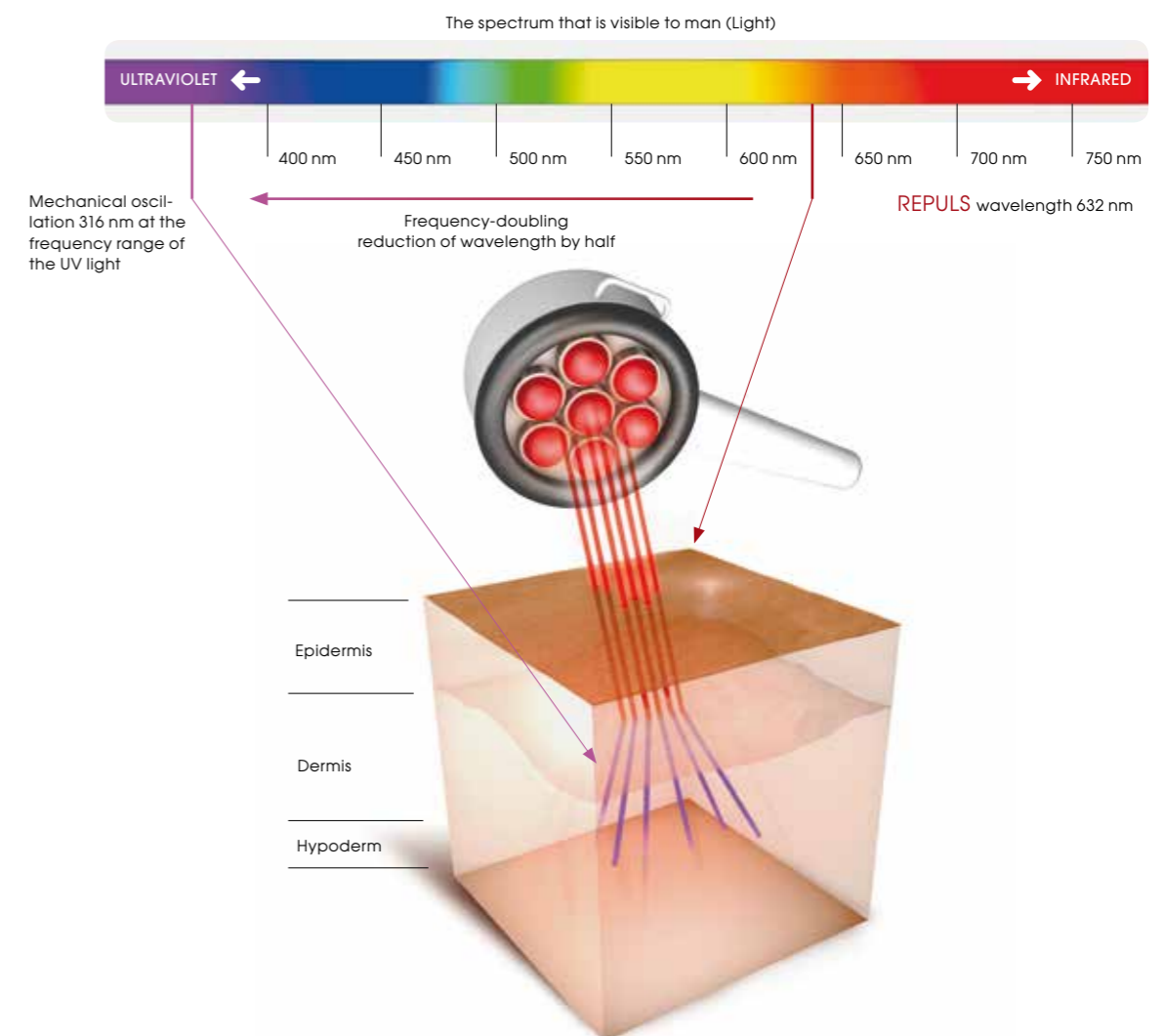
This leads to the reduction of thermal development with the exclusion of pain sensation in the face of the impact of heat.

With its breaks between the light pulses, the radiation rhythm of 2.5 light pulses per second serves the purpose of removing the reaction products that emerge in the aftermath of the radiation. This impact persists even after the treatment.

THE IMPACTS OF COLD RED LIGHT IN THE TISSUE

THE CONVERSION OF COLD RED LIGHT INTO MECHANICAL OSCILLATIONS

1. Frequency-doubling
2. Resonance-frequency in the cell
3. Influencing the inflammation metabolism (Leukotriene metabolism)





INFLUENCE OF PULSED RED LIGHT BY REPULS ON CELLULAR MECHANISMS IN CELL CULTURE MODELS*

Low level light therapy (LLLT) is a renowned medical treatment that uses red/near infrared (NIR) light or light-emitting diodes (LEDs) to treat a range of clinical conditions, such as reduction of inflammation, neurological pain and wound healing (1). It was discovered by Endre Mester in 1967, rather by accident, when he was trying to prove that exposure to the HeNe laser caused cancer. Conversely, he noticed that applying the laser light to the backs of shaven mice promoted faster hair growth (2). In-vitro studies have already demonstrated the positive effect of continuous low-level light in the red or infra-red range. It has been hypothesized that LLLT radiation is initially absorbed by the components of the mitochondrial respiratory chain which enables the rehabilitation of the cell after a traumatic event. Furthermore LLLT has been tested to increase the release of adenosine triphosphate (ATP), control reactive oxygen species (ROS) production and lead to the induction of transcription factors (3). Recently Relux Lichttechnik GmbH, Austria, introduced REPULS, a high frequency red light radiation lamp, to the market which emits cold pulsed (2.5Hz) LED light at 632 nm. The aim of this study was to investigate the effects of REPULS® on cellular, specifically mitochondrial mechanisms in a myoblast and a fibroblast cellline.

CONCLUSION

In the present study we investigated the effects of REPULS by Relux Lichttechnik GmbH on cellular metabolism in two different cells, namely a myoblastic (C2C12) as well as a fibroblastic (NIH/3T3) cell line. Myoblasts and fibroblasts are both cells which are important for regeneration processes after all kind of injuries. In our study, we demonstrated that treatment with REPULS had no negative influence on cell viability. In contrast, illumination by REPULS enhanced cell proliferation of both myoblasts and fibroblasts, seen as increased incorporation of BrdU into newly synthesized DNA of replicating cells. These results are in line with Observations in studies with red laser light (4). In addition, REPULS had positive effects on mitochondria, the powerhouses of the cell. Both respiration and ATP production were elevated in the light treated group. Enhanced energy production and proliferation are important for healing and regenerative processes. Our data demonstrate that pulsed red LED light by REPULS positively influences fibroblasts and myoblasts. These effects may contribute to the reported positive effects of this medical device in tissue regeneration.

* Chaudary S, Dimitrescu S, Weidinger A, Redl H, Dungal P, Ludwig-Boltzmann-Institut für experimentelle und klinische Traumatologie

CLINICAL EXPERIENCES

1 APPLICATION STATISTICS FROM RELUX CENTER VIENNA: PAIN STATISTICS OF THE MUSCULOSKELETAL SYSTEM

Dr. med. Martha Schmid,
Department of Trauma Surgery and Sports Traumatology

107 patients were examined with complaint of chronic diseases in the musculoskeletal system

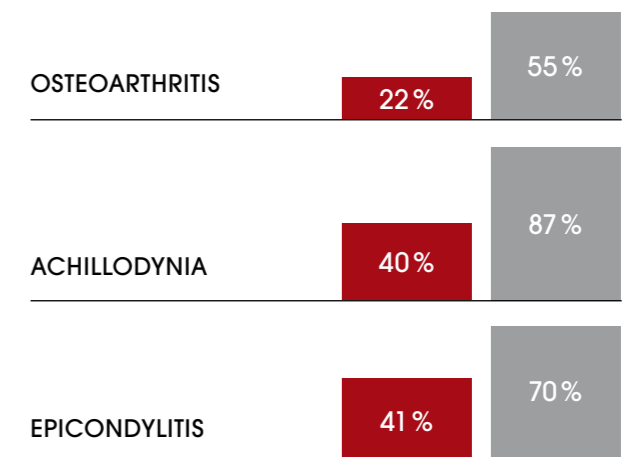
Complaint existed for: longer than 6 months
Duration of treatment: 30 minutes
Number of treatments: 10–12, 20–25

THE FOLLOWING INDICATIONS WERE TREATED:

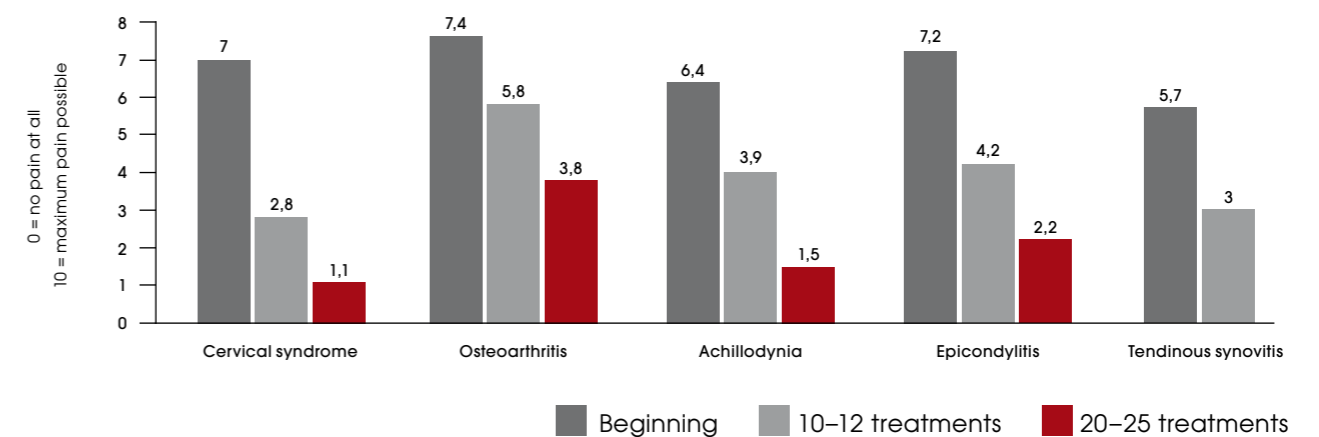
- Osteoarthritis in the knee, shoulder and hip area
- Epicondylitis
- Cervical syndrome
- Tendinous synovitis
- Achillodynia
- Tendinous synovitis

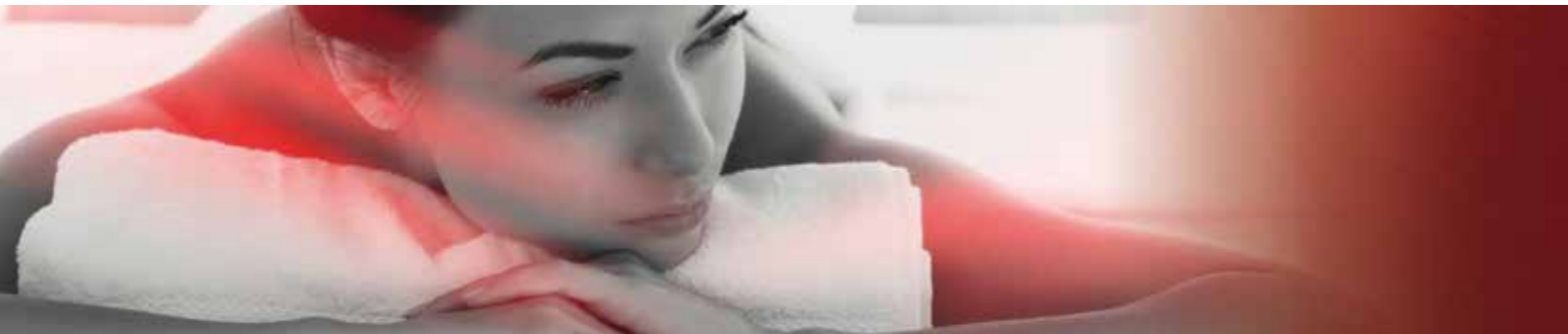
AVERAGE RATE OF IMPROVEMENTS IN %

■ after 10 treatments
■ after 20 treatments



AVERAGE RATE OF PAIN IMPROVEMENT





2 SUMMARY OF THE RESULTS OF THE TREATMENT OF CHRONICALLY DEGENERATIVE DISEASE OF THE MUSCULOSKELETAL SYSTEM WITH REPULS AT THE ORTHOPEDIC HOSPITAL IN SPEISING

DIAGNOSES:

"Radiohumeral Epicondylitis"

Painful calcaneal spurs

Tendinous synovitis

Other forms of chronic irritations

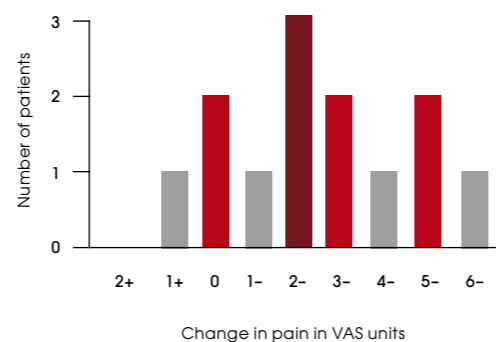
THERAPY: 10–15 treatments

Duration: First treatment: 7 minutes (following possible intermittent increase in pain), every further treatment: 15 minutes

THERAPY SESSION: 2 to 3 times per week

Ascertainment of pain situation by patients using a standardized "Visual Analog Scale" (VAS) of 0–10 (0 ... no pain, 10 ... max. pain imaginable)

CHANGES ON THE VAS AFTER REPULS THERAPY:



76.9% of patients that are certified beyond treatment by mainstream academic medicine (with symptoms ranging from a period of six months to seven years) experienced pain relief, 23% of that group became completely free of pain.

3 APPLICATION OF REPULS ON ORAL-SURGICAL INTERVENTIONS

Prof. Dr. Gerd Volland, M.Sc. and Prof. Dr. Greßmann, Heilsbronn or Neudrossenfeld, Germany placebo-controlled, parallel groups

n = 204 patients

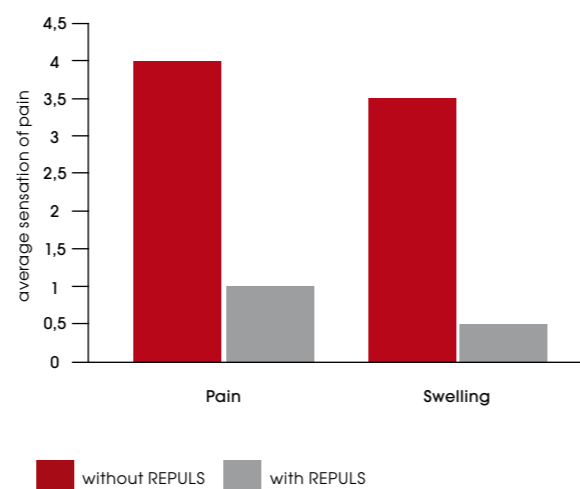
INDICATIONS: Tooth extractions, implantations, root tip resections, osteotomies

MODE: Pre and post-surgical radiation of 10 minutes respectively

MEASUREMENT: subjective pain, objective swelling based on VAS of 0–10 (0 ... no pain, 10 ... max. pain imaginable)

Through pre and post-surgical treatment with REPULS (with temporal proximity to the surgery), pain and swelling can be reduced or avoided three to four-fold as compared with the control group.

POSTOPERATIV POST-SURGICAL PAIN AND SWELLING IN DENTAL OPERATIONS



INDICATIONS

MUSCULOSKELETAL SYSTEM

TENDON DISEASES

- Tendinosis (Changes in the tendon, tendon pains)
- Tendinitis (Inflammation of the tendon)
- Insertion tendinopathies (Changes in tendon insertion)
- Distortions (Sprains)

PAIN RELIEF

- Myoneuralgia (Muscle pains)
- Tenseness of the muscle
- Myogeloses (Hardening of the muscle)

INFLAMMATORY PROCESSES

INDICATIONS ON USAGE OF REPULS

DISTANCE RING:

WOUND HEALING

INFLAMMATIONS OF THE SKIN

- Dermatitis (Inflammation of the skin)
- Eczema (Inflammation of the skin)
- Ulcers (Ulcers)

SKIN RASHES

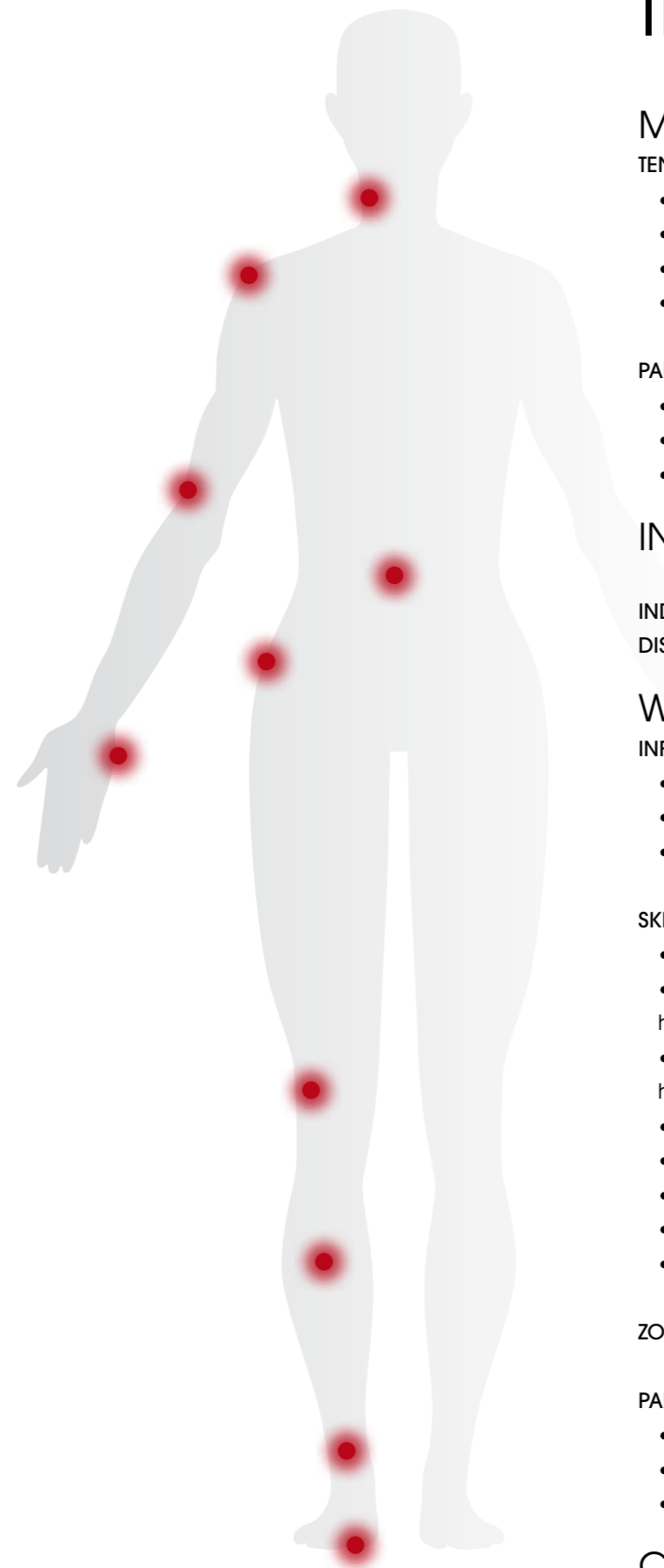
- Neurodermatitis (atopic eczema)
- Acne vulgaris (Inflammation of the sebaceous glands and hair follicle)
- Acne indurata (Inflammation of the sebaceous glands and hair follicle)
- Abscess (purulent tissue liquefaction)
- Furunculosis (Inflammation of the hair bulbs)
- Psoriasis (Broad scaling)
- Vitiligo (Piebald skin)
- Trichophytia (Fungal infections)

ZOSTER (VIRUS) NEURALGIA

PAINFUL SKIN DISORDERS

- Pruritus (Itching)
- Neuralgia (Nervous pains)
- Fibrosides (connective tissue-based thickening of the skin)

COMMON COLD





REPULS 7

TRIED AND TESTED MODE OF ACTION – IN THE STATE OF THE ART

- 7 LEDs of the latest generation enhancing increased light emitting efficiency
- 50% additional light energy
- enlarged treatment area
- new screwed-on cover disk enables homogenous distribution of light

APPLICATION

- REPULS 7 enables a short period of application. The duration of treatment can be set to a maximum of 15 minutes in five stages of 3 minutes respectively.
- Improved space utilization in the housing that is able to absorb 7 LEDs facilitates application on a broader area.
- The light may also be useful to Photodynamic Therapy (PDT) because REPULS 7 has 50% more area coverage efficiency.
- REPULS 7 “acts” very positively on chronic diseases. The increased area that is covered by the radiation now ensures a more intensive depth impact.
- Particularly useful e.g. in the treatment of the vertebral column: Three LEDs radiate directly on the vertebrae while two LEDs respectively enclose the vertebrae with light from the sides.



SAMPLE APPLICATIONS

MANDIBLE



SHOULDER



NECK



ELBOW



BACK/LUMBAR REGION



HAND



WRIST



HIP



ACHILLES TENDON



KNEE



WITH SPACER



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