

# Ultrasound Therapy 2.0

**EQultrasound** is a revolutionary device for an effective treatment of muscles, tendons, ligaments, joints and bone conditions in horses and dogs, both in the acute or chronic stages. It is a low-frequency therapeutic ultrasound (38 kHz) and produces much deeper and much more intense effects than traditional high-frequency ultrasounds (1-3 MHz). Through the use of six different hand probes, EQultrasound is able to produce mechanical vibration, diathermy (deep heat) and intense acoustic effects (stable cavitation, acoustical streaming and microstreaming). EQultrasound can be successfully employed in sports medicine, lameness treatment, pre-competition warm up and prevention of injuries. It can be used as an adjunct treatment to PRP and stem cell therapy injections, as a pre or post-surgery treatment, but also for sonophoresis (transdermal drug delivery) and to rapidly close open wounds.

EQultrasound can be a substitute or adjunct treatment to shockwaves.

EQultrasound operates in the kHz range, while traditional ultrasound devices operate in the 1-3 MHz range. Thanks to better knowledge of some physics and biophysics interactions, biological actions and therapeutic effects, we can point out at least four major differences between this innovative low frequency ultrasound device and the traditional 1 or 3 MHz devices.

These major differences are:

- stable cavitation, acoustical streaming and microstreaming
- deeper penetration
- reduction of dead zone
- the possibility to concentrate the cone of acoustic vibrations on a selected and punctual target with focalized transducers

The therapeutic effects of EQultrasound are very similar to those of extracorporeal shock waves, but since the induced mechanical effects (stable cavitation, acoustical streaming and microstreaming) are completely painless, horses and dogs can tolerate them without any need of sedatives.

## Stable cavitation, acoustical streaming and microstreaming

Cavitation is the most important non-thermal effect of therapeutic ultrasound. Several scientific papers agree on the fact that the most important biological and therapeutic effects of ultrasound are due to their mechanical and cavitation effects. Cavitation is the formation and vibration of micro bubbles inside interstitial fluids (or tissue fluids, which are the solution that bathes and surrounds cells of multicellular animals). This micro bubbles vibration produces changes in cellular activities and is called stable cavitation.

Now we know very well two important aspects of cavitation:

- cavitation increases as we reduce frequency
- cavitation increases as we increase emission power in W/cm<sup>2</sup> (at very low intensities cavitation is not present).

At traditional high ultrasonic frequencies (1 or 3 MHz) the production of cavitation bubbles becomes more difficult than at low ultrasonic frequencies, of the order of the kHz (like with EQultrasound therapy).

To produce cavitation with traditional 1 or 3 MHz devices, the intensity of the applied ultrasound must be significantly increased, which can possibly lead to burns and "hot spots" that might cause tissue damage. This is



a very important practical aspect, since in veterinary physical therapy we need only a safe and stable cavitation.

Other important non-thermal/mechanical effects associated to cavitation are acoustical streaming and microstreaming.

Stable cavitation produces also acoustical streaming, which is the movement of tissue fluids along cell walls; acoustical streaming increases cellular metabolic activity and permeability and contributes to recovery and restoration of cellular homeostasis.

Stable cavitation also produces circular currents inside tissue fluids surrounding the vibrating cavitation bubbles: this microscopic fluid movement is called microstreaming. Microstreaming (or micromassage) makes nearby cells and intracellular organelles twist and rotate. Microstreaming contributes to reduce edema.

Stable cavitation, acoustical streaming and microstreaming accelerate equine and canine natural healing processes by increasing cellular metabolic activity and enzymatic activity, accelerate the inflammatory phase of tissue repair, reduce pain, reduce fresh edema, hematoma and swelling and prevents from the evolution into calcific metaplasia.

### Deeper penetration

One of the most frequent problems therapists have to deal with is to reach a deep target without producing burns or potential harmful "hot spots" in the acoustic pathway, which might cause tissue damage.

When comparing the emission of the EQUltrasound device to the one of traditional high frequency ultrasounds (1-3 MHz), penetration is one of the biggest differences, since the effects of high frequency ultrasounds are much more superficial.

In fact with ultrasound, the lower the operating frequency, the higher the penetration.



Thanks to the particular duty cycle and frequency used in EQUltrasound therapy, it is now possible to reach deeper targets with very little acoustic attenuation and therefore without the need to increase applied intensity.

On the other hand in order to reach deeper targets with traditional high frequency 1-3 MHz ultrasound devices, the intensity of the applied

ultrasound must be significantly increased in terms of W/cm<sup>2</sup>: this can possibly lead to burns and "hot spots" that might cause tissue damage. In fact high frequency ultrasound waves are much more easily absorbed by superficial tissues and, unless intensity is raised at potentially harmful values, deeper equine and canine tissues and structures remain unaffected.

*continued overleaf*





### Reduction of dead zone

In the propagation of therapeutic ultrasound through the skin, physics taught us that there is a near zone (Fresnel's zone) and a far zone (Fraunhofer's zone), where the cone of vibrations submits the laws of acoustic physics: reflection, absorption, attenuation. With traditional 1-3 MHz ultrasound, a "dead zone" is present in the first layers of biological tissues, due to the high frequencies emitted. With low frequency / long wave ultrasound this dead zone is particularly reduced, which leads to better therapeutic effects also in the first layers of the body in some important districts of treatment.

### Concave / focalized transducers

There are plenty of equine and canine pathological conditions that need to be treated in a selected way, without involving surrounding tissues, and concentrating energy on a focalized target. EQultrasound concave and focalized transducers allow for better treatments while dealing for example with muscle fibrosis.

### Conclusions

EQultrasound is the expression of advances in technological capabilities and better understanding of some physics and biophysics interactions, biological actions and therapeutic effects. It produces much more efficient and deeper thermal effects than traditional high frequency devices (1-3 MHz).

EQultrasound also produces significant non-thermal/mechanical effects, with similar results to those achieved by extracorporeal shock waves, but in a totally painless manner.

The ability to deliver efficient deep heating and non-thermal/mechanical effects makes EQultrasound therapy a unique and flexible tool for equine and canine veterinarians and therapists, to treat muscles, ligaments, tendons, joints and bone conditions in horses and dogs.



**EQultrasound – BAC**  
E-mail: [info@equtrasound.com](mailto:info@equtrasound.com)  
[www.equtrasound.com](http://www.equtrasound.com)