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1 Ultrasound Bio-Safety survey for practicians - the current ECMUS policy

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The topic ultrasound bio-safety and exposure is engaged in research and practice since the first scanning equipment was used for routine practice. It has been detected that the ultrasound waves are not only used to produce images but also interact with the medium or tissue being coupled. More and more research and interest has been spent on these various interactions, and over decades has generated different modern application devices using the special advantages of the wave components for therapeutic (physio-therapy, HIFU) and diagnostic purposes (Elastography, Harmonic Imaging, Intermittent Imaging etc.)

But nevertheless there are potential drawbacks combined with the emission of ultrasound waves and if modern equipment is used the practician must know what is going on and what could happen.

The following paragraphs will cover a comprehensive survey of possible ultrasound interactions, actual epidemiological outcomes and bio-effects as well as "state-of-the-art" safety guidelines and recommendations given by the European Safety Committee (ECMUS) of the European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB).

1.1 Ultrasound interactions

An ultrasound wave regardless if continuous or pulsed interacts with its mechanical or thermal wave component with tissue (Figure 1). Depending on the imaging mode and the selected user pre-sets and settings, different effects can occur. Within the last 4 decades of clinical use of ultrasound imaging along with each new scanner generation an enhancement of ultrasound power output could be detected. The pressure amplitudes [p_-, p_+, MPa] representing the mechanical component of the wave and the intensity [mW/cm^2] or total power emission [W] characterising the thermal component have been increased [1]. In the early 1990s the Food and Drug Administration (FDA) changed its paradigm of safety and stated a new