

# Heat-shock proteins induced by extracorporeal shockwaves as a further cellular defence mechanism against external stress agents

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The human organism provides in addition to the enzymatic-oxidative system a further defence mechanism through the so-called stress proteins against reactive oxygenous and nitrogenous species (RONS). Part of this defense mechanism is the group of heat-shock proteins (HSP`s), which can be formed quickly and substantial quantities as a cellular response to external physical or chemical stress.

So far, HSP`s are found in nearly all pro- and eukaryotic cells. They are divided into groups according to their molecular weight in kilo Dalton.

Cellular stress-inducing agents of muscles and tendons are hyperthermia, ischaemia, denaturation of proteins caused by various chemical and physical effects and bodily strain.

Through mechanical irritations of muscles and tendons we were able to bring about the formation of heat-shock proteins in muscular and tendineous tissue. As mechanical stress agent we used extracorporeal shockwaves.

Subsequently, fine-needle biopsy were carried out at certain time intervals. Using the western blotting technique, we were able, to prove the formation of heat-shock proteins and their mRNA with monoclonal HSP-antibodies.

It is worth noting, that the frequency and intensity of stimulation appear to play a crucial role in the formation of heat-shock proteins.