

Significance of reactive oxygen- and nitrogen - compounds as muscular pain modulators with reference to triggerpoint shock wave therapy

Authors:

Neuland, Helmut, Duchstein, Hans-Joachim

Institution:

ZES Kronberg, 61476 Kronberg, Germany
Pharm. chemisches Institut Universität Hamburg
Hamburg Germany

One of the effects of the impact of various complex, signal emitting stress situations is the formation of free radicals. In the past, free radicals were primarily thought of as causing so-called oxidative stress. More recently it was discovered that they also play a significant role as signal and modulator molecules, particularly with regard to the activation of cellular defense mechanisms against various stress factors acting on the cell itself. The changes of the cellular redox system through oxidation and nitrosylation of other molecules or parts thereof are at the origin of the crucial role as signal and modulator molecules.

These changes are brought about through RONS (reactive oxygenous and nitrogenous species). The formation of nitrogen oxide (NO) plays an important role in the occurrence of muscle pain. Nitrogen oxide blocks, through interaction with thiolate ions (cysteine fragments), the receptors NMDA (N-methyl D-aspartate) and NK1 (neurokinin I).

Neurotransmitters like excitatory amino acids (e.g. glutamate) and neuropeptides such as somatostatin, substance P and calcitonin gene-related peptides are thereby deactivated. Through this mechanism the virtuous circle of continuous sensitization of muscular nociceptors and the related continuation of a local edema, accompanied by the release of bradykinin, is interrupted. We obtained evidence of the presence of nitrogen oxide in vitro through EPR (electron paramagnetic resonance) spectroscopy.

In vivo we were able to obtain evidence by using an NO-analyzing agent where a reaction takes place between NO and ozone resulting in chemiluminescence.

As mechanical stress agent we used extracorporeal shock waves.