Reactive oxygen species (ROS) are regularly produced in cells as a by-product of aerobic metabolism. Hence, organisms developed various defence mechanisms, which are able to avoid molecular damages caused by ROS under physiological conditions. In stress conditions, however, such defence mechanisms are not sufficient to avoid molecular damages. Accumulation of oxidized proteins is supposed to be a reason for ageing and many diseases including Friedreich's ataxia, Amylotrophic lateral sclerosis, Alzheimer's disease and many others. During oxidative stress, reactive oxygen species are reflected in oxidation of cystein residues in transcription factors, regulation proteins and active canters centers of enzymes. Oxidative modifications however could lead also to changes in transcription factor activity and activation of specific pathways, including changes in gene expression, cell cycle and proteolysis. This work shows defence mechanisms, ROS and proteins altered by reactive oxygen species that may function as important signalling molecules, which are essential for many cellular processes.