Signalling Effects of Redox Proteins in Response to Oxidative Stress

Jesse K. Kao and Ann M. English

Concordia University

Reactive oxygen species (ROS) are produced in metabolically active cells due to incomplete reduction of oxygen. One example of an ROS is hydrogen peroxide, which can trigger an oxidative stress response in cells.

Apoptosis can be induced by a variety of factors, including changes in redox potentials caused by hydrogen peroxide. During early apoptosis, cytochrome c is released from the mitochondria and enters the cytosol. What triggers cytochrome c release is unclear. It is possible that the production of free radicals on the surface of cytochrome c may have signalling effects. We have investigated the formation of these free radicals by forming stable radical adducts and examining them through the use of on-line LC/MS.

We have also investigated the oxidative stress signalling mechanism in *Saccharomyces cerevisiae* caused by hydrogen peroxide. The mitochondrial enzyme cytochrome c peroxidase (CCP) is induced when cells are exposed to hydrogen peroxide. CCP removes H_2O_2 by using cytochrome c as a terminal electron acceptor for mitochondrial respiration. Upon oxidative challenge, the transcription factors *Pos9* and *Yap1* are activated, which leads to the production of antioxidant genes such as thioredoxin. There is evidence that CCP can convey an oxidative stress signal to the transcription factor *Pos9*. We have examined this signal relay system *in vivo* using molecular biology techniques.