

Extracellular environment

Metal binding proteins



Antioxidant compounds
(α -tocopherol, β -carotene, urate...)

-ve

-ve

Transition metal ions
 Fe^{++} , Cu^{++} ...

Oxidants

Oxidative Stress

-ve

Antioxidant enzymes

Lipid peroxidation

Protein cross-linking

Normal cell

Direct repair
(reduction of
oxidized molecules)



- DNA strand breaks
- Mutations

Indirect repair
(replacement of
oxidized molecules)

Oxidatively
damaged cell

Apoptosis

Necrosis

Cellular environment